

CIRG

वार्षिक प्रतिवेदन ANNUAL REPORT 2007-08



केन्द्रीय बकरी अनुसंधान संस्थान
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 Preface

 CIRG: An Introduction

 कार्यकारी सारांश

 Executive Summary

 Organizational Chart

 Financial Statement and Staff Position



PREFACE



Goats are very important livestock species in the rural economy of the country. They are widely distributed in all the agro-ecological zones of India. Goat is a friend of the weakest section of society and ray of hope in the areas where agriculture is not economically viable and ecologically sustainable. Goats are

maintaining nutritional status of the lower strata of people by providing milk and meat. Goats can profitably be raised with low investment under intensive to the most extensive forms of nomadic grazing. The socio-economic importance of goat rearing is evident from the sharp increase in their population during the post independence period from 47.2 million in 1951-1952 to about 125 million presently. Annually, India produces 521 million kg of meat, 3790 million kg of milk, 130 million kg of skins, 30 metric tones of pashmina and about 90,000 metric tones of manure from goats.

The productivity of goats is low because they are mainly reared on scrub vegetation of community grazing land under most extensive system. Owing to their good economic potential the goat rearing under intensive and semi-intensive systems for commercial production is also gaining momentum. The country has to gear up to produce, process and market quality animals and their products to compete globally using latest technologies. The Central Institute for Research on Goats, Makhdoom is committed to conduct basic and applied research on all aspects of goat production and utilization. It gives me immense pleasure in presenting the Annual Report 2007-08 of the Institute containing salient research achievements made and training, extension and consultancy services provided by the Institute during the year. The Institute has developed, refined and validated a number of useful technologies for commercial goat production in the country. Genetic improvement of Jamunapari, Barbari and Jakhrana goats at the Institute and Sirohi, Black Bengal, Marwari, Surti, Sangamneri, Ganjam and Malabari breeds under the AICRP was continued. The Goat Semen Bank was further strengthened and studies on refinement of frozen semen technology and adaptability of goats were continued. Studies on adaptability in Barbari and Sirohi bucks and goat-waste management have been initiated. The area specific mineral mixture developed

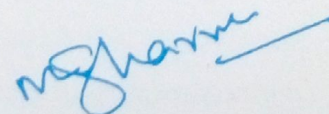




by the Institute was tested and validated under field conditions. Monitoring and surveillance of goat diseases was continued. The successful studies on development of herbal drugs and control of Johne's disease were undertaken. The Institute was awarded a mega project on 'Goat Husbandry based Integrated Approach for Livelihood Security in Disadvantaged districts of Bundelkhand Region' under the World Bank funded National Agricultural Innovation Project of the ICAR. Technologies developed by the Institute were transferred and evaluated at the farmer's door through a multi-disciplinary research project. A large number of elite breeding males and females of different goat breeds were provided to the State Animal Husbandry Departments and other major stakeholders for breed improvement. The institute imparted training on commercial goat farming to over 200 progressive farmers and entrepreneurs during the year. The human resource development and educational programmes offered by the Institute progressed successfully and number of Ph.D. and M.Sc. dissertations were completed during the year. The Institute in collaboration with the Indian Society for Sheep and Goat Production and Utilization organized National Goat Fair cum Scientists-Entrepreneurs- Farmers Interactive Meet. In total, over 800 National and International visitors visited the Institute during the year. The publication of Hindi News Letter 'Ajamukh' was continued and a new News Letter 'Goat News' in English was also started during the year.

We are grateful for the dynamic leadership and visionary guidance provided by Dr. Mangla Rai, Secretary, Department of Agricultural Research and Education, Government of India and Director General, Indian Council of Agricultural Research and Dr. K.M. Bujarbaruah, Deputy Director General (Animal Science) in pursuing research and management activities of the Institute successfully. We offer our sincere thanks to Dr. Lal Krishna, Assistant Director General (Animal Health), Dr. T.J. Rasool, Assistant Director General (AP&B) and Dr. C.S. Prasad, Assistant Director General (AN&P) for continued support and motivation in fulfilling the mandate of the Institute. I am highly thankful to the scientific, technical, administrative and supporting staff of the Institute for their untiring efforts in sincerely pursuing the programmes and contributing towards the mandated goals of the Institute.

I am sure that our stakeholders and partners would find the report useful and provide us their valuable suggestions in accomplishing our mission.


(M.C. Sharma)

CIRG: AN INTRODUCTION

Central Institute for Research on Goats is a premier Institute in the country engaged in research on goats. The Indian Council of Agricultural Research established a National Research Centre on Goats at Makhdoom village in Mathura district of Uttar Pradesh in the year 1975. This Centre was upgraded to the level of a full fledged Institute on July 12, 1979 and named as Central Institute for Research on Goats with a view to improve the productivity of goats and thereby socio-economic status of the goat keepers in the country. This Institute is located at Makhdoom village, on 302 ha of sandy, kans and munj infested ravine land. It is about 2 km away from Farah town (27.10° , 78.02° E, and 169 m above MSL), about 22 km from Mathura and 32 km from Agra cities. Main gate of the Institute is 1.8 km away from the Delhi-Agra National Highway No. 2. The general topography of the land is highly undulating. Geologically, the land comes under Jamuna alluvial soil category. Underground water resources are saline in most locations excepting some pockets from where drinking water is being harvested.

Vision

"Develop Poor Men's Cow: The Goat as a Source of Livelihood Security, Poverty Alleviation and Employment Generation for the Smallholders".

Mission

The Mission is to enhance and then sustain goat productivity in respect of meat, milk and fibre through Research, Extension and HRD support.

Mandate

The Mandate of the Institute is to undertake research, training and extension education programmes for improving milk, meat and fibre production of goats and develop products processing technologies with the following objectives:

- To undertake basic and applied research in all disciplines relating to goat production and product technology.
- To develop, update and standardize area specific package of practices on breeding,





feeding, management and prophylactic and curative health cover of goats.

- To impart National and International trainings in specialized fields of goat research and development.
- To transfer technologies for improving milk, meat and fibre production and value addition of goat products.
- To provide referral and consultancy services on goat production and product technologies.

The Head quarter of the All India Coordinated Research Project on Goat Improvement is also located at the Institute with 11 centers in different parts of the country. The Institute also maintains a Unit of AICRP on Sheep for Mutton. In addition, the Institute has a Unit of All India Coordinated Research Project on Improvement of feed resources and nutrient utilization for raising animal production. Externally-funded Research Projects like NAIP, DST, UPCST, AP Cess Fund etc. are also functioning at the Institute.

Research Divisions

Division of Goat Genetics & Breeding:

This division is conducting research in the field of goat genetics and breeding, conservation, breed improvement in natural habitats and gene marker studies for enhancing productivity in indigenous breeds, cytogenetic studies for screening bucks for breeding purpose and detecting genetic abnormality leading to reproductive disorders in various breeds. The macro and micro level studies on the population dynamics of goats are also undertaken.

Division of Physiology, Reproduction and Shelter Management:

This Division is primarily engaged in carrying out research in the field of reproduction bio-technology which includes embryo transfer and cryopreservation of buck semen, environmental physiology, management, grazing behaviour and development of goat shelter structures, feeding and watering devices.

Division of Nutrition, Feed Resource & Products Technology:

This Division is engaged in the studies on nutrient requirements of different breeds of goats, feed resource development, conservation and processing. It is conducting surveys on the feeding practices of goats in the villages and in organized farms. Another major activity of this Division is carcass evaluation and grading, preparation of package of practices for hygienic meat production and market survey of goat products like milk and meat etc. Studies are also being undertaken in the area of processing technology for value added milk and meat product preparation.

Division of Goat Health:

This Division is engaged in goat disease diagnosis, treatment and prevention under farm and field conditions. It is conducting surveillance and monitoring of goat diseases. Research work is also aimed at prevention of kid mortality. The Division is actively working in the area of immuno-diagnostics by molecular characterization of M. Paratuberculosis using DNA probes. Studies on parasitic problems and their control through herbal drugs is one of the new thrust areas.

Extension Education and Socio-Economics Section:

Transfer of viable production technologies to the field, studies on socio-economics of goat production under different farming systems and studies on constraints in adoption of newer technologies are the primary goals of this Section. The Section also produces extension aids and publications, organizes and participates in exhibitions, fairs and demonstrations besides training of extension workers and farmers for adopting eco-friendly and sustainable farming systems. This Section also maintains a well equipped Institute Museum.

All India Coordinated Research Project:

With a view to improve the performance of different breeds of goats in different agro-climatic conditions, the AICRP on goats has been functioning with its headquarters at CIRG.

The Project covers studies on goat breed improvement for meat, milk and fiber. A Unit of Muzaffarnagri sheep under All India Coordinated Research Project on Sheep Improvement is also located at the Institute. Another Unit of the All India Coordinated Research Project on improvement of feed resources and nutrient utilization for raising animal production is also functional at this Institute.

SALIENT RESEARCH ACHIEVEMENTS

1. GENETICS AND BREEDING

- Identification of Gene Pools in Goats
- Hemoglobin and Transferring polymorphism were studied in eight Indian goat breeds and the relations of breeds have been established.
- Micro-satellite characterization has been carried out in eight Indian goat breeds using 22 markers and best markers for breed differentiation have been reported. The Indian goats appear to cluster in three different groups viz. Group I- Jamunapari,



Sirohi, Marwari, Changthangi, Chegu, Group II- Jakhrana, Black Bengal, Osmanabadi, Barbari and Kutchi and Group III- Local (non-descript) goats.

- Indicator traits for resistance to gastrointestinal nematodes have been established in Barbari and Jamunapari breeds of goats.

2. NUTRITION AND FEED RESOURCE

(I) *Development of Economic Feeding Systems for Goats:*

- Several fodder tree leaves and cultivated leguminous fodders based complete feeds for different categories of goats as mesh,

pellets and blocks have been developed for economic goat meat and milk production.

- Supplementary feeding requirements of different categories of goats during different physiological stages have been worked out.
- Entolobium tree leaves as defaunation agent improved feed intake, nutrient utilization and growth rate in goats.
- Milk replacers were developed and tested successfully in pre-weaning Barbari kids.

Two and three-tier silvi-pasture models using several perennial grasses, legumes, fodder shrubs and trees were developed and evaluated for goats.

(ii) *Feed Technology:*

- A low cost Feed Pellet Making machine was developed for preparation of complete goat feeds in the form of pellets.



- A Complete Feed Block making machine was developed, tested and used for making CFBs for different categories of goats.

(iii) *Green House Technology:*

- Technology for drying of rainy season herbage in the form of hay under Poly Houses was perfected. Hay racks for drying the herbage have also been developed.

3. PHYSIOLOGY, REPRODUCTION AND SHELTER MANAGEMENT

(i) *Conservation of Energy and Climatic Adaptation:*

- Physiologically Sirohi goats are best suited to combat the thermal stress in semi-arid climate.
- The package of best management practices under both intensive and semi-intensive system has been developed.

(ii) Augmentation in Reproduction-

- A modified freezing protocol has been developed for ex-situ conservation of buck semen.
- Post-thaw motility was found better in straws having lower sperm concentration of 50-100 m spermatozoa as compared to higher concentration of 150-200 m spermatozoa.

(iii) Embryo Biotechnology:

- Good quality embryos were successfully collected through non-surgical technique.
- The conception rate in recipient does through surgical transfer varied from 20 to 40%.
- Caprine embryos could be successfully frozen at 4-12°C by vitrification technique.
- An eight cell in-vitro fertilized (IVF) embryo was transferred to a local goat and a healthy kid was born of a surrogate mother for the first time in the Country.

(iv) Housing Requirements:

- Housing requirements for different categories of goats have been determined and shelter management techniques standardized as follows-

**(v) Feeding and Watering Devices:**

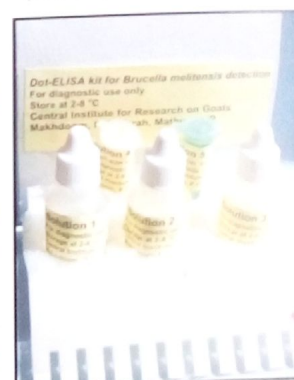
- Sets of 11 Feeding and Watering devices suitable for Goat and Sheep Farms have been modified and/or developed. This



technology has been adopted by several Commercial Goat Farmers in different parts of the country.

4. GOAT HEALTH**(i) Microbiology:**

- PCR based diagnosis directly from clinical material, serum and milk-ELISA diagnostic methodology has been developed.
- Several isolates of Mycobacterium Avium Paratuberculosis (MAP) have been characterized in organized and farmer flocks and maintained.
- A diagnostic kit for detection of J.D has been developed.
- A comb based dot-ELISA kit and PCR based test has been developed for diagnosis of *Brucella melitensis* infection in goats and sheep. The dimension of caprine Brucellosis disease has been studied in organized and unorganized farms.
- Development of DNA based vaccine against *Brucella melitensis* is underway.
- A latex agglutination test for quick and spot diagnosis of *M. Capri* infection has been developed.
- Pathogenic *E. coli* strains were isolated from the fecal samples and heart blood samples at autopsy of kids died of diarrhea. About 200 doses of experimental polyvalent vaccine, incorporating six strains of various sero types of enteropathogenic *E.coli*, were used successfully in pregnant does to control the kid mortality.
- Outbreaks of PPR were investigated throughout the country. The disease appears to be endemic in goats and sheep in India and the outbreaks seem to spread steadily now in young animals all over with high mortality of 38.75 to 48.90% and morbidity of 19.34 to 46.66%.



(ii) **Medicine:**

- Epidemiology of important goat diseases like PPR, Goat Pox, Contagious Ecthyma, FMD, Haemonchosis, Colibacillosis was studied in changing climatic conditions in organized farms.
- Several medicinal plants were evaluated for the control of Haemonchosis in goats.
- A herbal drug against Ectoparasites with the trade name "Alquit" has been developed, validated and found to be very effective.



(iii) **Parasitology:**

- Efficacy of Monensin treatment in experimental coccidiosis in kids was studied. Monensin @ 40 mg per kid/day in premixed concentrate mixture was found to be effective.
- The basic epidemiological information under field conditions on the common parasitic infestation and incidence of mortality has been studied.

5. **GOAT PRODUCTS TECHNOLOGY**

(i) **Carcass and Meat Quality Evaluation:**

- Live animal traits, carcass and non-carcass component yield, cutability, carcass composition, fat partitioning and meat composition of goat carcasses belonging to different breeds and age groups have been studied.
- Effects of age, system of feeding and management on



quantity and quality of meat production have been studied.

(ii) **Goat Meat Products:**

- Processing techniques for manufacture of value added products from spent goat meat have been developed and Recipes viz. pickles, sausages, cubes, shami kebabs,



samosas, patties, roll slices, cutlets, croquettes, meat balls, warm and serve meat curries and chevonettes have been standardized.

- The quality attributes of value added meat products and their shelf-life have been evaluated.

(iii) **Goat Milk:**

- Effects of breed, season, time of milking, parity and stage of lactation on major milk constituents and Paneer yield have been investigated.
- Keeping quality of Barbari and Jamunapari goat milk during summer, winter and rainy seasons at room temperature have been studied.



(iv) Goat Milk Products:

- Processing techniques for preparation of Paneer, a value added product using different coagulants such as citric acid, HCl, lactic acid and fermented Paneer whey have been developed and standardized.
- Quality and shelf-life of Khoa, Shrikhand, Channa, Mozzarella cheese, whey drink and Dahi (curd) have been studied.

5. EXTENSION EDUCATION AND SOCIO-ECONOMICS

- Goat rearing has been found to be profitable under semi-intensive and extensive system of management under field conditions giving net profit of 0.76 rupee per rupee of total input cost with a net income of Rs. 1300 to Rs. 1800 per goat/ annum.
- Several Extension Education Models in adopted villages and off and on-Campus training programmes have been studied. A Distant Extension Method for Commercial goat farming has also been studied.
- About 750 commercial goat farmers of 11 States were contacted. Information from 61 commercial goat farmers on status and constraints in commercial goat farming was collected. About 25% farmers were

undertaking goat rearing as their primary source of income and were fully dependent on it.

- The role of middlemen in goat marketing and exploitation of goat farmers by them was studied.

ARIS CELL

- The Agriculture Research Information System (ARIS) Cell was created during 1996. The Linux Operating system and Software used for creation of Internet was based on affordable and sustainable GNU based Open Source Software. CIRG has established the first functional LAN of National Agriculture Research System of India where Internet was available on Plug-n-Practice basis. Subsequently, web site of the Institute was launched from the server located at CIRG. Thus, CIRG web site <http://www.cirg.res.in> was the first web site launched from the own server and on OSS/FS software. The Institute has also launched Hindi version of its web site.
- The web-based e-mail was created making the e-mail of CIRG accessible from all over the world on Internet. The email conferencing systems generally known as Mailing Lists of List servers were created on 7 aspects of agriculture.

HUMAN RESOURCE DEVELOPMENT

The Institute is offering Ph.D. level research program in collaboration with Dr. B.R. Ambedkar University, Agra. In addition to specialized training programmes for professionals and veterinarians in various areas of scientific goat rearing, the Institute regularly organizes National Training Programme on Commercial Goat Farming of 10 days duration in every quarter of the year, for farmers and entrepreneurs.



कार्यकारी सारांश

केन्द्रीय बकरी अनुसंधान संस्थान की स्थापना वर्ष 1979 में बकरी पालन की विभिन्न विधाओं में मौलिक, आधारभूत एवं जनोपयोगी अनुसंधान हेतु हुई। निदेशक संस्थान के सर्वोच्च अधिकारी हैं जो अनुसंधान सलाहकार समिति एवं संस्थान प्रबन्धन समिति की सलाह एवं मार्गदर्शन से कार्य करते हैं। संस्थान में वर्तमान में निदेशक सहित 38 वैज्ञानिक, 72 तकनीशियन, 39 प्रशासनिक एवं वित्त तथा 100 सहायक कर्मचारी हैं। वर्ष 2007-08 में संस्थान को रु0 195.00 लाख योजना मद व रु0 783.00 लाख गैर-योजना मद में आवंटित हुई। इस राशि में से संस्थान द्वारा रु0 131.01 लाख योजना मद व रु0 710.67 लाख गैर-योजना मद में व्यय किये गये।

बकरियों की संख्या वर्तमान दर से बढ़ती रही तो वर्ष 2010 तक यह लगभग 13 करोड़ तक पहुंच जायेगी। बकरी प्रतिवर्ष अपने विभिन्न उत्पादों जैसे मांस (52.10 करोड़ कि०ग्रा०), दूध (379.0 करोड़ कि०ग्रा०), खाल (13.0 करोड़ कि०ग्रा०), पश्मीना (41 मी० टन) व खाद (90 हजार मी० टन) द्वारा देश की अर्थव्यवस्था में महत्वपूर्ण योगदान करती है। बकरी की उत्पादकता बढ़ाने के उद्देश्य से संस्थान बहुआयामी शोध, प्रशिक्षण एवं प्रसार कार्य में निरन्तररूप से संलग्न है। इसी कड़ी में संस्थान ने विगत वर्ष में निम्न उत्कर्ष शोध व प्रसार कार्यो को सम्पादित एवं प्रतिपादित किया है:-

बकरियों की विभिन्न नस्लों के विकास के लिए चयनधर्मी प्रक्रिया का प्रयोग अत्यन्त लाभकारी सिद्ध हुआ है। उत्कृष्ट प्रजनक नर हेतु, 9 माह पर शरीर भार एवं 90 दिन में उसकी माता का दुग्ध उत्पादन चयन प्रक्रिया का मुख्य हिस्सा रहे। जन्म के समय 3, 6, 9 व 12 माह की आयु पर जमुनापारी नस्ल में 3.28 ± 0.03 , 11.99 ± 0.14 , 16.41 ± 0.22 , 21.54 ± 0.38 एवं 27.06 ± 0.38 कि०ग्रा० शरीर भार प्राप्त हुआ। बरबरी नस्ल में यह आंकड़ा 1.87 ± 0.10 , 6.40 ± 0.10 , 6.40 ± 0.10 , 12.45 ± 0.09 , 17.66 ± 0.11 एवं 22.33 ± 0.33 कि०ग्रा० था। जमुनापारी एवं बरबरी नस्ल में 90 दिन का औसत दुग्ध उत्पादन 103.1 ± 2.0 एवं 58.81 ± 1.52 लीटर रहा। इन दोनों नस्लों में दुग्ध अन्तराल 169.9 ± 1.52 एवं 109.80 ± 1.32 दिन का देखा गया। जखराना नस्ल में जन्म 3, 6, 9 व 12 माह में शरीर भार क्रमशः 02.79 ± 0.09 , 9.98 ± 0.36 , 14.97 ± 1.05 , 17.89 ± 1.00 व 22.52 ± 1.55 कि०ग्रा० था। इस नस्ल में 90 एवं 150 दिन का दुग्ध उत्पादन क्रमशः 109.87 ± 3.99



एवं 145.79 ± 4.75 लीटर पाया गया। बकरियों में वृद्धि दर एवं मांस की गुणवत्ता से सम्बन्धित जीन्स में आनुवांशिक विविधता का विश्लेषण किया गया।

संस्थान द्वारा चयनधर्मी प्रक्रिया से उत्पादित जमुनापारी, बरबरी एवं जखराना नस्ल के कुल 254 उन्नयत नर एवं मादा पशुओं को ग्रामीण एवं अन्य क्षेत्रों में नस्ल सुधार हेतु बकरी पालकों, गैर सरकारी संगठनों, व्यवसायिक बकरी पालकों, कृषि विश्वविद्यालयों एवं शोध संस्थानों को दिया गया। संस्थान द्वारा उत्तर प्रदेश के बुन्देल खण्ड में बकरी पालन आधारित समन्वित कृषि प्रणाली विकसित करने हेतु एन०ए०आई०पी० प्रदत्त शोध परियोजना प्रारम्भ की गयी है।

बकरी में हिमीकृत वीर्य तकनीक को अधिक प्रभावी बनाने के उद्देश्य से प्रयोग एवं अध्ययन किये गये एवं बकरी वीर्य बैंक के सुदृढ़ीकरण हेतु प्रयास किये गये। कुल 60 सिरोंही बकरियों में किये गये कृत्रिम गर्भाधान में सफल निषेचन की दर 41.52 प्रतिशत रही। कम से कम 40-50 प्रतिशत पोस्ट-थॉ मोटिलिटी सहित अच्छी गुणवत्ता वाले वीर्य की 500



स्ट्रोज को भविष्य में प्रयोग के लिये भंडारित किया गया। बकरी में ऋतुकाल के समकालीकरण हेतु स्थानीय प्रोजेस्टेरान युक्त स्पॉज, रक्त में प्रोजेस्टेरोन स्तर 1 नैनो ग्रा0/मि0ली0 से अधिक बनाये रख सके। बकरियों में अनुकूलन व बकरी निष्प्रयोज्य प्रबन्धन पर अध्ययन किये गये। बरबरी बकरों का सघन पद्धति के अन्तर्गत व सिरोंही बकरों का अर्ध-सघन पद्धति के अन्तर्गत अनुकूलन अधिक अच्छा रहा।



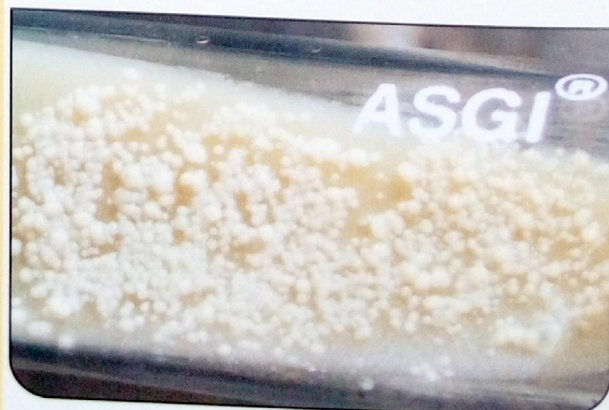
बकरी के चारे के संचयन एवं संवर्धन हेतु संस्थान द्वारा शोध प्रयास किये जा रहे हैं। अतिरिक्त हरे चारे को सुखाने से सम्बन्धित अध्ययन में पोलीहाउस में चारा सुखाना, खुले वातावरण में सूर्य की रोशनी से चारे सुखाने से अधिक प्रभावी पाया गया। वर्षा आधारित वन चरागाह में 8 प्रकार के एकल एवं मिश्रित चारा फसलों का परीक्षण किया गया। जिसमें ग्वार+लोबिया मिश्रित फसल से सर्वाधिक चारा (25.41 टन/है0) प्राप्त हुआ। अलसी एवं कपास की खली के रूप में बकरी हेतुरुमेन बाई पास प्रोटीन पर परीक्षण किये जिसके परिणाम आशाजनक रहे। संस्थान द्वारा विकसित स्थान विशिष्ट खनिज लवण मिश्रण का पशुओं में प्रयोग अत्यधिक लाभकारी पाया गया। अध्ययन में पाया गया कि इस मिश्रण के प्रयोग से गाय व भैंसों में 72 प्रतिशत रिपीट ब्रीडिंग व 15 प्रतिशत बाँझपन की समस्या दूर हुई। नीलगाय से प्राप्त फफूंदी इनोकुलेट करने पर, बकरियों द्वारा तुलनात्मकरूप से अरहर भूसा के रूप में अधिक चारा ग्रहण किया।

महीना, मौसम व दुग्ध अवस्था का बकरी दूध संगठन पर प्रभाव का आंकलन किया गया। कुल दोस पदार्थ व वसा फरवरी, सितम्बर व अक्टूबर माह में तुलनात्मकरूप से अधिक पाई गई। जमुनापारी बकरी के दूध में वसा की मात्रा गर्मी में सबसे कम (3.27 ± 0.03 प्रतिशत) व बसन्त ऋतु में सर्वाधिक (4.80 ± 0.11) थी। बकरी मांस की गुणवत्ता पर



अध्ययन में पाया गया कि पूरक दाने के साथ विशिष्ट खनिज लवण मिश्रण खिलाने पर अर्ध-सघन पद्धति के अन्तर्गत पाली गयी बकरियों के विभिन्न कट्स के भार में वृद्धि हुई। करी पत्ता चूर्ण को बकरी मांस में मिलाकर एन्टीओक्सीडेंट के रूप में सफल परीक्षण किया गया।

देश में बकरी में विभिन्न बीमारियों की स्थिति पर संस्थान द्वारा लगातार सर्वेक्षण इस वर्ष भी जारी रहा। बकरी में कोक्सीडियोसिस के हर्बल उपचार के उद्देश्य से 15 पौधों की छंटनी की गयी। इन-विट्रो परीक्षणों के दौरान लहसुन का सत कोक्सीडियोसिस के खिलाफ अत्यधिक प्रभावी पया गया। मेमनों में दस्तों के उपचार हेतु तैयार किये गये 8 पादप सतों का परीक्षण किया गया। इनमें से 4 प्रोटोटाइपस का सम्भावित दस्त विरोधी हर्बल दवा बनाने हेतु चयन कर लिया गया। बकरी में ब्रूसेलोसिस रोग के कारक ब्रूसेला की पहचान आणविक स्तर पर की गयी। बकरियों में माइकोप्लाज्मोसिस रोग पर अध्ययन में इम्यूनो-रिएक्टिव प्रोटीन बैंड्स की पहचान की गई। संस्थान द्वारा विकसित जोहनीस रोग के टीके के मूल्यांकन हेतु इसका बकरी व भेड़ पर देश के विभिन्न क्षेत्रों में परीक्षण किया गया। जिसके अच्छे परिणाम प्राप्त हुए।



संस्थान द्वारा विकसित नवीन तकनीकों का मूल्यांकन एवं स्थानान्तरण सुचारु एवं प्रभावी रूप से एक विशेष परियोजना के अन्तर्गत किया गया। इसके परिणाम स्वरूप गोद लिये गाँवों में बरबरी बकरियों का प्रतिशत बढ़ा व बकरी मृत्यु दर



कम हुई। उन्नत तकनीकों का अंगीकरण व ज्ञान व अभिवृत्ति को मापने हेतु टैस्ट व पैमानों का विकास एवं उन्नत तकनीकों व उभरती बाजार स्थितियों का बकरी उत्पादन पर प्रभाव आदि पर अध्ययन जारी रहे। उन्नत बकरी पालन के ज्ञान को अधिक से अधिक लोगों तक पहुँचाने के लिए संस्थान द्वारा गतवर्ष में 4 राष्ट्रीय प्रशिक्षण कार्यक्रम आयोजित किये गये। संस्थान द्वारा मंगोलियन वैज्ञानिकों के लिए 2 माह के एक अंतर्राष्ट्रीय प्रशिक्षण कार्यक्रम का आयोजन भी किया गया। इस वर्ष 12 पीएच-डी एवं 10 एमएससी के विद्यार्थियों को संस्थान में प्रवेश दिया गया। देश-विदेश के विभिन्न भागों से आये कृषकों, गैर सरकारी संगठनों के प्रतिनिधियों, व्यावसायिक बकरी पालकों एवं छात्रों के लिए परामर्श की व्यवस्था की गई। वर्ष भर में कुल 791 सम्बन्धित व्यक्तियों व संस्थाओं को परामर्श सेवा दी गई। यह परामर्श विभिन्न वर्गों के लिए अत्यन्त लाभकारी सिद्ध हुआ।



EXECUTIVE SUMMARY

Central Institute for Research on Goats (CIRG) was established in 1979 to conduct basic, fundamental and applied research in all aspects of goat production. Director is the Head of the Organization assisted and guided by Research Advisory Committee (RAC) and Institute Management Committee (IMC). The Institute presently has 38 Scientists including Director, 72 Technical staff, 39 Administrative and 100 Supporting staff. The total annual budget allocated to the Institute for 2007-08 was Rs. 195.00 Lakh under plan and Rs. 783.00 Lakhs under non-plan. Total expenditure was Rs. 131.01 Lakh under plan and 710.67 Lakh under non-plan.

The goat population in the country is likely to reach a figure of 130 million by 2010. Goats contribute 521 million kg of meat, 3790 million kg of milk, 130 million of skins, 41 metric tones of Pashmina and 90 thousand metric tones of manure annually to the national economy. CIRG, Makhdoom is actively engaged in conducting research, training and extension activities on all aspects of goat production and utilization with a view to improve the productivity of goats in respect of milk, meat and fibre.

The selective breeding programme has been executed in the nucleus goat flocks and also in their natural habitat involving farmers' flocks. The criterion for selection of superior bucks was on the basis of index computed by taking account



of 9 months body weight and 90 days milk yield of their dams. Top ranking bucks were used for producing superior progeny. Mean body weights of the kids at birth, 3, 6, 9 and 12 months of age were 3.28 ± 0.03 , 11.99 ± 0.14 , 16.41 ± 0.22 , 21.54 ± 0.38 and 27.06 ± 0.38 kg in Jamunapari and 1.87 ± 0.10 , 6.40 ± 0.10 , 12.45 ± 0.09 , 17.66 ± 0.11 and 22.33 ± 0.13 kg in Barbari, respectively during the period under report. In case of Jamunapari field unit mean body weights of the kids at birth, 3, 6, and 9 months of age were 2.41 ± 0.06 , 15.54 ± 0.23 , 22.15 ± 0.48 and 27.22 ± 0.60 kg. Average milk yield in the two breeds at 90 days was 103.1 ± 2.0 and 58.81 ± 1.52 liters, respectively during the year. The average lactation length in Jamunapari was 169.9 ± 3.1 days and in Barbari 109.80 ± 3.99



days. Body weight at birth, 3, 6, 9 and 12 months age averaged 2.78 ± 0.09 , 9.98 ± 0.36 , 14.97 ± 1.05 , 17.89 ± 1.00 and 22.52 ± 1.55 kg, respectively in Jakhrana kids during the reported period. The average milk production in Jakhrana was recorded to be 109.87 ± 3.99 and 145.69 ± 4.75 liters in 90 and 150 days, respectively. The elite germplasm of Jamunapari, Barbari, Jakhrana and Sirohi breeds numbering 56,195, 2 and 1 respectively was supplied to the farmers, SAUs, NGOs and other research institutions for breed improvement and conservation under field conditions. Genetic variations in MyoD family



genes, which are responsible for growth and meat quality in Barbari, Jamunapari and Black Bengal goats were analyzed. A NAIP project on Development of Goat based Integrated Farming System in Bundelkhand Region of U.P. has been initiated.

Studies on refinement of frozen semen technology were continued and efforts were made for strengthening of goat semen bank. A total of sixty Sirohi goats were inseminated with the overall conception rate of 41.52% on actual kidding basis. A total of 500 good quality straws having post thaw motility of minimum 40-50% were stored for further use. Progesterone impregnated sponges were prepared indigenously and tested for their retention and synchronization of oestrus in goats. Sponges containing 300 mg progesterone maintained the blood level of progesterone above 1 ng/ml. Studies on adaptability in Barbari and Sirohi bucks and goat-waste management have been initiated. The Barbari bucks were physiologically



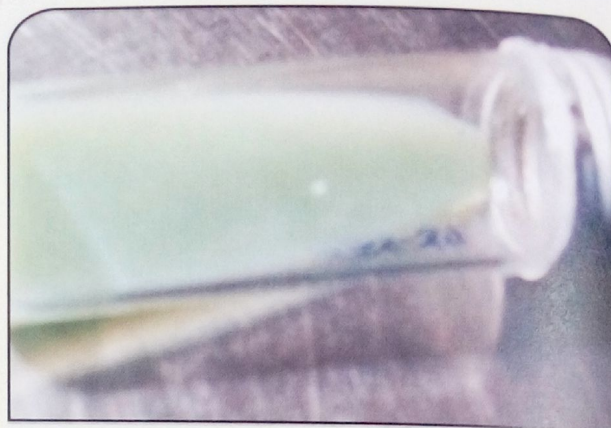
better adapted in intensive system of goat production and Sirohi bucks in semi-intensive production system.

The feeds available to goats are poor in quantity and quality. In the study on drying of surplus green fodder, the drying rate was recorded higher under poly house drying as compared to ambient solar drying irrespective of swath thickness. Under rainfed agro forestry system, four fodder legumes were raised as sole crops and in combination i.e. Lobia, Sunhemp, Sesbania, Guar+Lobia, Sesbania (low density), Control, Sesbania+Sunhemp, Sesbania + Lobia. Maximum biomass production of 25.41t/ha was associated with the Guar + Lobia combination. Supplementation of concentrate mixture with rumen by-pass protein in 3 combinations of Linseed cake: Cotton seed cake 30:70 (T1), 50:50 (T2) and 70:30 (T3) were evaluated in pregnant and lactating goats. T2 (50:50) has shown promising results in terms of performance of pregnant goats and their off-springs. Trials on area specific mineral mixture showed beneficial effect of use of area specific mineral mixture. With feeding of mineral mixture, 72% of cattle and buffaloes suffering from the problem of repeat breeding conceived on no return basis, and 15% cases of anoestrous in cattle and buffaloes were restored with in 15-65 days. A group of male goats fed area specific mineral mixture under intensive system indicated higher body weight gain and better rumen fermentation pattern in comparison to non-mineral fed group. Efficient fungal species (*Orpinomyces*) isolated from Nilgai was selected on the basis of higher estimated fibrolytic enzyme activity. Goats administered inoculated exotic fungi *Orpinomyces* species had significantly higher ($P < 0.05$) intake of Arhar straw in comparison to the control group.

Effect of months, season and stage of lactation on goat milk composition was studied. Fat content was higher during February, September and October viz. 5.14 ± 0.07 , 5.07 ± 0.07 and 5.40 ± 0.03 %, respectively. Total solids content was also noticed higher during these months resulting better paneer yield. Fat content was observed higher (4.80 ± 0.11) during

spring/autumn and lowest (3.27 ± 0.03) during summer season in Jamunapari goats. Type of birth had no effect on milk composition. Carcass study showed that supplementary feeding along with specific mineral mixture improved various cuts weight in Barbari kids maintained under semi-intensive system. The curry leaf powder (CLP) had potent antioxidant effect as measured by DPPH method and its use in fresh meat did not impart any negative effect on meat quality.

Monitoring and surveillance of important goat diseases in India is being done through questionnaires and personal visits to farmers' flocks and AHDs. For herbal therapy of caprine coccidiosis, 15 plants were selected for in-vitro and in-vivo trials against different stages of coccidia. In-vitro trials, *Allium sativum* extract successfully checked sporulation even in lowest concentration. Diarrhoea in young kids is a serious problem. Eight potential plant candidates were selected for clinical study by preparing combinations for synergistic activity. Clinical trials of four prototypes have shown potential as antidiarrhoeal in goats. Suspected *Brucella* isolates were isolated and morphological, biochemical and molecular characterization done. For the diagnosis of mycoplasmosis, in immunoblot the immuno-reactive protein bands were found to be in higher range of 90 kDa to 250 kDa. Moreover 2 promising immuno-reactive bands were observed at 20 kDa and 30 kDa, which needs further study. Trials of the first 'indigenous inactivated Johne's disease vaccine' (IIJDV) were conducted in goats and sheep in different regions of the country and the vaccine has shown encouraging results in terms of prevention and control of JD.



Technologies developed by the Institute were transferred and evaluated at the farmer's door through the multi-disciplinary Project. The Project has resulted in proportionately higher share of Barbari goats in the adopted villages, lower mortality and morbidity and adoption of better marketing strategy. Work on adoption of technologies and development of tests, scales to measure knowledge and attitude of the goat farmers towards selected goat husbandry practices was carried out. Assessment of the impact of the improved technologies and emerging market conditions on goat production is in progress.

A total of four National Training Programmes on different aspects of scientific and commercial goat production were organized for the farmers, goat keepers, entrepreneurs, extension workers and scientists sponsored by several State Animal Husbandry Departments, State Agricultural Universities, Directorate of Extension, Non-Governmental Organizations, Self Help Groups etc. A 2-months International Training Programme on Goat Semen Freezing and Embryo Transfer was organized for Mongolian





scientists. A total of 12 Ph.D and 10 M. Sc. students were admitted during the year for undertaking research work under the guidance of scientists of the Institute.

Consultancy services on goat production and

utilization were provided to several national and international agencies. A total of 791 entrepreneurs, goat farmers, professionals, students and representatives of development agencies got benefited through advisory and consultancy services.



ORGANIZATIONAL SETUP



FINANCIAL POSITION

(On March 31, 2008) (Rs. in Lakhs)

Head	Plan		Non-Plan	
	Allocation	Expenditure	Allocation	Expenditure
1. Establishment Charges	0.00	0.00	505.00	481.13
Wages	0.00	0.00	100.00	98.25
OTA	0.00	0.00	0.20	0.20
2. T.A.	2.00	1.84	2.65	1.55
3. HRD	1.00	0.91	0.00	0.00
4. Other Charges including equipments	192.00	128.26	140.15	108.82
5. Works	0.00	0.00	35.00	20.72
6. Land development	0.00	0.00	0.00	0.00
TOTAL	195.00	131.01	783.00	710.67

STAFF POSITION

(on March 31, 2008)

Category	Sanctioned	Filled
Director	01	01
Scientific	56	37
Technical	72	72
Administrative including Non-Min. staff	39	39
Supporting	104	100
Temporary Status	114	114
TOTAL	386	363

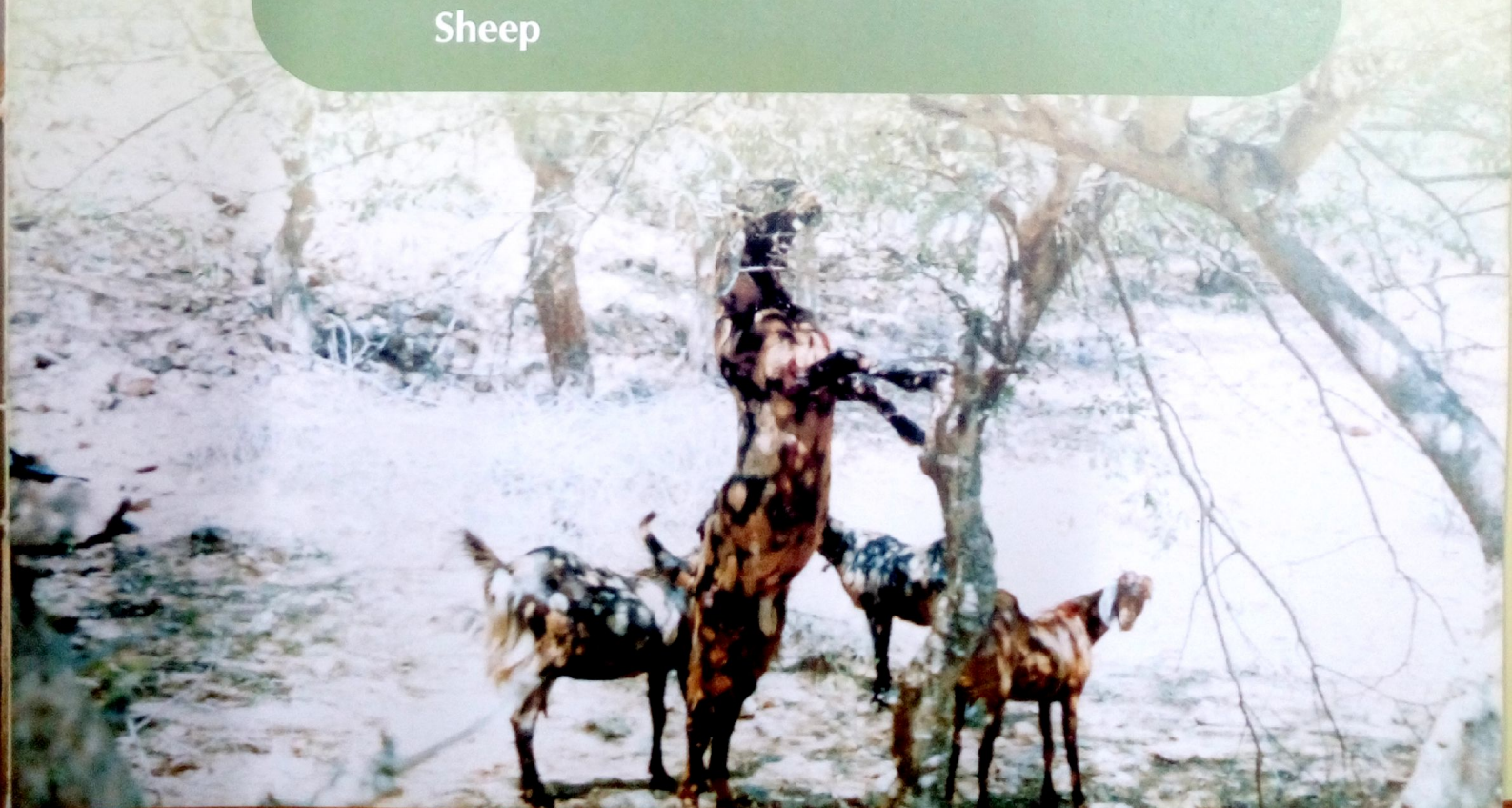


CIRG

ANNUAL REPORT 2007-08

Research Achievements

- 👉 Goat Genetics and Breeding
- 👉 Physiology, Reproduction and Shelter Management
- 👉 Nutrition, Feed Resource and Products Technology
- 👉 Goat Health
- 👉 Extension Education and Socio-Economics
- 👉 AICRP
 - Goat
 - Sheep



RESEARCH ACHIEVEMENTS

GOAT GENETICS AND BREEDING

GGB-1.09: Genetic Improvement and Sire Evaluation of Jamunapari Goats for Milk Production (AICRP)

M.K. Singh, H.A. Tiwari and T.K. Dutta

Jamunapari is one of the important dual-purpose goat breeds of India with greater recognition for milk yield. Nucleus flock of Jamunapari goats has been established at CIRG in 1983 and since then selective breeding is practiced to improve the performance of flock for body weight, milk and reproduction efficiency traits. Besides generating data base, good quality bucks and does were also distributed for the on going field goat improvement programmes in the country.

Body weight: Average least squares means of body weights of kids at birth, 3, 6, 9 and 12 months of age were 3.16 ± 0.01 , 11.45 ± 0.07 , 15.51 ± 0.09 , 20.87 ± 0.13 and 26.82 ± 0.13 kg, respectively during the period of 2005 to 2007 (Fig. 1), whereas, corresponding average least squares means of body weights of kids for 2007 were 3.28 ± 0.03 , 11.99 ± 0.14 , 16.41 ± 0.22 , 21.54 ± 0.38 and 27.06 ± 0.38 kg, respectively. The average least squares means of body weights of kids at birth and 3 months of age for the year 2008 were 3.21 ± 0.04 and 13.45 ± 0.33 kg, respectively. Year and season of kidding, type of birth, sex of kid, parity and weights of dam at kidding have significantly affected the body weights under study. Kids born as single and males were born with higher birth weight and maintained their superiority up to 12 months of age. Parity has significantly



influenced body weight at 3, 6 and 12 months of age, however the magnitude of effect was low. The heritability estimates for body weight at birth, 3, 6, 9 and 12 months of age were 0.272 ± 0.068 , 0.169 ± 0.076 , 0.230 ± 0.064 , 0.213 ± 0.003 and 0.327 ± 0.073 , respectively.

Milk Yield: Average milk yield in 90 days, 140 days and total lactation and total lactation length for the period from 2005-2007 were 92.4 ± 0.9 , 127.4 ± 1.3 , 136.2 ± 1.7 liters and 175.1 ± 1.4 days, respectively; whereas corresponding estimates for the year 2007 were 103.1 ± 2.0 , 143.6 ± 2.9 , 152.8 ± 4.2 liters and 169.9 ± 3.1 days, respectively (Fig 2). Year, season of kidding and does' weight at kidding significantly influenced all the milk performance traits. Goats kidded in winter produced ($P < 0.05$) higher milk yield than those, which kidded in autumn and spring. Significantly ($P < 0.05$) lower lactation length was observed of does, which kidded in summer. The performance of milk production traits and lactation length's decreases significantly after 5th parity. The observed additive genetic variability for milk production traits was low ranged from 0.098 (90 d MY) to 0.124 (140 d MY).

Reproductive Performance: The average age at first kidding, weight at first kidding and kidding interval for the year 2007-08 were 754 ± 21 days, 32.6 ± 0.5 kg and 323 ± 5 days, respectively (Table 1). The Multiple birth rates and litter size were 34.2% and 134%, respectively. Kidding percentages on the basis of does available and does tupped were 78.5 and 103.17% respectively (Table 2). Selection differential on the basis of bucks superiority over flock average was 6.4 kg for body weight and 26.6 lit for milk yield. The average body weight of male kids under complete feed (feed lot) at 9 months of age, average weight gain (kg), average daily weight gains during 3-9 months (gm/d), carcass weight, dressing percentage (empty weight) were 27.65 ± 1.51 kg, 15.15 ± 1.06 , 84.17 ± 5.92 , 12.23 ± 1.62 and $55.4 \pm 1.67\%$

respectively, for the group fed with Arhar pellet. Corresponding means were 24.68 ± 2.14 kg, 11.43 ± 1.71 kg, 63.51 ± 9.53 , 11.36 ± 12.67 kg and 55.43 ± 3.08 , respectively for the group fed with Arhar mesh. The corresponding means for the group of kids fed with Gwar pellet were 25.85 ± 1.31 kg, 13.01 ± 0.86 , 72.31 ± 4.78 , 11.76 ± 0.12 and 54.56 ± 1.67 % respectively, and the corresponding means for Gwar mesh were 24.76 ± 1.67 kg, 10.21 ± 0.85 kg, 11.97 ± 1.09 and 55.33 ± 1.69 , respectively.

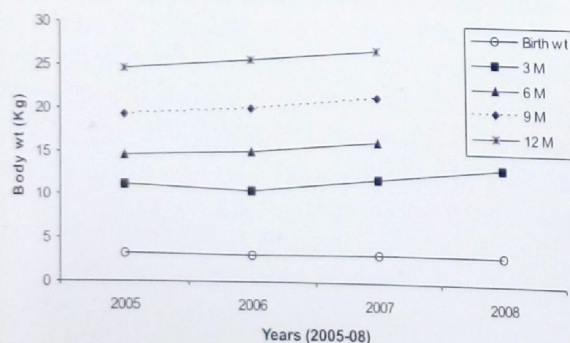


Fig. 1: Least squares means for body weight at different ages in Jamunapari

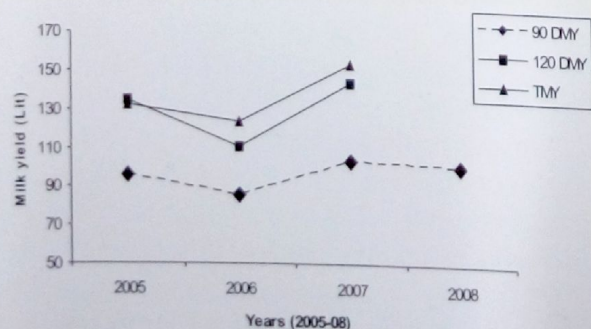


Fig. 2: Least Squares means for milk yield at different period in Jamunapari goats

The population growth rate during the year was 101%. The overall survivability of the flock was 93%. Thirty-three males and twenty-two females were supplied to farmers, SAUs, NGOs and other research institutions for improvement and conservation of Jamunapari goats under field conditions.

Table 1: Reproductive Performance of Jamunapari Goats

Sr. No.	Traits	2005	2006	2007
1.	AFK (d)	767 ± 24 (56)	739 ± 29 (53)	754 ± 21 (113)
2.	KI (d)	338 ± 11 (119)	321 ± 13 (81)	323 ± 5 (146)
3	Kidding rate (DT)	126	137	134
4	Litter Size (%)	138.5	142	134
5	Multiple births (%)	38.91	38.20	34.02

GGB 1.10: Genetic Improvement of Barbari Goats for Meat and Milk Production (AICRP)

S.K. Singh and P.K. Rout

The Barbari is one of the most suited dual purpose goat breeds of semi-arid climates in India. It has lactational performance similar to Indian dairy goat breeds and possesses many desirable characters of body weight growth, prolificacy, reproductive efficiency and sufficient milk to nourish high litter size. Because of these characteristics, the breed is considered to be one of the best dual-purpose among Indian goat breeds.

Population Growth

The population growth for the period of 2007-08 was 164 per cent. A total of 174 elite animals were supplied to farmers, government departments and NGOs for Breed improvement in the field.

Body Weights: The overall mean body weight at birth, 3, 6, 9, and 12 month of ages was 1.87 ± 0.10 , 6.40 ± 0.10 , 12.45 ± 0.09 , 17.66 ± 0.11 and 22.33 ± 0.13 kg, respectively. Kids born between July to December months attained significantly higher body weight at 9 month of age as compared to kids born during January to March. Single born kids had significantly higher body weight than that of

twins and triplets at 6 and 9 months of age. The heritability and genetic parameters for body weight growth at 3, 6, 9 and 12 months of age were 0.347 ± 0.059 , 0.390 ± 0.620 , 0.308 ± 0.57 and 0.374 ± 0.061 respectively. The h^2 for most body weight traits were high except for weight at birth, which was in medium range. Most genetic correlations were highly positive and precise. Likewise, the phenotypic correlations were highly significant and positive.

Genetic Trends: Genetic trends for body weight at 3, 6, 9 and 12 months of age were estimated using method described by Smith (1967). The genetic trends for all above method traits were positive precise and significant. The phenotypic trend was of low magnitude than that of genetic trends. This is because the environmental trends were negative. The results on genetic trends indicated that by improving the environment desired gain in bodyweight can be obtained.

Lactation Performance: The overall mean for 90 days milk yield, lactation yield and Average Daily Milk yield were 58.81 ± 1.52 , 62.21 ± 1.84 liters and 565.4 ± 12.9 gm, respectively. The lactation length was 109.80 ± 1.32 days. Year of kidding significantly affected the 90 days milk yield but the means for last three years were of same magnitude. Year had significance influence on milk yield both in 90 and 140 days of lactation. Does kidded during 2003 and 2004 also recorded similar performance but year 2006 it is 54% only. Compared with last 7 years milk performance, year 2006 indicated one of the lowest performance.

Genetic Parameters: The h^2 estimates for MY 90, LMY and LL were 0.333 ± 0.071 , 0.303 ± 0.068 and 0.107 ± 0.052 respectively. These estimates appear to be precise and reliable. The genetic correlations among these traits were of high magnitude and positive in nature.

Genetic Trends: Phenotypic, genetic and environmental trends for 90 days milk yield and lactation length have been estimated. Although phenotypic and environmental trend were positive but the genetic trend was of negative magnitude. There had been negative association between 9 M body weight and first lactation milk yield of female barbari kids.

Reproductive Efficiency: The adult does with good health were allowed to re-bred during the same year and hence they reproduced twice within a span of 12-14 months. During 2007 out of 298 does available in the beginning of the year there were 467 breeding making tupping % as 157. Out of this 341 does kidded during the calendar year 2007 producing 543 kids at the rate of 1.53 kid per kidding.

XI/GGB-1.1 Improvement of Jakhrana Breed of Goats for Milk and Meat Production under Farm and Field Conditions

Saket Bhusan, R.B. Sharma and H.A. Tiwari

The selective breeding has been followed to improve the performance of Jakhrana goats for milk, body weight and reproductive efficiency traits.

Body Weights: Weekly body weight of kids and monthly body weight of adult males and females were recorded. Least square means of body weight of Jakhrana kids are presented in Table 1. Weights of Jakhrana kids from birth to 18 months of age were higher in year 2007 as compared to 2006.

Milk Production: Least squares means of milk production are presented in Table 2. Milk yield of does was higher in 2007 as compared to 2005. It indicates that selection of does for the production of milk was in proper direction to increase milk yield of Jakhrana breed. Average lactation length of Jakhrana goats was 173.67 ± 5.42 days.

Table 1: Least squares mean of body weight (kg) in Jakhrana kids

Factor	Age of kids					
	Birth	3M	6M	9M	12M	18 M
Overall mean	2.59 ± 0.09 (263)	9.23 ± 0.38 (216)	13.49 ± 1.04 (131)	16.52 ± 0.66 (96)	22.63 ± 0.87 (70)	31.00 ± 1.29 (34)
Year of birth						
2006-07	2.61 ± 0.10 (85)	9.95 ± 0.41 (75)	13.95 ± 1.21 (59)	17.86 ± 0.74 (50)	22.39 ± 0.81 (40)	31.99 ± 1.78 (17)
2007-08	2.78 ± 0.09 (151)	9.98 ± 0.36 (110)	14.97 ± 1.05 (48)	17.89 ± 1.00 (19)	22.52 ± 1.55 (6)	n.a.
Season of birth						
Winter	2.53 ± 0.09 (219)	9.21 ± 0.35 (184)	13.18 ± 0.91 (108)	17.25 ± 0.57 (77)	21.17 ± 0.66 (57)	30.68 ± 1.74 (21)
Summer	2.64 ± 0.11 (44)	9.26 ± 0.88 (32)	13.79 ± 1.43 (23)	15.79 ± 1.09 (19)	24.08 ± 1.41 (13)	31.33 ± 2.19 (13)
Sex of kid						
Male	2.70 ± 0.10 (136)	9.82 ± 0.39 (114)	13.92 ± 1.09 (70)	17.32 ± 0.79 (52)	24.22 ± 1.03 (34)	32.75 ± 1.76 (13)
Female	2.48 ± 0.09 (127)	8.64 ± 0.40 (102)	13.05 ± 1.14 (61)	15.72 ± 0.76 (44)	21.03 ± 0.92 (36)	29.26 ± 1.39 (21)
Type of birth						
Single	3.00 ± 0.07 (86)	9.65 ± 0.28 (74)	14.10 ± 0.90 (46)	17.06 ± 0.85 (41)	22.32 ± 1.05 (30)	30.69 ± 1.64 (16)
Multiple	2.66 ± 0.06 (167)	9.03 ± 0.24 (134)	14.72 ± 0.79 (81)	16.00 ± 0.73 (55)	22.93 ± 0.93 (40)	31.32 ± 1.52 (18)

Table 2: Least Square Means of Milk Production of Jakhrana goats

Factor	Age of kids				
	30 d	60 d	90 d	120 d	150 d
Overall mean	34.13 ± 1.65 (167)	67.35 ± 2.74 (167)	92.70 ± 3.74 (167)	121.69 ± 4.33 (151)	144.56 ± 5.79 (135)
Year of birth					
2006-07	39.32 ± 1.89 (57)	70.40 ± 3.12 (57)	92.60 ± 4.26 (57)	117.67 ± 4.91 (57)	140.28 ± 6.30 (50)
2007-08	35.75 ± 1.77 (92)	75.79 ± 2.93 (92)	109.87 ± 3.99 (92)	145.69 ± 4.75 (77)	176.88 ± 6.62 (68)
Season of birth					
Season I	37.70 ± 1.29 (139)	73.46 ± 2.13 (139)	98.66 ± 2.91 (139)	126.39 ± 3.48 (123)	153.28 ± 4.15 (115)
Season II	30.56 ± 2.82 (28)	61.24 ± 4.66 (28)	86.74 ± 6.36 (28)	117.00 ± 7.29 (28)	135.85 ± 10.21 (123)
Type of kid					
Male	34.51 ± 1.84 (85)	66.36 ± 3.05 (85)	90.26 ± 4.16 (85)	119.75 ± 4.93 (76)	140.76 ± 6.55 (67)
Female	33.74 ± 2.05 (82)	68.34 ± 3.39 (82)	95.14 ± 4.62 (82)	123.64 ± 5.35 (75)	148.36 ± 6.96 (68)

Reproductive Performance: Gestation period, kidding interval and dry period of Jakhrana goats were 151.48 ± 1.56, 311.16 ± 22.23 and 154.25 ± 12.64 days, respectively.

RAPD markers for genetic divergence study in Jakhrana goats: High molecular-length DNA was isolated in all the samples from both the lines (Fig 1). A total of 20 random primers were screened using pooled DNA samples representing HP and LP lines. All the 20 primers generated reproducible



and distinct RAPD profiles. The total number of bands amplified ranged from 2 to 10. Out of 20 random primers capable of generating distinct and repeatable RAPD profile, only 5 primers (25 %) could detect polymorphism between the HP and LP line, while rest 15 primers generated monomorphic RAPD pattern. The five

polymorphic random primers i.e. PI₁₄, PI₁₈, PII₁₁, PII₁₄ and PII₁₅ were used for further analysis using individual DNA samples from LP and HP lines. The RAPD profiles generated by these primers have been shown in Fig 1 to 2. Within line genetic similarity as band sharing proportion (WS) and band frequency (WF) estimated from 5 polymorphic primers. Between lines genetic distance from band sharing (DS) and from band frequency (DF), between the low and high milk producing lines were estimated. Study confirms that there is DNA polymorphism between high and low milk producer Jakhrana goats. Line specific markers for different lines (HP and LP) were not found very clear but there is still scope to find out such type result by using more animals in the study with specific traits. Genetic similarity and genetic distance between high and low milk producing lines of Jakhrana goats was distinguished by this study.



Fig 1. RAPD profile generated by different random primers in high producing (H) and Low producing pools. M: Molecular size marker (Middle range fast ruler).

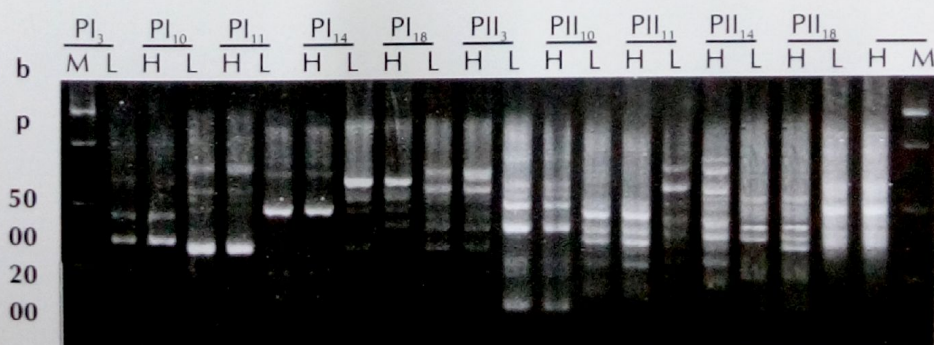


Fig. 2: RAPD profile generated by different random primers in high producing (H) and Low producing pools. M: Molecular size marker (Middle range fast ruler)

XI/GGB-2: Molecular Analysis of Major Genes and Quantitative Trait Loci Influencing Growth, Reproduction and Disease Resistance Traits in Indian Goats

P.K. Rout, A. Mandal, A.K. Das, S.K. Singh, M.K. Singh, R. Roy

It is necessary to utilize molecular markers to select high performance individuals for suitable environment for enhancing productivity and sustainability in goat production. DNA marker information, which identifies important allelic variation within the genome, could be incorporated into genetic evaluations to provide producers with selection tools that increase the rate of genetic improvement for lowly heritable traits.

Genetic diversity in Indian goats has been established using micro-satellite and mtDNA markers. The geographical structuring exists within Indian goats and the genetic distances between breeds are significant indicating that they are unique population. The association of some markers with different traits has also been studied. Therefore, it was proposed to analyze the major genes/QTL influencing production and other traits in Indian goats. The established loci in cattle, goat and human for milk production and growth will be selected and will be analyzed by PCR-RFLP, microsatellite and SNP based approach. This will be again validated in population and will give an idea to use markers for enhancing productivity in the population. As bovine genome sequence draft has been declared, therefore the information yielded from the bovine genome will have direct application to goat, sheep and other farm animal research. The bovine genome physical map and genome sequence will help to select desirable production traits, identify genes controlling economic traits and disease resistance traits and enable to produce better matching products for market specifications. As a part of objective, we have analyzed genetic variations in MyoD family genes, which are responsible for growth and meat quality.

Molecular Analysis of Myf-5 Gene Myofibrillar formation in mammals occurs only during embryonic development and is controlled by the MyoD family genes. MyoD gene family consists of four genes namely myogenin, MyoD1, myf5 and myf6. The myf5 and myoD genes are expressed in proliferating single nucleotide precursor cells called myoblasts. The Myf6 gene is mainly expressed postnatally. Myogenin has a crucial role during myogenesis and expressed in all myoblasts during early differentiation (i.e. Fusion of myoblasts into multinucleated myofiber), and its expression continues during cell fusion. The myf-5 gene has been considered to play an important role in growth and development of mammals. Myogenin expression also marks the end of the proliferation of myoblasts. Therefore different myogenin function or timing of expression could have a major influence on the number of muscle fibers that develop during myogenesis. Therefore polymorphism in Myf-5 coding sequence in different breeds will give an idea regarding body growth and meat quality in Indian goat breeds.

Myf-5 gene polymorphism was carried out in 35 samples of Barbari, 25 samples of Jamunapari and 25 samples of Black Bengal. DNA was isolated from the samples using standard protocols and was checked for its quality, purity and concentration. Subsequently DNA samples were purified by Gene Elute PCR Clean up Kit of Sigma for further use. PCR-RFLP was carried out to analysis myf5 gene using following set of primer $F_1 = 5'$ -CCT ATC TGG TCC AGA AAG AGC AG-3' $R_2 = 5'$ -TAT ATA AGT TAA GCA TTG CAA CAA-3' The PCR reaction was performed in a 50 μ l final volume containing 0.5 unit of Taq DNA polymerase, 1xPCR buffer, 1.5 mM $MgCl_2$, 200 μ M each dNTP, 10 pmole of each primer and approximately 100 ng of goat genomic DNA. The PCR conditions were: 94°C for 4 min, followed by 38 cycles of 94°C (30 sec), 58°C (1 min), 72°C (1 min), and final extension at 72°C-(4 min). About 30 microliters of the PCR product were digested with 5 units of

the restriction endonucleases *TaqI* (New Biolab) overnight at 37°C. The resultant fragments were separated by electrophoresis in a 4% agarose gel stained with ethidium bromide. Genotyping of *Myf-5* gene was carried out by analyzing DNA samples of 3 different breeds of goats for the presence of different alleles by allele specific polymerase chain reaction (AS-PCR). PCR amplified product was observed to be 980 bp. The PCR product of 980 bp long was digested with *Taq-I* restriction enzyme. The PCR-RFLP pattern revealed three genotypes, BB (580 bp + 400 bp), AB (980 bp + 580 bp + 400 bp) and AA (980 bp). The BB genotype was most frequent in all the analyzed samples. The frequency of AA genotype was very low in all the analysed samples. The genotypic frequencies of BB and AB genotypes were 0.62 & 0.32 in Barbari, 0.54 & 0.42 in Jamunapari goats and 0.50 & 0.45 in Black Bengal goats. The frequency of B allele was higher than an allele in all the three breeds. The *myf-5* gene has been considered to play an important role in growth and development of mammals. *Myf-5* knock out mouse showed no muscle growth, which indicates that the gene *myf-5* had an effect on muscle development. The significant association between the *myf-5* gene and these growth traits suggest that the gene may be one of the causative genes that control growth traits in beef cattle or that the gene is very close to the causative genes. Naturally occurring genetic variation in *myf-5* gene could affect muscle fibre number and thus lean meat production.

GGB 1.11 Conservation and Improvement of Jamunapari Goats in their Home Tract

P.K. Rout, A. Mandal, Saket Bhusan and R.Roy
Population Dynamics:

The overall population of two villages varies over the years and the population remains minimum from May to September and thereafter increases due to kidding. After kidding, then the migration of population is observed due to selling, purchasing and providing the animal to relatives in other villages. Migration in goat population in village flocks has been usual phenomenon due to frequent sale and purchase.



Males were sold at all the age groups. The percentages of males sold were 10.97%, 46.66% and 33.33% in 3-6 months, 6-12 months and adult age groups, respectively. Similarly 42.22% and 18.83% females were sold in 6-12 months and adult age groups, respectively. The villagers also purchased 9 animals from adjacent villages.

Reproductive Performance:

54 male kids and 59 female kids were born during the period from 76 does and seven abortions were observed during the year. The sex ratio was 1:1.09. The kidding rate was 1.48. The multiple birth percentage was 64.60 during the year. The average fertility percentage was 75.45% during the year.

Production Performance:

Body Weights: The overall body weight in adopted villages was 2.42 ± 0.05 , 14.53 ± 0.16 , and 21.14 ± 0.39 and 26.24 ± 0.49 kg at birth, 3 months, 6 months and 9 months of age, respectively. The mean body weight during the year was 2.39 ± 0.06 , 14.35 ± 0.21 kg at birth and 3 months of age, respectively. The mean body weight during the year was 2.41 ± 0.06 , 15.54 ± 0.23 , 22.15 ± 0.48 and 27.22 ± 0.60 kg at birth, 3 month, 6 month and 9 month of age, respectively. Village had significant effect on 9 months of body weight. Sex had significant effect ($P < 0.05$) on body weight up to 9 months of age. Birth type had significant effect ($P < 0.05$) on body weight at birth and 3 months of age. The body weight at 3, 6 and 9 months of age were showing an increasing trend over the years in both the villages.

Milk Yield: The factors affecting milk yield were year, birth type and fortnight and all the factors had significant effect ($P < 0.05$) on total milk yield. The average daily milk yield over the last five years was about 1.117 ± 0.013 litre. The



average daily milk yield during the year was 1.134 ± 0.015 litre. The total milk yield at 30, 60 and 90 days were 32.52, 72.12 and 110.82 litres, respectively. The fortnight milk yield showed consistent yield up to 5th fortnight and highest milk yield was observed at 4th fortnight and thereafter it started to decline (Fig. 1). Does, which produced twin and triplet, produced more milk in comparison to does having single kid. To analyse the effect of birth status on milk yield, fortnight and type of birth (TOB) interaction was carried out. The milk yield up to fourth fortnight with respect to birth status was observed as 65.640, 69.075 and 82.005 liters in single kidded, twin kidded and triplet kidded does, respectively (Fig. 2).

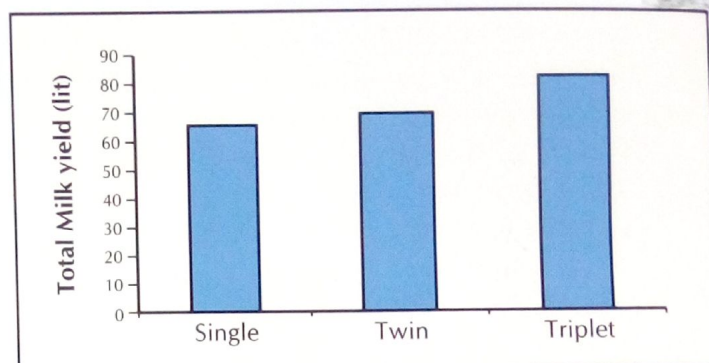


Fig 2: Total milk yield up to fourth fortnight with respect to birth status in village condition.

Biomass Characterization

The gullies and ditches are densely covered with vegetation of Bilati babool (*P. juliflora*) and other drought resistant trees like Babool (*A. nilotica*), Chhonkra (*P. spicigera*), Hingota (*B. aegyptica*). Arhar (*C. cajan*), Gram (*C. erietinum*) and Bajra (*P. typhodium*) are the main cereal crops. Different varieties of mustard are also grown in this area.

Disease Incidence and Health Coverage:

The mortality observed in 0-3 months age group and was about 6.77% in male and 1.51% in female. Mortality in 3-6 months of age group was observed in males and was about 3.63%. The general symptoms/disease including mastitis, tympany, lameness, coccidiosis, colibacillosis. Parasitic characterization of field condition was made by analysing faecal sample every month. The parasitic load was not observed from May to July. Bursate load was more in animals from September to January and subsequently it was lower.

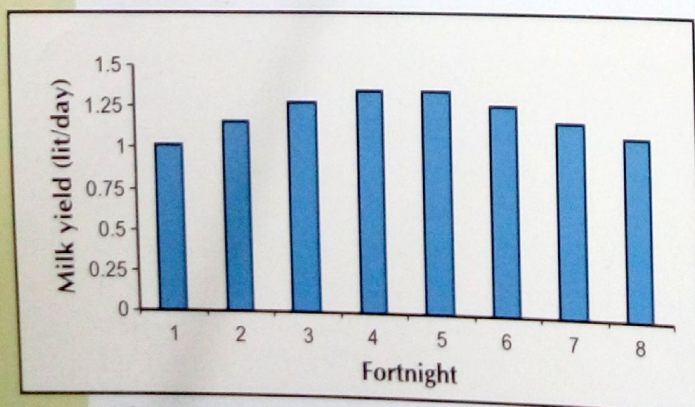


Fig.1: Fortnight milk yield in Jamunapari goat in field condition

PHYSIOLOGY, REPRODUCTION AND SHELTER MANAGEMENT DIVISION

PR&SM XI/1.1: Studies on Refinement of Frozen Semen Technology and Strengthening of Goat Semen Bank

S.K. Jindal, N.K. Sinha, A.K. Goel, S.D. Kharche, N. Ramachandran and R. Ranjan

Refinement in Semen Freezing Protocol:

The modification in an already standardized semen extender and freezing protocol was

evaluated for getting optimum post thaw recovery. The neat semen samples having mass activity of +4 and above were immediately diluted in glycerol free extender (part A) at the ratio of 1:5 at room temperature. Then the samples were cooled to 5 °C in cold handling cabinet in 1.5 to 2 hrs and an equal part of glycerolized extender (part B) was added gradually to make the final dilution rate of 1:10. Then the samples were filled in French mini straws (0.25 ml) and sealed. An equilibration period of 4 hrs was allowed before samples were frozen conventionally i.e. frozen in liquid nitrogen vapor 2.5cm above LN₂ for 10 minutes and dipped in liquid nitrogen. A total of 500 (Jamunapari- 250; Sirohi- 200; Marwari-50) good quality straws having post thaw motility of minimum 40-50% were stored in large LN₂ container for further use/study. However, for supply of straws to field needs improvement in quality control aspects and further refinement in freezing protocols are under process.

Experiments on Different Cryoprotectants and its Levels:

Penetrating Cryoprotectants:

Two levels (6 and 8%) of four types of penetrating cryoprotectants viz., Glycerol, Ethylene glycol, Propylene glycol and Dimethyl Sulfoxide were tried in the above modified freezing protocol to observe the comparative cryoprotective ability of cryoprotectants. Irrespective of four types of cryoprotectants studied, 8% did not yield satisfactory results. However at 6% level, glycerol yielded 30-40% post thaw motility vis-a-vis 20-30, 0-10, 0-10% for Dimethyl Sulfoxide, Ethylene glycol, Propylene glycol, respectively.

Non-Penetrating Cryoprotectants Levels:

The ejaculates were collected at weekly intervals using artificial vagina and were extended at the rate of 1:10 with Tris- Citric acid- Fructose (TCF) diluent having 2.5%, 5%, and 7.5% and 10% egg yolk by volume as non-penetrating cryoprotectant and preserved up to 72 hours in refrigerator. Analysis of data using two way ANOVA revealed that sperm motility differed significantly ($p < 0.05$) at different levels

of egg yolk up to 72 hours of preservation. The mean sperm motility recorded at 0, 24, 48, 72 hours of preservation in 7.5% egg yolk level were 85.00 ± 1.29 , 63.33 ± 1.05 , 50.00 ± 1.82 and 44.17 ± 1.54 %, respectively. The corresponding figures in 10% egg yolk were 85.00 ± 1.29 , 69.17 ± 1.54 , 61.67 ± 1.67 and 55.00 ± 2.23 %, respectively. However, at lower egg yolk levels (2.5 and 5 %), the mean sperm motility drastically reduced to below 50% with in 24 hours of preservation. The live sperms did not vary significantly among different egg yolk levels and storage periods.

Standardization of in Vitro Fertility Test:

Hypo Osmotic Swelling Test (HOST)

A total of 28 samples were taken from stored frozen straw from male reproduction laboratory of this division for the standardization of hypo osmotic swelling test. A different strength of 50, 75, 100, 125, 150, 175, 200 and 300-mosmol solutions were prepared for this purpose. Frozen semen was thawed at 40°C temperature for 45 second and 0.1 ml were added in 1ml hypo osmotic solution of different strength for one hour at 37°C. Sperms were evaluated for strongly coiled, weakly coiled and non-coiled under oil immersion lens. The total coiled percentage in 50, 75, 100, 125, 150, 175, 200 and 300 mosmol were 34.04 ± 1.39 , 54.45 ± 1.39 , 31.44 ± 1.39 , 21.66 ± 1.39 , 19.86 ± 1.39 , 12.85 ± 1.39 , 8.67 ± 1.39 and 0.58 ± 1.39 respectively. The best swelling in term of strong coiling and total coiling was in 75-mosmol hypo- osmotic solution. There is significant difference in swelling in different strength of hypo osmotic solution. So for frozen sperm 75-mosmol and fresh diluted 100 - mosmol hypo-osmotic solution is the best.

Dual Staining Test for Viability and Acrosomal Integrity:

Dual staining technique was standardized for frozen and fresh semen for viability and acrosomal integrity. A thin smear was prepared on warm glass slide of fresh diluted and frozen thaw semen and stained with eosin-nigrosin stain. After drying it was fixed in formalized buffer solution for 30 minutes at 37°C and was

washed in running tap water for 10 minutes and again dried. Now slides were kept in Giemsa stain for 1 hour at 37°C and wash in running tap water for 10 minutes and dry it and observed under oil immersion lens. Based on observation it was found that there is no significant difference in viability and acrosomal integrity in dual staining technique and individual vital staining technique and acrosomal staining technique. So dual staining technique will save time and chemicals as viability and acrosome integrity can be seen in same slide. There is no need for separate test for viability and acrosomal integrity.

Artificial Insemination Using Liquid Semen and Pregnancy Diagnosis:

Immediately after semen collection, ejaculates were diluted in TRIS buffer at the ratio of 1:5 at room temperature having 10% egg yolk level and preserved in refrigerator for 2-3 hours before use. The does, which come into estrus in the morning, were inseminated in the evening

and the does, which came in estrus in the evening, were inseminated in the morning using above diluted and stored liquid semen. Twice insemination (deep cervical) was done per oestrous cycle. The inseminated goats were examined for pregnancy status by real time ultrasonography at 25-30 days post insemination. A total of sixty Sirohi goats were inseminated with the overall conception rate of 41.52% on actual kidding basis.

PR&SM XI/1.2: Augmentation of Prolificacy by Using Biotechnological Tools in Goats

S.D. Kharche, A.K. Goel and S.K. Jindal

Preparation of Sponges of Different Sizes and Shapes to Study their Retention

Sponges of different sizes and shapes were prepared in the laboratory. They were inserted in to the vagina of Sirohi goats and tested for their retention in to vagina for 12 days.

Table 1: Effect of size and shapes of sponges on its retention in to vagina of goats.

S. No.	Type of sponge	Total goats	Sponge retained	Sponge lost	Sponge retained (%)
1.	Square (25mm)	7	4	3	57.14
2.	Circular (25mm)	6	4	2	66.66
3.	Circular (30mm)	6	5	1	83.33
4.	Cylindrical (25mm)	8	7	1	87.5
5.	Cylindrical (13mm)	7	4	3	57.14

Preparation and testing of hormone delivery system (sponges):

Sponges impregnated with different doses of progesterone were prepared. The sponges were inserted in to the vagina of Sirohi goats up to the external os of the cervix by using glass speculum on day 17 of the estrous cycle. The sponges were kept for 12 days in to the vagina to prolong the estrous cycle. The goats were observed for estrus daily in the morning and evening using teaser buck.

Table 2: Effect of different doses of progesterone impregnated sponges on prolongation of estrous cycle in goats.

S. No.	Progesterone (mg)	No. of animals treated (n)	Prolonged estrous cycle (%)
1.	25	5	40.00
2.	50	7	71.42
3.	75	4	75.00
4.	100	9	66.66
5.	200	9	55.44
6.	300	10	80.00
7.	350	4	100.00

Table 3: The average serum progesterone (ng/ml) concentration in goats inserted with sponges.

S.No.	P4 Sponge (ng/ml)	Day 17 before sponge insertion	Day 18 at sponge insertion	Day 20	Day 22	Day 24	Day 26	Day 29 at sponge withdrawal	Day 31
1.	350	4.15±1.11	6.0±1.28	4.32±1.53	1.8±0.41	3.32±1.45	1.77±0.26	2.35±0.24	1.87±0.20
2.	300	5.3 ±2.5	10.36±4.68	4.56±2.14	5.76±2.88	8.24±4.22	5.38±2.30	3.75±2.02	3.27±1.60

Reproductive status of Jamunapari Goats:

The reproductive status of thirty adult cyclic Jamunapari goats was observed. The estrus detection was done daily in the morning and evening by using aproned buck. Twenty four goats were bred naturally. Out of which nineteen goats (79.16%) were kidded. Eleven goats produced single kid and eight goat produced twins' kid. After kidding the goats were observed for the onset of estrus. It was observed that only 26.31% goats came into estrus within 6 months of kidding, indicating long postpartum interval in Jamunapari goats.

Standardization of technique for visualization of follicles / corpus luteum using ultrasonography in treated goats.

Twenty estrous does were scanned by employing curvilinear trans-rectal (TR) scanners of variable frequency ranging between 5 to 7 MHz. The does were kept off feed 12 hour prior to scanning. The uterus was located in all animals but ovaries could be located only in 50% cases.

In vitro embryo production and transfer:**Oocyte collection**

Oocytes were recovered by follicle puncture technique for in vitro maturation, fertilization and culture from goat ovaries collected from slaughter house located at Agra. A total of 1874 goat ovaries were used for recovery of oocytes using follicle puncture technique for IVMFC. The recovery of oocytes using follicle puncture was 1.82 per ovary.

In-vitro maturation of goat oocytes:

Goat ovaries obtained from an abattoir situated at Agra. The oocytes collected from goat ovaries were cultured in tissue culture medium (TCM-199) containing 20% EGS or 10% NCS with FSH, LH, 1µg/ml E2, and bovine serum albumin,

(pH: 7.2-7.4) supplemented with insulin (50ng/ml) or EGF (10ng/ml) in 50 µl drops of maturation medium covered with mineral oil. The matured oocytes were evaluated under stereo zoom microscope and the maturation rate of oocytes on morphological evaluation was 85.36%.

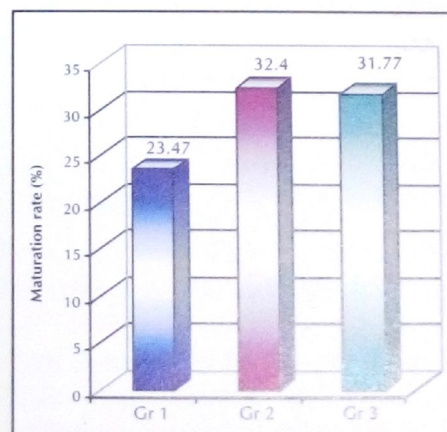
In-Vitro Maturation of Nude Goat Oocytes:

Effect of granulosa cell co-culture and monolayer on IVM of nude oocytes: The selected nude oocytes were assigned at random in following treatment groups:

Group 1: Approximately 115 selected oocytes were matured in TCM-199 (sigma) supplemented with 10% FBS in 50µl droplets.

Group 2: Approximately 108 selected oocytes were matured in TCM 199 (sigma) supplemented with 10% FBS and granulosa cell co-culture in 50µl droplets.

Group 3: Approximately 107 selected oocytes were matured in TCM-199 (sigma) supplemented with 10% FBS and granulosa cell monolayer in 50µl droplet.

**Fig. 1:** Effect of granulosa cell co-culture and monolayer on IVM.

Effect of hormones on IVM of nude oocytes:

Group 1: Approximately 107 selected oocytes were matured in TCM-199 (Sigma). Supplemented with 10% FBS in

Group 2: Approximately 100 selected oocytes were matured in TCM-199 (Sigma) with 10% FBS, FSH (5µg/ml), LH (5µg/ml), estradiol-17β (1µg/ml) in 50µl droplets.

Group 3: Approximately 105 selected oocytes were matured in TCM-199 (Sigma) supplemented with 10% FBS and FSH (5 µg/ml), LH (5µg/ml), estradiol-17β (1µg/ml) and insulin (50ng/ml) in 50µl droplets.

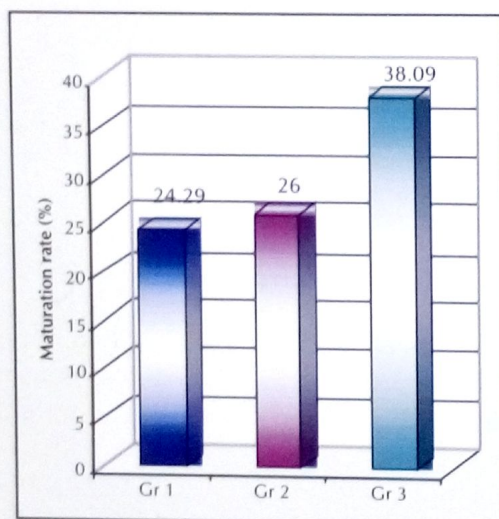


Fig. 2: Effect of hormones on *in vitro* maturation of goat oocytes.

After 27h of maturation of oocytes, the oocytes were washed by vortexing. The oocytes were then fixed for 15 minutes in 2.5% (w/v) glutaraldehyde in phosphate buffered saline, washed twice with PBS, stained with 0.1µg/ml 4, 6 diamidino 2 phenylindole (DAPI) in PBS and mounted on slides. The evaluation of nuclear status was done by epifluorescence microscopy.

In-vitro fertilization of *in vitro* matured goat oocytes:

The matured oocytes were separated from cumulus cells by treating them with PBS containing 0.1% hyaluronidase and by passing through a fine pipette and kept for fertilization in 100 µl fertilization drop. Fertilization drop (Fert

TALP) containing oocytes were inseminated with 25 to 50 µl of final diluted semen (1x10⁶ sperm/ml).

***In vitro* produced embryo transfer:**

Twelve *in vitro* produced embryos of 4-16 cell stage were transferred in to two natural synchronized recipients on day 2 or 3 post oestrous surgically at tip of the uterine horn of the genital organ. The recipient was monitored for the oestrus / pregnancy. Following transfer, pregnancy was detected by using ultrasound scanner at 8 weeks.

***In vivo* produced embryo transfer:**

The percentage of goats responded to oestrus synchronization treatment in recipient and donor groups were 75.00% and 100%, respectively. The onset and duration of oestrus in recipient and donor were 32.00±10.58/36.0±12.00 and 28.00±10.58/32.0±4.0 hrs, respectively. The average number of follicles and corpus luteum in donors were 7.0±2.51 and 4.66±2.60, respectively. Three embryos were recovered. Two embryos were transferred surgically at the tip of one uterine horn and remaining one was transfer into another horn of a synchronized recipient goat. The results indicated that:

- Crestar ear implant can be used effectively for oestrus synchronization in donor and recipient goats during non-breeding season.
- The recipient could not sustain pregnancy and repeated oestrus after two months.

PRSM XI/2.1: Model Goat Production Systems With Special Reference to Intensive and Semi-Intensive Systems

Dharm Singh, S.K. Jindal, N. Ramachandran, B. Rai, R.B. Sharma and H.A. Tiwari

The Layout Plan of the Model Goat Farm has been prepared and submitted to the Institute. The construction of Model Goat Farm involving about Rs. 42 Lakhs is pending subject to the approval of the PLAN. The recording of observations will be done after experimental animals are purchased and the purchase of animals is dependent on construction of Goat Farm.

PRSM XI/2.2: Adaptability of Goats and Environmental Aspects Under Different Production Systems

Puneet Kumar and R.P.Misra

Adaptability studies on Barbari and Sirohi bucks were initiated during the period under report. Changes in the climate in terms of temperature and rainfall in the last decade from that of last to last decade were found. Presently the method of collecting goat faeces within the shed is not correct and may transmit infection to the workers by inhaling contaminated air and thus is injurious to the health of the shed workers. Studies were initiated on goat waste management. A comparative adaptability study was also initiated on the goats brought to this institute from different agro-climatic regions.

Adaptability of Barbari and Sirohi bucks under semi-intensive system of goat production

Rectal temperature, respiratory rate and heart rate of 12 bucks, 6 each of Barbari and Sirohi breed were recorded in May and June (hot-moderate humid), July, August and September (hot-humid), October and November (comfortable-dry) and in December (cool-dry) months of the year. The goats were managed under semi-intensive system at this institute. The recordings of physiological responses in the morning were done before feeding and watering of the goats. In the afternoon, recording was done after giving rest of about 1 hr after the goats arrived to sheds from grazing. The recording was done at 15 days interval for 3 consecutive days. The mean body temperature in both the breeds in comfortable period was almost equal. It was 38.42 ± 0.03 in Sirohi and 38.41 ± 0.04 °C in Barbari bucks.



The mean rectal temperature in hot period was higher and in cool period was lower than the comfortable period. Rectal temperature in the afternoon was higher in both the breeds in all the four periods. In the afternoon, in the hot moderate humid period, the rectal temperature of Sirohi breed was higher than Barbari breed. But in hot-humid period, which forms the longest part of the hot period, rectal temperature in the afternoon of Barbari was higher than Sirohi bucks. The mean rectal temperature in cool period of both the breeds was equal i.e. 38.25 ± 0.06 °C in Sirohi and 38.25 ± 0.08 °C in Barbari breed. In the morning hours of cool period, Barbari bucks were able to keep themselves warmer than those of Sirohi bucks.

Respiratory rate which reflects the ability of the bucks to dissipate extra heat during hotter part of the year. The mean respiratory rate in comfortable period of Sirohi and Barbari bucks was equal in both the breeds i.e. 31.64 ± 1.01 in Sirohi and 31.58 ± 0.82 in Barbari bucks. Respiratory rate increased in hot periods and decreased in cool period. Barbari bucks remained under more heat stress than those of Sirohi bucks.

Heart rate, which is an indicative of metabolic rate of the goats under comfortable and cool period and of cutaneous evaporation in heat stress. Under comfortable period, the metabolic rate of Sirohi breed is lower than that of Barbari breed. It was 86.59 ± 1.26 no./min. in Sirohi breed and 91.40 ± 0.90 in Barbari breed. Heart rate increased in Barbari breed in hot humid period of the year than that in Sirohi breed indicating more heat stress on Barbari bucks as compared to Sirohi bucks.

Blood Biochemical Studies:

Metabolic Activity: Blood metabolites like glucose, urea, uric acid, creatinine, cholesterol and triglycerides of Barbari and Sirohi bucks during summer season have been presented in Tble 1. All the parameters except creatinine were higher in Barbari bucks than in Sirohi bucks.

Table 1: Metabolite concentration in blood plasma of Barbari and Sirohi bucks during summer season under semi intensive production system

Breed	Glucose (mg/dl)	Urea (mg/dl)	Uric Acid (mg/dl)	Creatinine (mg/dl)	Cholesterol (mg/dl)	Triglycerides (mg/dl)
Barbari	86.27 ± 5.51	32.81 ± 3.03	3.53 ± 0.23	1.79 ± 0.08	159.87 ± 5.24	50.65 ± 3.57
Sirohi	81.62 ± 5.36	26.16 ± 1.38	3.50 ± 0.15	1.87 ± 0.09	139.34 ± 4.87	44.79 ± 3.25

Enzyme Activity: The activities of enzymes like acid phosphatase, alkaline phosphatase, GOT, GPT, LDH and Amylase have been given in Table 2. The activities of alkaline phosphatase and GOT were higher in Barbari bucks. Rest of the enzyme activities were higher in Sirohi bucks.

Table 2: Enzyme activity in blood plasma of Barbari and Sirohi bucks during summer season under semi intensive production system

Breed	Acid Phosphatase (KAU/dl)	Alkaline Phosphatase (KAU/dl)	GOT (Units/ml)	GPT (Units/ml)	LDH (IU/lit.)	Amylase (Street Close Units/100ml/dl)
Barbari	1.76 ± 0.10	25.60 ± 1.34	59.78 ± 5.98	19.80 ± 1.49	277.03 ± 9.53	10.79 ± 0.50
Sirohi	1.99 ± 0.22	25.11 ± 1.72	55.68 ± 3.47	22.98 ± 1.98	299.71 ± 10.34	10.94 ± 0.67

Hormones: T₃ and T₄ hormones were higher in Barbari bucks than that in Sirohi bucks.

Electrolytes: The concentration of phosphorus, chloride and calcium have been given in table 3. The concentration of all the three electrolytes were higher in Barbari than that in Sirohi bucks.

Table 3: Electrolyte concentration in blood plasma of Barbari and Sirohi bucks during summer season under semi intensive production system

Breed	Phosphorus (mg/dl)	Chloride (mg/dl)	Calcium (mg/dl)
Barbari	7.82 ± 0.40	96.81 ± 4.85	10.36 ± 0.94
Sirohi	7.12 ± 0.47	91.55 ± 4.84	8.94 ± 0.82

Comparative adaptability of Barbari and Sirohi bucks under intensive and semi-intensive production systems

Twenty four bucks of Barbari and Sirohi bucks were taken to study the cardinal physiological responses in December, January and February (cool period), February and March (comfortable) and April, May (hot-dry). 12 bucks, 6 each of Barbari and Sirohi were taken in intensive system of goat production and 12 in semi-intensive system of goat production. The mean rectal temperature of the bucks of both the breeds reduced in cool period from that of comfortable period in both the systems of goat production. The reduction was comparatively more in Sirohi bucks than that of Barbari buck in both the systems. The reduction in rectal temperature was more in intensive system in Sirohi bucks than that in semi-intensive system.

The mean respiratory rate of bucks of both the breeds in cool period reduced in cool period than that of comfortable period as a means of heat conservation process. The reduction in mean respiratory rate was more in semi-intensive system than that of intensive system. The reduction in respiratory rate was more in Sirohi bucks than that of Barbari bucks (Table 4). The mean heart rate of the bucks of both the breeds in cool period was less affected in semi-intensive system than that of intensive system. Sirohi bucks seemed to be more affected than Barbari bucks in intensive system, whereas; Sirohi bucks were less affected by cold in semi-intensive system of goat production.

Overall, the Barbari bucks were physiologically better adapted in intensive system of goat production and Sirohi bucks in semi-intensive production system.

Table 4: Respiratory rate (no./min) of Sirohi and Barbari bucks in Intensive and semi-intensive system of goat production

Period of the Year	Breed	n	Intensive system			Semi-intensive system		
			Morning	Afternoon	Mean	Morning	Afternoon	Mean
Cool -dry	Sirohi	72	17.21 ±0.40	34.18 ±1.36	25.69 ±0.72	16.07 ±0.27	31.56 ±0.97	24.26 ±0.63
	Barbari	96	22.23 ±0.06	39.11 ±1.16	30.67 ±0.09	25.52 ±0.07	35.21 ±0.06	30.36 ±0.05
Comfortable	Sirohi	72	18.04 ±0.04	60.79 ±0.30	42.44 ±1.47	17.14 ±0.05	56.64 ±0.26	36.89 ±0.13
	Barbari	96	22.17 ±0.0.04	67.96 ±0.25	45.06 ±0.13	23.33 ±0.05	60.73 ±0.21	42.03 ±0.11

Comparative adaptability of Marwari, Sangamneri, Surti and Black Bengal goats

A comparative study on the adaptability of Marwari, Sangamneri, Surti and Black Bengal goats was done in hot-dry period. The rectal temperature and respiratory rate of the goats has been recorded. The rectal temperature indicated that it was higher in females of Marwari, Sangamneri and Surti goats than the male goats of the same breed. In Black Bengal goats, the rectal temperature of males was higher than the females. The growing kids of Black Bengal recorded the highest rectal temperature. The respiratory rate of the female goat was lower than the male goats in Marwari, Sangamneri and Surti goats. In Black Bengal goats females had higher respiratory rate than the males. Black Bengal growing kids recorded the higher respiratory rate. The heart rate of Marwari and Sangamneri goats was lower than Surti. Black Bengal goats had highest rate. Heart rate in males and females in all the breeds was of almost similar magnitude. However, kids had lower heart rate than adult black Bengal goats.

Climate Change

Date collected on various meteorological observations during the last 21 years (1987-2007) was analyzed to study the climatic changes at this institute. The overall increase of 1.90 °C in mean temperature has been observed during the last decade (1998-2007) from that of 1987-1997 periods. The increase in maximum temperature and minimum temperature during that period was 0.92 °C and 2.84 °C respectively. The lowest minimum temperature of 1.5 °C has been observed on February 02, 2008. During the last 21 years the lowest minimum temperature dropped either in the month of December or January. June 9, 2007 remained the hottest day during the last 21 years as the maximum temperature reached 50 °C. The average annual rainfall has decreased to 382.01 mm in 39 wet days during the last decade from 487.81 mm in 38.18 wet days during 1987-1997.

Development of Appliances for Faeces Collection

At present in most of the goat farms in the country brooms are used for cleaning the sheds. During cleaning dust particles create difficulties and health hazards for the workers. Simultaneously soil erosion also takes place. To take care of these problems four types of appliances were developed to clean the shed and collect faeces. Two appliances were not found suitable during preliminary testing. One appliance gave promising results during preliminary testing. One is yet to be tested. A buck drawn trolley is under design stage to transport faeces, which will help in waste management.

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NUTRITION, FEED RESOURCES AND PRODUCTS TECHNOLOGY DIVISION

NFRPT XI/1: Development of Fodder Production, Conservation and Processing Technologies for Small holders and Commercial Goat Farmers

P.K. Sahoo (upto Dec. 31, 2007), Prabhat Tripathi and T.K. Dutta

Performance of Various fodder legumes under Agroforestry system

Under the agro forestry system four fodder legumes were raised as sole crops and in combination i.e. Lobia, Sunhemp, Sesbania, Guar+Lobia, Sesbania (low density), Control, Sesbania+Sunhemp, Sesbania + Lobia. The study was conducted under rain fed condition. The maximum green fodder yield among the various treatments were recorded with Guar + Lobia 25.41t/ha and lowest biomass yield was associated with control i.e. 5.89 t/ha. Maximum dry fodder yield also occurred with Guar+Lobia treatment.

Soil pH and electrical conductivity after harvesting of the crops were lower than the their initial values. The pH value of the soil at initial stage ranges from 7.53 to 8.02 while at post harvest stage it ranged from 7.31 to 7.81. The lowest electrical conductivity 0.06 dsm/cm was associated with Sesbania crop (low density). At post harvest stage all the treatments were observed with lower available nitrogen from its initial value but the magnitude of the reduction was not very large, However lowest values of organic carbon and available nitrogen 0.60% and 303.6 kg/ha were associated with control treatment respectively.

Leaf stem ratio of various legumes under *Morus alba* and *Azadirachta indica* indicated that Sunhemp had lowest leaf stem ratio 0.44 on dry weight basis under Sesbania + Sunhemp mixture and 0.49 in the sole stand. Maximum leaf stem ration was observed in Guar and Lobia crop as sole or mixed crop.

Maximum weed density was observed with the Sesbania under both the densities. While Sunhemp was observed with the minimum

weed infestation than all other treatments at 15 days after sowing. All the treatments reduced weed infestation at 30 days after sowing except control. A three hectare land was also sown under the *Cenchrus* sp. based rainfed pasture.



Guar (*Cyamopsis tetragonoloba*) crop under Agroforestry system

Drying Studies of fodder legumes

To observe the drying rate of Lobia and Guar fodder in polyhouse and in ambient conditions, harvested fodder was used for study. The swath thickness was 2" and 4" and the initial moisture content were from 77% to 83% in Guar and 70 to 79% in Lobia. The drying rate was recorded higher for poly house drying as compared to ambient solar drying irrespective of swath thickness. Inside the poly-house the swath thickness has no effect. However, incase of ambient solar drying 2" swath gives higher drying rate. Therefore, poly house may be used for making good quality hay due to higher drying rate as compared to ambient condition.

Effect of Goat manure on *Cyamopsis tetragonoloba*

Under this experiment various doses of goat manure were incorporated in to the soil as alone or with potassium and nitrogen doses as the basal dose at the time of land preparation and Guar crop was raised under various treatments i.e. Goat manure@20t/ha, Goat manure @ 10 t/ha, Goat manure 10t+ 50 kg K/ha, 20kg N + 50 kg K, 50 kg. K/ha and Control. Maximum 27.3 t/ha Fresh fodder yield was achieved from

the Goat manure @ 20 t/ ha treatment followed by Goat manure @10t/ha + 50 Kg. K

Top feed Harvesting

Under field conditions ground cover in the grazing areas dries in the winter season and more or less remains dry up to monsoon season in semiarid/ arid areas. In these areas only top feed is the main source of green biomass production especially during the summer months. Hence under this study fodder trees were lopped at their maximum leaf bearing stage or maximum biomass producing stage when they were usually offered to the animals. Among the harvested species *Sygium cumini* produced maximum biomass i.e. 44.5 kg/tree. However maximum dry matter percentage was associated with *Zizyphus* species. During the harvesting and collection and drying of the fodder tree leaves thorny plants required more man power due to difficulty in handling.

XINFRPT/2. Development of Feeding Strategies for Goats under Intensive and Semi-Intensive System

T.K. Dutta, P.K. Sahoo (up to Dec. 2007) and R.S. Upadhyay

Nutritional manipulation for higher productivity and reproductive performance in female goats

Thirty nine female Barbari goats were divided into three equal groups based on their body weight, age and parity of kidding (0-3 parity females taken). The non-pregnant females were put under challenge feeding with the ration schedule as under,

T1: Concentrate mixture-A @ 2% of the BW + Arhar straw *ad lib.* + Green fodder 1kg/goat

T2: Concentrate mixture-B @ 2% of the BW + Arhar straw *ad lib.* + Green fodder 1kg/goat

T3: Concentrate mixture-C @ 2% of the BW + Arhar straw *ad lib.* + Green fodder 1kg/goat

Pregnancy performance and growth of kids

Pregnant goats under T2 group gained higher

(12.67 kg) than other two treatments (T1, 10.52 kg and T3, 11.35kg). Average daily gain (due to foetal growth and body weight change during pregnancy) was 83.54, 90.40 and 93.30 g in the respective three groups. Pregnant females under experimental groups kidded 92.31, 100 and 100 per cent in T1, T2 and T3 groups respectively. The percentage of female goats, which gave birth single and multiple kids were 66.67 and 33.33% in T1, 69.23 and 30.77% in T2 and 61.54 and 38.46% in T3, respectively. Total kids born in each treatment were 16, 18 and 18 in T1, T2 and T3 groups. It was observed that weight of male and female kids born under T2 and T3 tended to be higher than T1 (Table 1). Similar pattern was observed when the data calculated based on birth type. Average daily gain of kids up to three months of age was also higher in T2 (65.75g) and T3 (70.65g) than T1 (56.47). Similar pattern was observed when analyzed sex-wise. Therefore, the ration containing cotton seed cake and linseed cake in the ration 50:50 and 30:70 have better impact on kids' performance during pregnancy period and lactation period.

Table 1: Birth weight of kids born under different groups.

Parameter	T1	T2	T3
Birth weight (kg)			
Male	2.04 ± 0.19	2.24 ± 0.09	2.27 ± 0.04
Female	1.90 ± 0.10	1.94 ± 0.17	1.99 ± 0.12
Overall	1.96 ± 0.10	2.14 ± 0.09	2.14 ± 0.07
Birth type (kg)			
Single	2.01 ± 0.15	2.16 ± 0.11	2.19 ± 0.10
Twin	1.89 ± 0.11	2.33 ± 0.08	2.15 ± 0.06
Triplet	-	1.95 ± 0.10	-
ADG (g/d)			
0 day-1 month			
Male	54.85 ± 8.13	68.20 ± 7.22	80.57 ± 12.89
Female	53.85 ± 9.53	50.70 ± 12.77	60.97 ± 7.44
0 day-2 month			
Male	58.67 ± 6.88	68.09 ± 5.17	74.07 ± 6.91
Female	48.75 ± 9.61	60.54 ± 4.98	63.65 ± 5.34
0 day-3 month			
Male	63.47 ± 7.11	67.17 ± 5.80	76.43 ± 4.35
Female	52.09 ± 9.86	63.47 ± 5.52	65.70 ± 4.56
Overall	56.47 ± 6.61	65.75 ± 4.02	70.65 ± 3.40



Intake and digestibility of DM

Two metabolism trials were conducted during the pregnancy (mid pregnancy) and lactation periods (mid lactation) of the experimental female goats. Six goats from each group were taken for the trial during both the periods.

1. Pregnancy period: 18 goats (6 x 3).
2. Lactation period: 18 goats (6 x 3).

It was observed that lactating goats under each group consumed higher DM than pregnant goats (Table 2). DMI/100 kg body weight ranged from 3.10 (T3) to 3.49 kg (T1) in pregnant does and 3.99 (T3) to 4.42 kg (T1) in lactating does. However, the differences were statistically similar.

Table 2: DM intake and DM digestibility in pregnant and lactating Barbari goats under different treatments

Treatments	DMI (g)	DMI (g)/100 kg BW	DMI (g)/kg W ^{0.75}
Pregnant Barbari goats			
T1	830.07	3.49	77.98
T2	857.16	3.35	75.14
T3	880.925	3.10	71.44
Pooled mean	856.05	3.31	74.85
Pooled SE	98.04	0.16	2.38
Significance	NS	NS	NS
Lactating Barbari goats			
T1	1188.36	4.42	100.46
T2	1257.99	4.30	99.84
T3	1101.55	3.99	91.42
Pooled mean	1182.63	4.24	97.24
Pooled SE	93.39	0.30	6.47
Significance	NS	NS	NS



NERPT XI/3.1: Studies on Nutritional Value of Goat Milk

R.B. Sharma and A.K. Das

Milk Composition and Paneer Yield of Jamunapari Goats during different Months

Total 274 Jamunapari goat milk samples were collected during different months to study the milk composition and paneer yield. Specific gravity of goat milk was not affected during different months. However, a wide variation was observed in fat, SNF and T.S. content of Jamunapari goat milk during different months (Fig.1-4). Fat content was observed to be higher during February, September and October viz. 5.14 ± 0.07 , 5.07 ± 0.07 and 5.40 ± 0.03 %, respectively. Total solids content were also noticed higher during these months resulting better paneer yield.

Fig. 1: Monthly variation in FAT content of Jamunapari milk

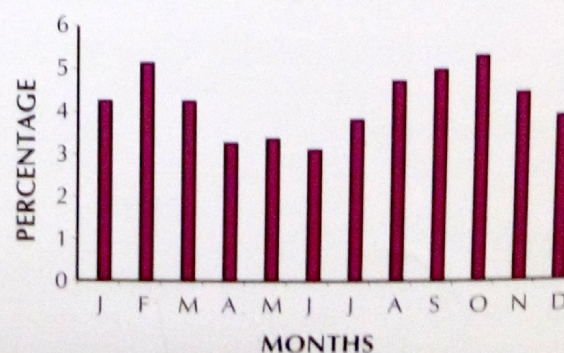


Fig. 2: Monthly variation in SNF of Jamunapari milk

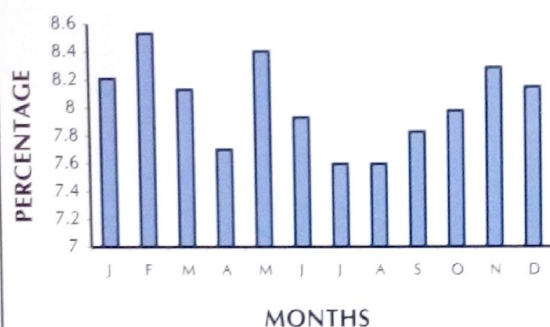


Fig. 3: Monthly variation in TS content of Jamunapari milk

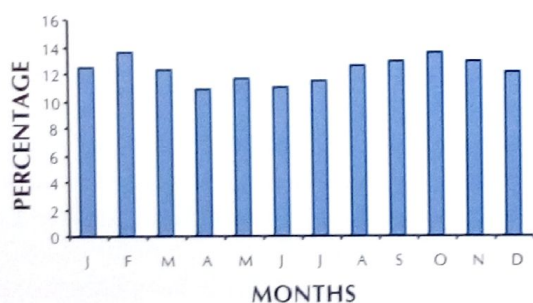
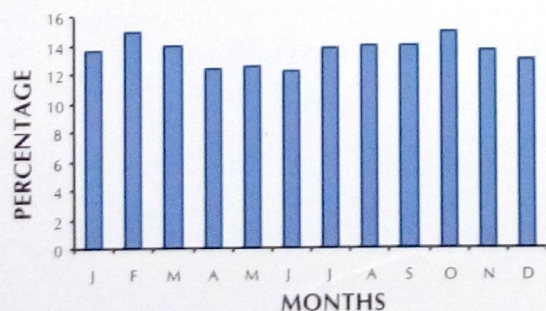


Fig. 4: Monthly variation in paneer yield of Jamunapari milk



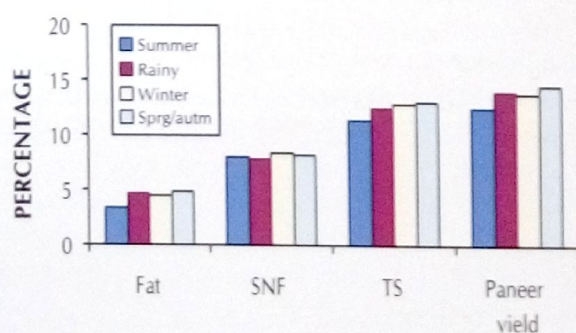
Effect of different seasons on major milk constituents and paneer yield of Jamunapari goats

Jamunapari goat milk samples were collected and analyzed during summer (65), rainy (69), winter (90) and spring/autumn (50) season. Fat content was observed higher (4.80 ± 0.11)

during spring/autumn and lowest (3.27 ± 0.03) during summer season ($P < 0.05$) (Fig. 5). Intermediate values were obtained during rainy and winter season and no significant difference was noticed between these two seasons. Almost similar trend was noticed between seasons in respect of total solids in goat milk. A significant difference was also observed in SNF content during different seasons. However, SNF and TS content of Jamunapari goat milk were not statistically different between winter and spring/autumn season. The yield of paneer was highest (14.43 ± 0.14) in spring/autumn and lowest (12.35 ± 0.17) in summer. Intermediate results were obtained during rainy and winter season showing non-significant difference between two.

Seasonal variation in total solids content of Jamunapari goat milk followed the pattern of fat probably due to very high correlation (Table 1) between fat and TS content in all the seasons. Fat and TS content also had highly significant correlation with the paneer yield in Jamunapari goat milk ($P < 0.01$).

Fig. 5: Influence of seasons on milk composition and paneer yield of Jamunapari goats



Effect of multiple births on goat milk composition

Milk samples (31) were collected From Jamunapari goats to study the effect of multiple births on composition. No significant difference was observed between single and twins birth milk in respect of fat, solids-not-fat, total solids, protein and ash content.

Table 1: Correlation among milk constituents and paneer yield in different seasons

Season	Constituents	Solids-not-fat	Total solids	Paneer yield
Summer N = 65	Fat	0.375**	0.704**	0.481**
	SNF	-	0.850**	0.109NS
	TS	-	-	0.414**
Rainy N = 69	Fat	0.620**	0.941**	0.629**
	SNF	-	0.822**	0.440**
	TS	-	-	0.619**
Winter N = 90	Fat	0.723**	0.974**	0.856**
	SNF	-	0.857**	0.625**
	TS	-	-	0.840**
Spring/autumn N = 50	Fat	0.286*	0.908**	0.790**
	SNF	-	0.655**	0.285*
	TS	-	-	0.757**

Table 2: Effect of multiple birth on milk composition of Jamunapari goats (Mean \pm SE)

Type of birth	Fat	SNF	TS	Protein	Ash
Single (16)	2.87 \pm 0.20	8.44 \pm 0.26	11.31 \pm 0.29	2.68 \pm 0.13	0.79 \pm 0.07
Twins (15)	2.99 \pm 0.36	8.38 \pm 0.21	11.41 \pm 0.34	2.90 \pm 0.16	0.71 \pm 0.05
Overall (31)	2.93 \pm 0.19	8.41 \pm 0.17	11.36 \pm 0.22	2.78 \pm 0.10	0.75 \pm 0.04

Effect of stage of lactation on milk Composition of Barbari goats

51 samples of Barbari goat milk were collected during different stages of lactation (early-20, middle-13 and late-18) and analyzed to study the variation in milk composition. Fat content was highest (4.84 ± 0.28) during late stage of lactation and lowest (3.86 ± 0.21) during early stage of lactation in Barbari goats. The difference was highly significant ($P < 0.01$) (Table 3). The total solids content also showed a similar trend but it was statistically non-significant. The solids-not-fat, protein and ash content in Barbari goat milk were found to be non-significant between the different stages of lactation. However, Calcium content in goat milk was observed higher (150.73) during early stage of lactation followed by middle (147.11) and late (131.96) stage of lactation. No significant difference was found in zinc content of goat milk during different stages of lactation.

Table 3: Effect of stage of lactation on milk Composition of Barbari goats (Mean \pm SE)

Lactation Stage	Fat	S.N.F.	T.S.	Protein	Ash	Calcium	Zinc
Early (20)	3.86A ± 0.21	10.91 ± 0.50	14.76 ± 0.47	3.40 ± 0.13	0.77 ± 0.03	150.73A ± 2.44	0.47 ± 0.02
Middle (13)	4.23AB ± 0.25	10.46 ± 0.74	14.69 ± 0.69	3.44 ± 0.18	0.78 ± 0.04	147.11A ± 6.58	0.48 ± 0.04
Late (18)	4.84B ± 0.28	10.59 ± 0.49	15.43 ± 0.64	3.58 ± 0.12	0.76 ± 0.03	131.96B ± 5.38	0.43 ± 0.03
Overall (51)	4.30 ± 0.15	10.68 ± 0.32	14.98 ± 0.34	3.47 ± 0.09	0.77 ± 0.02	143.18 ± 2.90	0.46 ± 0.02

Means in the same column with the different superscripts differ significantly ($P < 0.05$)

NFRPT XI/3.2: Evaluation of Carcass Traits, Meat Quality and Products from Goat Meats

A.K. Das and R.B. Sharma

Effect of Concentrate Supplementation with Area Specific Mineral Mixture on Carcass Traits and Meat Quality of Barbari Kids

Fifteen post-weaned male Barbari kids (3 months old) were divided into three equal groups to study the effect of supplementation of concentrate mixture along with area specific mineral mixture (ASMM). The kids under Group A and Group B were allowed 5-6 hrs grazing daily. The kids under Group A were supplemented with barley grain @2% of body weight along with common salt and kids under Group B were supplemented with concentrate mixture (CP-18.87%, TDN-70.33%) @2% of body weight along with ASMM. The kids under Group C were fed under intensive system with same concentrate mixture containing ASMM @2% of body weight with gram straw and green fodder offered *ad lib*. Five kids from each Group were slaughtered at 10 months of age. Though there was no significant difference between the Groups, supplementary feeding with mineral mixture on an average improved the slaughter weight by 1-1.5 kg. Hot carcass weight was higher in Group B (10.34 kg) and C (10.48 kg) than Group A (9.24 kg). Similarly improved dressing percentage was obtained in Group B (49.12%) than Group A (46.10%). The Groups supplemented with concentrate mixture containing ASMM showed significantly ($P < 0.05$) higher forequarter percentage (27.93%, 27.18%) than the control (25.61%). Intensive feeding coupled with ASMM (Group C) significantly ($P < 0.05$) improved GR and breast fat thickness (1.22 mm; 2.16 cm) than Group A (1.06 mm; 1.82 cm) and Group B (1.08 mm; 1.82 cm) whereas loin eye area was not significantly different in these Groups.

Group B had significantly ($P < 0.05$) higher separated lean (71.65%) than Group C (66.38%)

but Group C deposited significantly more fat in the muscles. Different dietary treatments significantly affected variety meat yield and Group C had significantly lower yield than other Groups. Concentrate mixture feeding (Group B and C) had positive effect on fat deposition in different depots and omental fat was significantly ($P < 0.05$) higher in Group B and C than Group A. Supplementary feeding along with deficient mineral mixture improved various cuts weight in Barbari kids maintained under semi-intensive system. The loin cut weight was significantly higher ($P < 0.05$) in Group A and Group B. However, no differences were observed in the chemical composition of *Longissimus dorsi* muscle among various dietary treatment Groups. Cholesterol content of the muscles was not significantly different among the treatments and values were within the range of 83.73-87.25mg/100g. It is concluded that concentrate supplementation along with area specific mineral mixture may be used for improving goat meat productivity.

Antioxidant effect of curry (*Murraya koenigii*) leaf powder on quality of fresh ground goat meat

The curry leaf powder (CLP) had potent antioxidant effect as measured by DPPH method (Fig. 1) and its use in fresh meat did not impart any negative effect on meat quality. CLP though did not significantly influence odour but improved odour score. Fresh goat meat had acceptable odour upto 5 days whereas in control sample it was upto 3days. CLP treated sample had significantly lower free fatty acids content (0.31 to 0.71) as compared to control sample (0.37 to 0.93). Addition of 0.2% CLP to ground goat meat is sufficient to lower the free fatty acids, thiobarbituric acid and peroxide values. The control sample was not acceptable after day 3 while treated sample could be acceptable up to day 5 during refrigerated storage.

Fig. 1: DPPH radical scavenging activity of the extracts from curry leaf powder

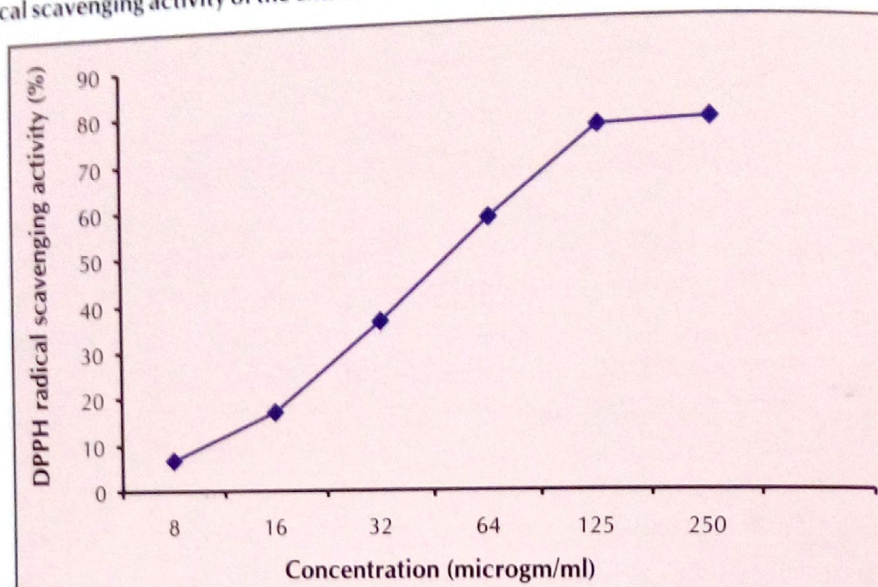


Table 1: Effect of CLP on free fatty acids, peroxide and thiobarbituric acid values of fresh goat meat

Treatments	Storage period (days)					Treatment Effect
	1	3	5	7	9	
Free fatty acids						
Control	0.37d	0.58c	0.65c	0.78b	0.93a	**
CLP	0.34e	0.46d	0.55c	0.57bc	0.71a	
Peroxide values						
Control	1.74a	2.21b	2.52c	3.01d	3.56e	**
CLP	1.52a	2.04b	2.17b	2.61c	2.82d	
Thiobarbituric acid values (mg malonaldehyde/kg)						
Control	0.56d	0.68d	0.87c	1.05b	1.22a	**
CLP	0.47e	0.58d	0.73c	0.90b	0.93a	

Means in the same row with different superscripts are significantly different ($P < 0.05$), ** $P < 0.01$

Effect of fat levels on microwave cooking properties and quality of goat meat patties

Patties with various fat levels (5%, 10%, 15% and 20%) were cooked in a microwave oven with full power (700W) operating at 2450 MHz. Results showed that fat level did not affect emulsion stability of batter but it decreased as fat level increased. Microwave cooking time decreased as fat levels increased. Patties with 5% fat level showed lower cooking loss than other fat levels. As fat level increased, shear force value decreased indicating soft texture. Subjective colour evaluation indicated patties with 5% fat were darker and were redder than patties with more fat. Sensory analysis revealed that goat meat patties with 5% and 10% fat had less flavour and juicer than patties with 15% and 20% fat. Tenderness and oiliness increased significantly with an increase in fat level. Patties with 10% and 15% fat rated higher overall palatability than others. Cooking properties and quality of goat meat patties with different fat level were affected when cooked by microwave energy.

Table 1: Effect of fat levels on microwave cooking properties and quality of goat meat patties

Variables	Fat level (%)			
	5	10	15	20
Emulsion stability (%)	93.50 ± 0.65	93.12 ± 0.52	91.87 ± 0.69	91.42 ± 0.58
Cooking time (s)	164.37 ± 1.85a	148.46 ± 5.41b	133.85 ± 3.68c	114.62 ± 3.86d
Cooking loss (%)	8.81 ± 0.73b	10.82 ± 1.17b	11.87 ± 1.22b	15.20 ± 1.25a
Surface colour	4.41 ± 0.16a	4.24 ± 0.10ab	4.05 ± 0.15ab	3.85 ± 0.11b
Shear force (kg/cm ²)	0.82 ± 0.06a	0.69 ± 0.03b	0.58 ± 0.02b	0.41 ± 0.02c
Tenderness	4.68 ± 0.30c	4.91 ± 0.25c	6.02 ± 0.22b	7.03 ± 0.15a
Juiciness	5.28 ± 0.21c	6.29 ± 0.24b	6.54 ± 0.13ab	6.88 ± 0.15a
Oiliness	4.35 ± 0.07c	4.82 ± 0.23c	5.38 ± 0.20b	5.91 ± 0.16a
Flavour	4.97 ± 0.18b	5.48 ± 0.16b	6.34 ± 0.22a	6.73 ± 0.16a
Overall palatability	5.21 ± 0.13c	5.85 ± 0.20b	6.52 ± 0.29a	6.90 ± 0.16a

Means in the same row with the different superscripts are significantly different ($P < 0.05$)

Visual colour score based on 5 point scale, in which 5 = tan and 1 = pink

Sensory core based on an 8 point scale, in which 8 = excellent and 1 = extremely poor

AICRP on Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production

U.B.Chaudhary and S. D. Kharche

Based on deficiency observed in the samples of feed, fodder, water, soil and plasma of different livestock species, collected at farmers end from three agro-climatic zones of UP, area specific mineral mixture was formulated separately for each of three agro-climatic zones. To validate the formulated area specific mineral mixture, on farm trials were conducted on cattle and buffaloes suffering from problems of repeat breeding and anoestrous. Results obtained up to 31st of March, 2008 indicated that out of 81 Cattle and Buffaloes suffering form problem of repeat breeding, 58 (72%) became pregnant on no return basis, where as out of 26 cases of anoestrous cattle and buffaloes, 4 (15%) became pregnant with in 15-65 days of initiation of feeding of area specific mineral mixture. Feeding of area specific mineral mixture is in progress and there may be increase in number of recovery cases of cattle and Buffaloes suffering from reproductive problems. Results of on farm trial conducted on Milch cattle and Buffaloes did not show any positive effect of mineral feeding on milk

production.

Another study conducted to observe the effect of area specific mineral mixture on productive performance of male goats maintained under intensive system of management for a period of 308 days, indicated higher body weight gain, better rumen fermentation pattern and more economic gain from the group of goats fed area specific mineral mixture in comparison to corresponding non mineral fed group. However in a similar study conducted on male goats maintained under semi-intensive system of feeding management for a period of 4 months indicated no effect of feeding area specific mineral mixture on productive efficiency as well as fermentation pattern of goats. It may be attributed to intake of required minerals by non mineral fed goats through browsing. Initial observation collected in terms of semen quality and quantity of bucks and testosterone level in serum did not show any pronounced effect of feeding of area specific mineral mixture. In order to create more awareness amongst the livestock farmers about the importance of feeding mineral mixture for improvement of productive and reproductive efficiency of livestock, field trials of area specific mineral mixture are in progress.

Table 1: Effect of feeding area specific mineral mixture to treat reproductive problems in cattle and buffalo at farmer's level.

No. selected villages & commercial dairy farm	Total no of animals for trial	No of days of min, mix feeding	No of animal become pregnant	Percentage	Case history of problematic animals
Villages- 18 Commercial dairy farm -2	107 R.B.: 81 Anestrus: 26	15-65	R.B.: 58 Anestrus: 4	71.60 15.3	Most of the repeat breeder buffaloes and cattle repeated at least 4 -5 times at regular intervals of 21-30 days prior to feeding of area specific mineral mixture. In case of cattle and buffaloes suffering from problem of anestrus attained the age of > 4years and never came in heat prior to feeding of area specific mineral mixture.

Table 2: Effect of feeding area specific mineral mixture on growth, intake and fermentation pattern of male Barbari goats maintained under intensive system of management

Particulars	Control (A)	Experimental (B)
No of goats	08	08
Age of animals	03 months	03 months
Intake in terms of straw (g/d/goat)	439.47 ± 16.73	452.7 ± 14.52
Initial body wt. (kg)	6.78 ± 0.55	6.93 ± 0.66
Final body wt. (kg)	22.41 ± 1.68	23.77 ± 1.39
Gain in body weight (kg) /goat	15.63	16.84
Rumen Fermentation Pattern		
Ammonia N2 (mg/dl)	0.45 ± 0.05	0.42 ± 0.04
VFA (m mol/dl)	7.96 ± 0.41	8.04 ± 0.22
pH	7.0 ± 0.05	7.28 ± 0.26

Table 3: Economic details of feeding of area specific mineral mixture to the goats maintained under intensive system of management

Particulars	Control (A)	Mineral fed (B)
No goats under study	08	08
Age and breed	Barbari male, 3 months of age	Barbari male, 3 months of age
Duration of study	308 days	308 days
Consumption of Arhar straw /goat and its cost (@Rs. 200/100kg)	270.0 (135.35)	278 (139.43)
Consumption of green fodder/goat and its cost (100/100kg)	154 (154.0)	154 (154.0)
Consumption of barley grain (kg)/ goat and its cost (@ 8/kg)	Rs. 340.0 (42.50)	Rs. 354.8 (44.35)
Consumption of mineral mixture/ goat and its cost (@ Rs.40/kg)	-	35.48 (0.887)
Cost of total input (Rs)	764	822.28
Body weight gain	15.7	17.01
Total meat (kg) @50 % dressing	7.85	8.50
Cost of meat (Rs) @ 150/kg	1177.5	1275.0
Net profit/goat during the experimental period	413.5	453.0

AP Cess Project: Isolation and Identification of Efficient Exotic Fungi for Improvement of Pasture/ Fibre Digestibility in Goats

U.B. Chaudhary and V.K. Gupta

Amplification of ribosomal ITS2 region

The ribosomal ITS2 region defined by primers JB206F 5' GGAAGTAAAAGTCGT AACAAAGG 3' and JB206R 5' TCCTCCGCTTATTAATATGC 3' was amplified from genomic DNA of rumen anaerobic fungi using PCR. The PCR was performed in a 50 µl volume containing (final concentration): forward and reverse primers, 150 pmol each; 1X PCR master mix (Banglore Genei) having *Taq* DNA polymerase, dNTPs and reaction buffer with $MgCl_2$ at optimum concentration, 25 µl; template, 4 µl and sterile water to make up the vol. to 50 µl. The ribosomal ITS2 region of different species was amplified from genomic DNA and gave amplification of approx 700bp.

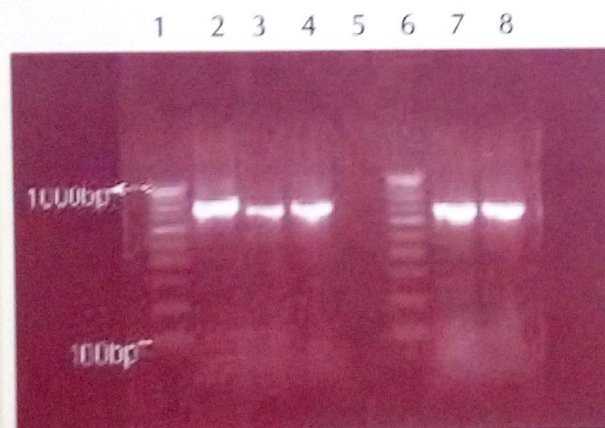


Fig.: Amplification of ITS 2 region.(700bp App.) of *Piromyces* and *Orpinomyces*.

Lane 1 and 6: Standard 100bp molecular weight marker.

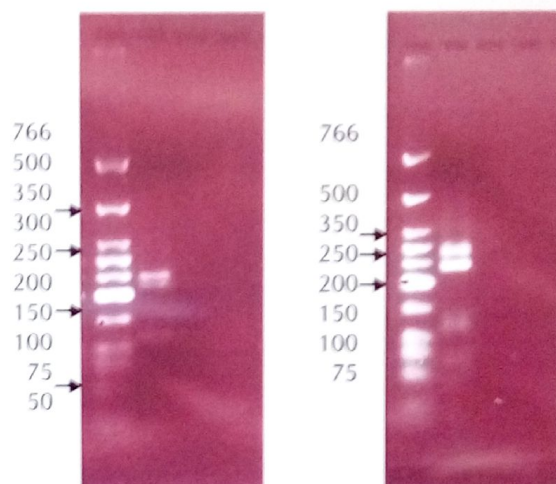
Lane 2, 3 and 4: ITS 2 region of *Piromyces*

Lane 7 and 8: ITS 2 region of *Orpinomyces*

RFLP analysis of *Orpinomyces* species isolated from Nilgai and Goats

The amplified intergenic spacer ITS2 region was digested by site specific restriction enzyme (*Dra* I). After digestion with *Dra*I, PCR amplicon of *Orpinomyces* species isolated from Nilgai and goats generated fragments of 300, 250, 130, 65 bp (approx) and 250, 240, 130 bp, respectively.

RFLP of ITS 2 region of *Orpinomyces* sp. RFLP of ITS 2 region of *Piromyces* sp. isolated from Nilgai isolated from Goats.



Effect of cross inoculation of exotic fungi *Orpinomyces* sps. (isolated from Nilgai) on growth, feed intake, digestibility, rumen microbes and rumen fermentation pattern in Barbari goats

Efficient fungal sps. (*Orpinomyces*) isolated from Nilgai was selected on the basis of higher estimated fibrolytic enzyme activity, observed during last two years. This species of anaerobic fungi was cultivated in the laboratory in serum bottles (100ml) containing 40ml of non defined Joblin's medium and antibiotics. All the components of the medium were same except 40% of clarified rumen liquor (CRL) in place of 15% and an extra addition of 0.2% milled Arhar straw. Higher proportion of CRL was used for making exotic fungal sps. adapted in goat rumen liquor. Survivability of fungal culture was checked under microscope and live culture of exotic fungi was used for cross inoculation. For experimental trial, 10 male Barbari goats of approx. 9 months of age were selected and divided equally into two groups (C and D). Animals of both the groups were kept separate in iron cages and were receiving Arhar straw + Pelleted feed @ 100g /day daily. Animals of group C, were administered 40ml of un inoculated fungal medium containing 0.2% milled arhar straw and antibiotics at weekly

interval. Where as in case of group D, animals were administered 40 ml of 48 hrs. old culture of *Orpinomyces* sps.(isolated from Nilgai) containing 0.2% milled arhar straw and antibiotics at weekly interval using stomach tube and syringe. Regular inoculation in control (C) and treated (D) groups was done at weekly interval up to 3 months. Observations in terms of growth rate, (fortnightly) and intake of arhar straw (daily) was recorded.

Results related to the productivity and rumen fermentation pattern affected by inoculation of exotic fungi are presented in Table 1. Significantly higher ($P < 0.05$) intake of arhar straw under group D in comparison to group C. Reason seems to be associated with the effect of inoculated exotic fungi. Higher concentration of VFA ($P < 0.05$) observed in group C needs to be correlated with the results of digestibility trial. Lower values of microbial population in terms microcrystalline cellulose degrading bacteria, fungal and protozoal population under group D indicated that inoculated exotic fungi could not establish symbiotic relationship with native fauna and flora. Results of metabolic trial are under statistical analysis.

Table 1: Effect cross inoculation of exotic fungi on productivity and rumen fermentation pattern in goats.

Particulars	Group C (Control)	Group D (Treated)
Breed and sex of the goats	Male Barbari	Male Barbari
Number of goats	05	05
Initial body wt.	16.82 \pm 1.0	16.5 \pm 0.56
Final body wt.	19.38 \pm 0.93	18.56 \pm 0.81
Gain in body wt.	2.56	2.06
Intake of straw (g/d)	788.48 \pm 13.75a	830.54 \pm 14.26b
Rumen fermentation pattern		
pH	6.84 \pm 0.03	6.35 \pm 0.35
TVFA (m/dl)	10.98 \pm 0.61a	8.56 \pm 0.15b
Ammonia Nitrogen (mg/dl)	1.7 \pm 0.37a	1.82 \pm 0.42a
Rumen Microbial Population		
Total Viable Count of microcrystalline cellulose degrading bacteria (X 10 ¹¹ /ml)	128.3 \pm 8.39a	108.9 \pm 2.41b
Total fungal Count X10 ³ /ml	4.6 \pm 2.47a	3.7 \pm 1.79a
Total Ciliate Count X10 ⁶ /ml	3.94 \pm 0.34a	3.7 \pm 0.28a

Mean followed by the different superscript (s) in the same row differ significantly ($P < 0.05$)

AP Cess project: Development of Supplementation Strategies for Goats under Field Conditions

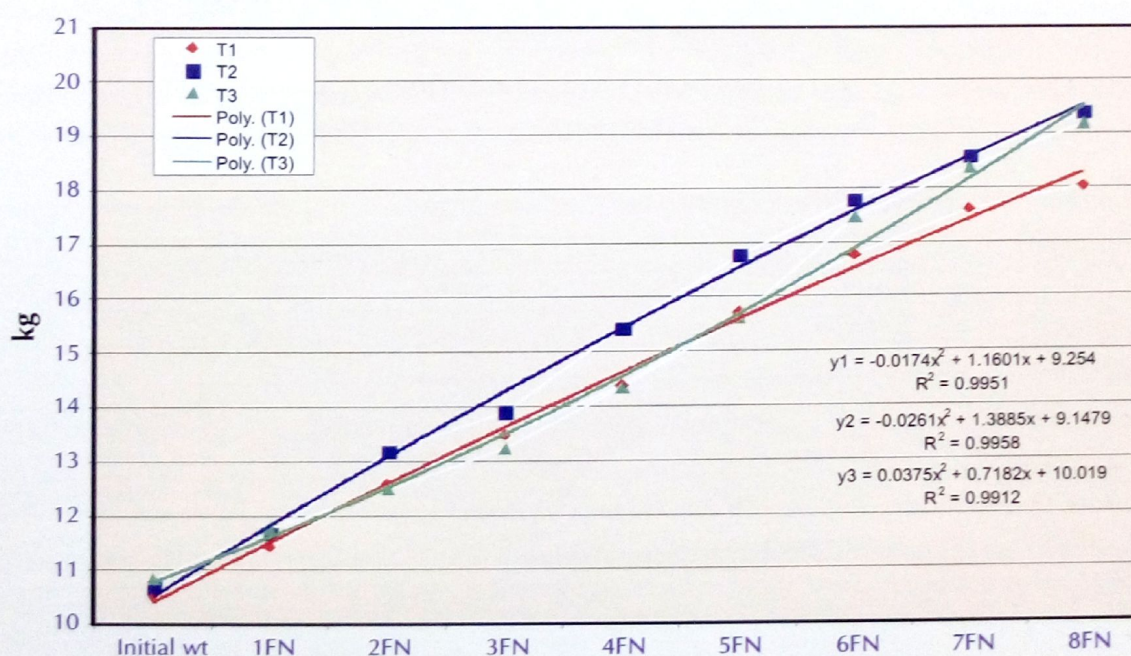
T. K. Dutta and P. Tripathi

In vitro evaluation of goat feeds/fodders collected from the semi-arid region

Some farmers supplement grain component (home grown) to their goats. Therefore, four combinations of rations were prepared using the ingredients collected from each block of surveyed districts. Total of 16 combinations of rations were prepared for two districts (Aligarh and Agra). Addition of concentrate mixture (20%) in the ration increased CP% in the total mixed ration (TMR). Inclusion of mineral mixture (3%) in the ration improved the major and trace mineral status in the TMR. *In vitro* evaluation of the above rations was done using PC based synchronized Bio-fermentor module. Each ration was subjected to *in vitro* incubation for 48 hours under this module to observe total gas production, IVDMD and fermentation pattern. Supplementation of barley grain or concentrate mixture (with mineral mixture) in the roughage based rations (as followed in the village condition) increased IVDMD, thereby, improved the total VFA, NH₃-N and total-N concentrations in the incubation medium. pH was also influenced by such treatments. Therefore, supplementation of deficient nutrients (energy, protein and minerals) may improve the production potential in goats under field condition. The similar supplementation patterns were further validated in the growing

Table 1: Effect cross inoculation of exotic fungi on productivity and rumen fermentation pattern in goats.

Parameters	T1	T2	T3	S.E.M.	Significance
<i>Weight gain and FCE</i>					
Initial BW (kg)	7.97	8.08	7.63	0.99	NS
Final BW (kg)	8.55	9.92	10.13	1.00	NS
Weight gain (kg)	0.58a	1.83b	2.50b	0.51	P<0.05
ADG (g)	9.72a	30.56b	41.67b	8.53	P<0.05
DM intake (g)/d	270.21	268.72	288.44	27.58	NS
Feed conversion efficiency (%)	3.60a	11.37b	14.44b	3.04	P<0.05
<i>Rumen fermentation pattern</i>					
pH	6.64b	6.53b	6.24a	0.13	P<0.05
TVFA (mmol/dl SRL)	9.83	9.78	10.83	1.10	NS
Total-N (mg/dl SRL)	44.10	52.40	53.05	5.35	NS
NH3-N (mg/dl SRL)	19.88a	28.85b	27.48b	1.39	P<0.01

**Fig. 1. Growth performance of kids with different supplementations**

GOAT HEALTH DIVISION

XI/GH-1 Project title: Monitoring and Surveillance of Important Goat Diseases in India.

D.K. Sharma, V.K. Gupta, Rajneesh Rana, Ashok Kumar and V.S. Vihan

Passive surveillance:

Questionnaire was developed to collect the information regarding various important diseases of goats. The questionnaire was sent to 42 goat farmers by post. The result has been presented in Tables 1, 2 and Fig.1. A total of 10 goat farmers had responded. The data were critically analyzed and interpreted. The colostrums were fed to newly born kids by all the farmers. It was also observed that 60 per cent farmers do get veterinarian help for the treatment of their animals even than the mortality in 0-1 M and 3-5 M kids was 32.5 and 38.4% respectively. All the farmers got their goats vaccinated. Vaccination for PPR was observed in 60 per cent cases but none of the farmers adopted complete schedule of vaccinations. Of the total 145 pregnant animals, 63 aborted giving an occurrence of abortion to be 43.4 per cent. All the abortions were, however, reported in middle of pregnancy.

Qualitative chemical analysis: Qualitative chemical analysis was conducted for flavonoids, alkaloids, saponins, Carbohydrates, glycosides, steroids, tannins and phenolic compounds and protein and amino acids by standard methods. The result is portrayed in Table 1.

Table 1: Chemical constituents in methanolic extract

Sl.No.	Coded extract	Plant constituents								
		Flavonoids	Alkaloids	Saponins	Carbohydrates	Glycosides	Steroids	Tannins	Triterpenoid and phenolics	Protein and Amino Acid
i.	CIRG-1	+	+	-	+	-	-	-	+	-
ii.	CIRG-3 A	-	-	-	+	-	-	+	+	-
iii.	CIRG-2 A	+	-	-	-	-	-	+	-	-
iv.	CIRG-6	-	-	-	-	-	-	+	-	-
v.	CIRG-4	-	-	-	-	-	-	+	+	-
vi.	CIRG-5	-	-	-	+	-	-	+	-	+

Chemical compatibility analysis of combination of plant extracts:

Individual extracts and in combinations of two, three and four extracts were tested. Test methanolic plant extract dissolved in methanol and applied 5 μ l on thin layer plate (Aluminum silica plate) at the concentration of 0.35 gm/ml and subjected to run in Toulene: Ethyl acetate (70:20) solvent system. The developed test plates were examined for presence of spot in both single and combination extracts. In first experiment, 6 single extract and 15 different extracts were tested, which did not reveal any interaction among fractioned spots. In second experiment, 20 different combinations of three extracts were tested in similar way, also not exhibited any interaction in fractioned spots (Fig 1). In third experiment, 15 different combinations of four plants were tested and results showed that expression of all spots were there in both single and mixed extract spot. The results of this study indicated any plant extract may be mixed for development of prototypes.

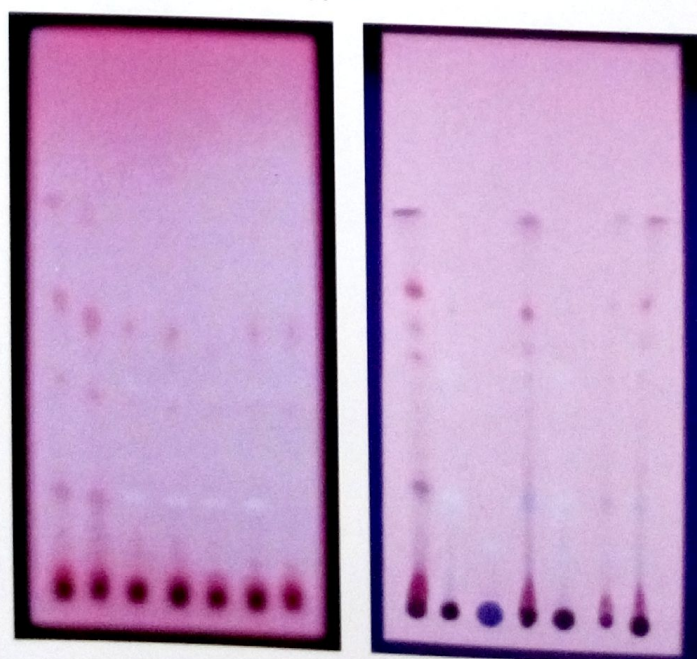


Fig. 1: Chemical compatibility analysis of combination of plant extracts by TLC

Isolation of organism for antibiogram: For testing in vitro antibacterial property of plants extracts against pathogenic strain of *E. coli*, the organisms were isolated from clinical cases of diarrhoea in kids and goats of Jamunapari and Barbari goat breed. Isolates were characterized as *Escherichia coli*. Antibiogram of both the isolated were evolved against all commonly used antibiotics. Plant extract was dissolved in suitable solvent, then test plant extract solution with different concentrations (500 mg/ml, 250 mg/ml, 125 mg/ml, 62.5 mg/ml and 3.25 mg/ml) and impregnated disc with 25 μ l of each serial dilution of extract solution contain different concentration (12.5, 6.25, 3.12, 1.50 and 0.78 mg/disc) respectively of extract. The susceptibility and resistance level were observed.

The organisms were isolated from the different places in order to identify the difference in the level of susceptibility/resistance. The organisms (*E. coli*) isolated from Jamunapari kids revealed the susceptibility to most of the antibiotic discs used (Cephalexin, Cephalexime, Cephadroxil, Ceftazidime, Cefaclor, Ciprofloxacin, Norfloxacin, Sparfloxacin, Lomefoxacin, Gatifloxacin, Tobramycin, Amikacin, Gentamycin, Kanamycin, Roxithromycin, Oxytetracycline, Furazolidone, Chloramphenicol and Co-Trimoxazole), except colistin and sulphadiazine. In contrast to the organism isolated from Jamunapari kids, the isolate from Barbari kids showed the resistance to most of the antibiotic disc used, except amikacin, gentamycin, furazolidone and colistin.

Antibiogram of Prototypes: In order to study in the enhancement in antibacterial activity, some selected combination of extracts was tested. The ratio of 50:50 of the individual extract was prepared. Antibiogram property of was evaluated against isolated and characterized pathogenic ETEC *Escherichia coli*, at the concentration of 12.5, 6.24, 3.12, 1.56, 0.78 and 0.39 mg/disc by disc diffusion test. In CIRG-5 + CIRG-6, CIRG-5 + CIRG-3A, CIRG-1 + CIRG-6, CIRG-2B + CIRG-6, CIRG-1 + CIRG-2B, CIRG-2A + CIRG-1 and CIRG-5 + CIRG-2B. There were no synergistic antibacterial activity were reported in any prototypes, however, in CIRG-5 + CIRG-4 and CIRG-5 + CIRG-6, there was antagonistic effect in these combinations (Fig 2).

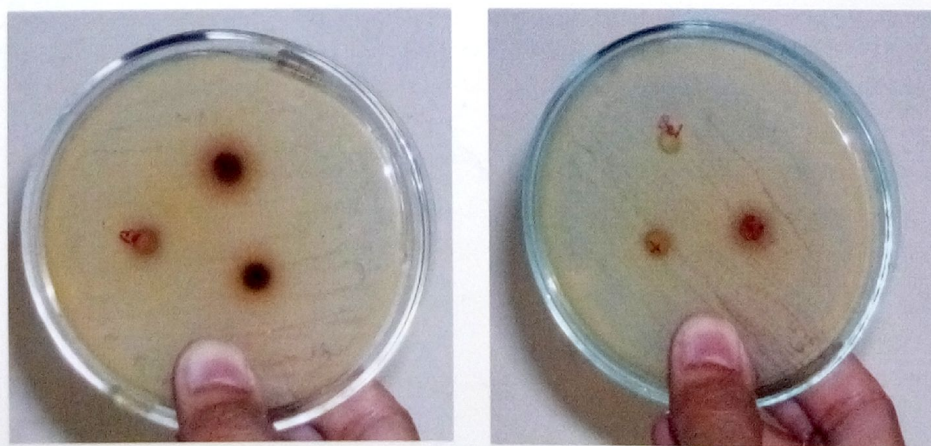


Fig. 2: Antagonistic antibacterial activity of CIRG-5 + CIRG-4 and CIRG-5 + CIRG-6

Clinical trails of Prototypes in oral liquid formulation: Four prototypes, Prototype A (CIRG-2A + CIRG-1), Prototype B (CIRG-1 + CIRG-2B), Prototype C (CIRG-4 + CIRG-2B) and Prototype D (CIRG-5 + CIRG-2B) were prepared in ratio of equal amount. Therapeutic efficacy of extracts were evaluated in clinical cases of diarrhoea kids at the dose rate of 10 mg/kg bwt for 1- 2 days orally and observed degree of recovery (score) and recovery days. In clinical trials (6 kids), pretreatment values of appetite (Good 1, Low 2, No appetite 3), fecal consistency (Watery 1, Semi solid 2, Loose ball 3, Normal 4) and dehydration (+1, +2, +3, +4) were recorded on score basis on the basis of their

severity. Rectal temperature was recorded in both the groups. Recovery score recorded as (Poor 1, Partial 2, Moderate 3, and Complete 4). In CIRG-2B, on same dose rate mean recovery score was 3.8 ± 0.19 and mean recovery days were 1.0 ± 0.00 days. In diarrheic kids, Appetite score was 1.0 ± 0.00 , Fecal core was varied from 1.6 to 1.80. The mean duration of diarrhoea varied from 2.2-2.5 days. In prototypes A, mean recovery score was 4.0 ± 0.19 and mean recovery days were 2.41 ± 0.08 days. Similarly In prototypes B, mean recovery score was 4.0 ± 0.00 and mean recovery days were 2.50 ± 0.06 days. In prototypes C, mean recovery score was 4.0 ± 0.00 and mean recovery days were 2.40 ± 0.06 days and In prototypes D, mean recovery score was 4.0 ± 0.00 and mean recovery days were 2.50 ± 0.09 days. All are showing potential as antidiarrhoeal in goats.

XI/GH-2.3 Control of Brucellosis in Goats by Molecular Diagnosis and Epidemiology.

V.K. Gupta, S.V. Singh and V.S. Vihan

Isolation of *Brucella* from specimens: The following specimens were used for isolation of *Brucella* sp.

Table 1: Isolation of *Brucella* isolates from different source of goat origin

S.No.	Specimen	Number	Number of suspected <i>Brucella</i> isolates
1.	Milk	20	nil
2.	Vaginal swab	15	05
3.	Fetal membranes	08	05
4.	Aborted fetus	06	03
5.	Fetal stomach content	06	02
6.	Uterus	05	01
7.	Supramammary lymph nodes	05	nil
	Total	65	16

The suspected isolates were further subjected to identification and characterization.

Identification of *Brucella* organisms

There is no single test by which an organism like brucella can be identified. A combination of growth characteristics, serological and bacteriological methods usually enable brucella to be correctly identified.

Morphology and staining: All the 16 suspected *Brucella* isolates were Gram-negative, cocco-bacilli, usually arranged singly. The morphology was fairly constant in 10 isolates however 06 isolates showed pleomorphic character. True capsule was not detected in any of 16 isolates.

Growth characteristics: Suspected *Brucella* colonies which were close to colonies of contaminants were picked and re-streaked on Brucella agar medium. After incubation for 4-5 days, the plates were examined for colonial morphology. There were several types of suspected *Brucella* isolates colonies were seen, representative colonies of each isolates were selected for further characterization. In most of the cases the growth was smooth, clear, pale honey-colored appearance. The colonies producing haemolysis on blood agar or lactose fermentation on Mac-Conkey agar were eliminated from further consideration as *Brucella*.

Antigenic characteristics: Out of 16 *Brucella* isolates, 06 were with smooth surface antigens and reacted in agglutination with antisera prepared against smooth *Brucella* culture. Rest 10 isolates did not reacted with antisera. These 10 isolates were either may be rough *Brucella* or variants of *Brucella*.

Biochemical tests: *Brucella* cultures were oxidative rather than fermentative in metabolism. All the 06 smooth *Brucella* were oxidase and urease positive.

Typing of *Brucella* culture: After it was established that out of 16 suspected *Brucella* isolates, only 06 were identified as genus *Brucella*, it is important to try to establish its species and biovar. Species identification was based on 2 main sets of properties:

- i. lysis by phages and ii. Oxidative metabolic profile on selected amino acid and carbohydrate substrates.

For characterizing the *B. melitensis* at the biovar level four (04) main tests were used:

- i. carbon di oxide (CO₂) requirement,
- ii. production of hydrogen sulphide (H₂S),
- iii. dye (thionine and basic fuchsin) sensitivity, and
- iv. agglutination with monospecific A and M antisera.

The characteristics of all 06 *Brucella* isolates as revealed by the routine typing tests are presented in Table 2.

PCR-RFLP for molecular typing of *Brucella* culture: PCR-RFLP analysis has been used of *Brucella* omp2 gene. Omp2 gene was used as a locus of two nearly homologous repeated copies that differ slightly among *Brucella* species and biotypes in presence or absence of the *Pst* 1 site to differentiate between them.

PCR and oligonucleotide primers: The PCR test was performed with all 06 *B. melitensis* biovars isolated from goats. The PCR technique has increasingly been used as a supplementary method in *Brucella* diagnosis. We have used a molecular biotyping approach which has been proposed on the basis of restriction endonuclease polymorphism in the genes encoding the major 25- and 36- KDa outer membrane proteins of *Brucella* i.e. omp2. The *Brucella* omp2 gene was used as target DNA. The forward 5' primer (p1 [TGGAGGTCAGAAATGAAC]) and reverse 3' primer (p2 [GAGTGCAGAACGAGCGC]) were used to amplify an omp2 gene segment.

Validation of the method with prototype strains: The PCR was first performed to test specificity by comparing *Brucella* species DNAs to the DNAs from several other bacteria, including the taxonomically closely related *Agrobacterium* and *Rhizobium* strains. A single band with the expected size of 282 bp was obtained only when *Brucella* DNA was used as a template. All other bacterial strains and a water sample failed to produce an amplified fragment.

The omp 2 gene exists as a locus of two nearly homologous repeated copies (omp2a and omp2b) that differ slightly among *Brucella* spp. We used this information to design specific primers that amplify a 282-bp fragment (Fig.1). The results revealed that DNA fragments obtained from *B. melitensis*

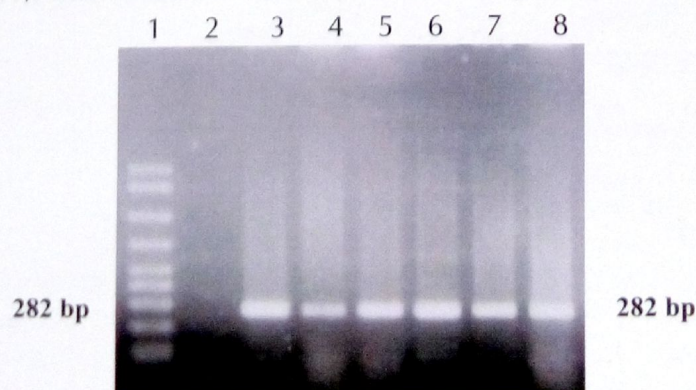


Fig. 1: Agarose gel electrophoresis of PCR-amplified omp2 gene fragments from isolated *Brucella* strains. The Fig. shows a single band, a 282-bp DNA fragment. Lanes 1: M, molecular size ladder (in base pairs); 2, negative control; 3 and 4, *B. melitensis* strain 16M; 5,6,7 and 8, *B. melitensis* biovar 3

standard 16M strain and two isolates from seropositive goats identified as *B. melitensis* 16M strain produce three bands, an intact 282-bp fragment from the amplified *omp2a* gene that lacks *Pst* I site and two smaller fragments of 238 and 44 bp, the product obtained from digestion of *omp2b* amplified fragment. In contrast *B. melitensis* biovar 3 produced only two smaller fragments from both genes; (*omp2a* and *omp2b*), a 238-bp fragment and a 44-bp fragment.

The two isolates identified as *B. melitensis* 16M strain and 03 isolates were identified as *Brucella melitensis* biovar 3. The profiles of the digested PCR products DNA were analyzed by polyacrylamide gel electrophoresis, as shown in Fig (2). The purpose of this analysis was to visualize the smaller fragment that was not shown by agarose gel electrophoresis. In Fig (2), besides the 282- and 238-bp DNA bands, all samples produced an additional identical smaller fragment, which was calculated to be 44-bp. It was calculated that the two small bands (44 and 238 bp) together were the same size as the uncut DNA

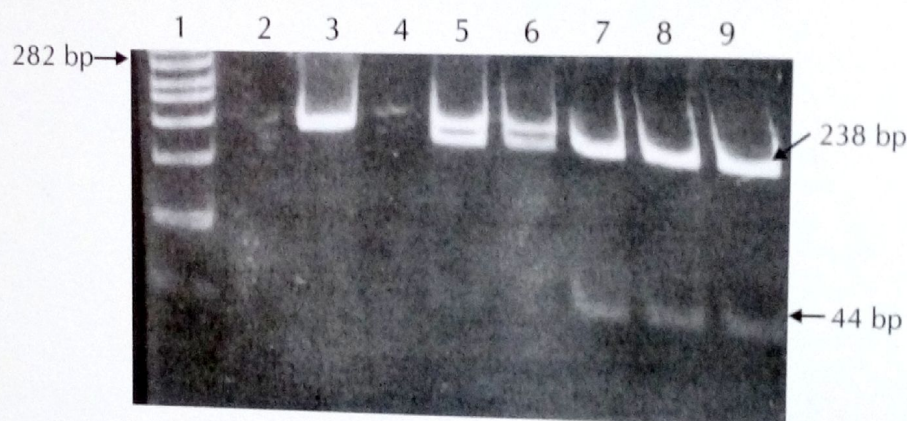


Fig. 2: Polyacrylamide gel electrophoresis of *Pst* I digests of amplified *omp2* gene fragments from isolated *Brucella* strains. Lanes 1: M, molecular size ladder (in base pairs); 2: negative control, 3: *Brucella melitensis* biovar 3 *omp2* gene uncut, 5 and 6: *Pst* I cut *B. melitensis* 16M DNA fragments with sizes 282, 238 and 44 bp respectively, 7, 8 and 9: *B. melitensis* biovar 3 *omp2* gene *Pst* I cut and uncut DNA fragments with sizes 238 and 44 bp

A total of 16 suspected *Brucella* isolates were isolated and on morphological, biochemical and molecular characterization it was found that the two isolates identified as *B. melitensis* 16M strain and 03 isolates were identified as *Brucella melitensis* biovar 3. Sixth one was the variant of *Brucella* spp.

Table 2: Species and biovar differentiation of the species of the genus *Brucella* isolated from goats.

Suspected <i>Brucella</i> isolates	Source	Growth characteristics					Monospecific sera				Phage typing						Inter-pretation
		Urea	H ₂ S	CO ₂	BF	TH	A	M	R	Ac	Tb	Wb	BK ₂	Fi	Iz	R/C	
P1	Foetal membrane	++	-	-	+	+	-	+			NL	NL	CL	NL	PL	NL	<i>Brucella melitensis</i> 16M
P2	Stomach content	++	-	-	+	+	-	+			NL	NL	CL	NL	PL	NL	<i>Brucella melitensis</i> 16M
P3	Stomach content	++	-	-	+	+	+	+			NL	NL	CL	NL	PL	NL	<i>Brucella melitensis</i> biovar 3
P4	Stomach content	++	-	-	+	+	+	+			NL	NL	CL	NL	PL	NL	<i>Brucella melitensis</i> biovar 3
P5	Vaginal Swab	++	-	-	+	+	+	+			NL	NL	CL	NL	PL	NL	<i>Brucella melitensis</i> biovar 3
P6	Vaginal Swab	++	-	-	+	+	-	-			NL	NL	CL	NL	PL	NL	<i>Brucella</i> variant

BF = Basic fuchsin at 20µl/ml (1/50,000 w/v); TH = Thionin at 20µl/ml (1/50,000 w/v);
Ac = 0.1% acriflavin; CL = Confluent Lysis; PL = Partial lysis; NL = No lysis
Plq = Plaques; NL Some lytic activity observed, but not considered true lysis

XI/GH2.4: Development of Specific Diagnostic for Caprine Pleuropneumonia in Goats using Native *M. mycoides* subsp *capri* Isolate.

Rajneesh Rana, V.K. Gupta, P.K. Rout, Ashok Kumar and V.S. Vihan

Preparation of respective medium of choice for the growth of native *M. capri* isolate: Hank's Balanced salt solution (both solid and liquid) medium was prepared for the growth of four native *M. mycoides* subsp *capri* isolates including standard strain. All the isolates are regularly being maintained under Health Division. The ingredients of Hank's I, II and III were mixed and pH was adjusted to 7.6-7.8. Later, medium was filtered and stored under refrigeration till further use.

Bulk cultivation of the organism and its sonication: All the 4 isolates were cultivated in solid and liquid H.B.S.S. medium. Approximately 1-liter growth of 3 native *M. capri* isolate and 2 liter growth of isolated standard strain was obtained and harvested. The harvested organism was sonicated @ 14-20 μ H_z for 10 minutes with an alternate gap.

Rising of hyper immune serum against standard native *M. capri* isolate: The standard native *M. capri* antigen was sonicated. Its protein concentration was estimated and standardized with UV spectrophotometer. Later the standardized antigen having protein concentration @ 2 mg/dose after proper mixing with CFA was inoculated sub-cutaneously at neck region in 2 different goats. A booster of same dose via same route was given separately to these animals at 21st day. The standard protocol of Krogsgaard-Jensen (1971) with some minor modifications was followed. Later the animals were test bled and the high titer serum (tested with IHA and Latex agglutination tests) was collected, filtered and kept at 20 °C till further use.

Preparation of protein samples for standardization of SDS-Polyacrylamide gel electrophoresis: The proteins of *Mycoplasma mycoides* subsp *capri* native isolates including standard native was prepared using 2 different protocols (Archer 1979 and Solsona et al. 1996) with minor modifications. The growth of 72 hrs cultures was harvested @10,000 rpm at 4°C for 20 minutes. Later the pellet was washed thrice with PBS and resuspended in 100 μ l of PBS containing Triton X-100 and was further incubated at 20°C for 15 minutes. The volume was further centrifuged at 10,000 rpm for 10 min. under refrigeration and supernatant was harvested (Archer 1979). The second sample of antigen was reconstituted and washed in 200 μ l TBS (0.125 M pH 6.8) and boiled in water for 5 min. The sample was centrifuged at 10,000 rpm and supernatant was collected (Solsona et al. 1996). The protein of both the samples was estimated by BCA method. The 20 μ l of protein sample of later one was mixed with equal volume of sample buffer (Distilled water, Tris-HCL 0.5 M pH 6.8, Glycerol, SDS, Brilliant blue and 2-Mercaptoethanol). The mixture was boiled for 5 minutes and high speed centrifuged. Now the supernatant was collected for loading in PAGE.

Electrophoresis by SDS-PAGE: SDS-PAGE of whole cell proteins of all the four mycoplasma strains were carried out as per the method of Laemmli (1970) adopted by Anthony et al. (1997) with slight modifications. The gel of 0.75 mm (12%) was prepared for a foresaid purpose (Bio-Rad mini gel apparatus).

Preparation of Stacking and resolving gels: A 12% separating gel was prepared by mixing the reagents and poured immediately in the casting assembly to fill the space of sandwich. Gel was overlaid by thin layer of isopropanol without disturbance. Later it was allowed to polymerize at room temperature for 30 minutes approximately. Further the layer of isopropanol

was washed-off. A 5% stacking gel was further prepared and poured immediately on the separating gel by leaving 5mm space from the top of the spacer plate. Further a Teflon comb was inserted into the layer of stacking gel solution and additional stacking gel was added to fill the spaces in the comb completely. The gel was allowed to polymerize at room temperature.

Sample loading for electrophoresis, staining and destaining and estimation of molecular weights:

The gel sandwich was removed from the casting apparatus and fit into running tank assembly. The tank was filled with tank buffer (Glycine, Tris base, SDS and distilled water) further the combs were removed. Now the sets of prepared proteins were loaded by mixing with bromophenol blue dye in different wells along with protein molecular weight marker (205 kDa-3 kDa) and electrophoresis was carried out at constant voltage of 60V. The gel was stained in staining solution for two hours and then destained with destaining solution with several changes until background disappear. Molecular weight of protein bands was estimated using computerized gel-documentation system. The protein bands resolved in all the samples of *M. capri* were ranged from 151 kDa to 2.4 kDa (Fig. 1 and 2).

Immunostaining: Blocking, binding of primary antibody and conjugate Probing

After completion of protein transfer on NCP, the membrane was kept in blocking solution (Tris-HCl, NaCl, 5% skim milk, 1% BSA) for 2 hours at room temperature. After blocking the NCP was washed twice for 5 minutes with wash buffer-I (Tris-HCl, NaCl, pH-7.4; 0.1% Tween-20). Further the membrane was placed in a solution of serum diluent (Tris-HCl, NaCl, pH-7.4; 0.1% skim milk) with primary antibodies and incubated for hours at 37°C in shaking water bath. Further the NCP was washed thrice with wash buffer-I for 5 minutes. Later the membrane was transferred in a conjugate diluent (Tris-HCl, NaCl, pH-7.4; 0.1% skim milk) containing anti-goat-rabbit HRPO conjugate and incubated for 60 minutes at 37°C. After incubation NCP

was washed thrice for 5 minutes each with wash buffer-II (Tris HCl, pH-7.6).

Visualization with Luminescent Substrate: The Genie made DAB kit was used to develop the NCP. The immuno-reactive protein bands were found to be in higher range of 90 kDa to 250 kDa. Moreover 2 promising immuno-reactive bands were observed at 20 kDa and 30 kDa. (Fig. 3) which needs further study.

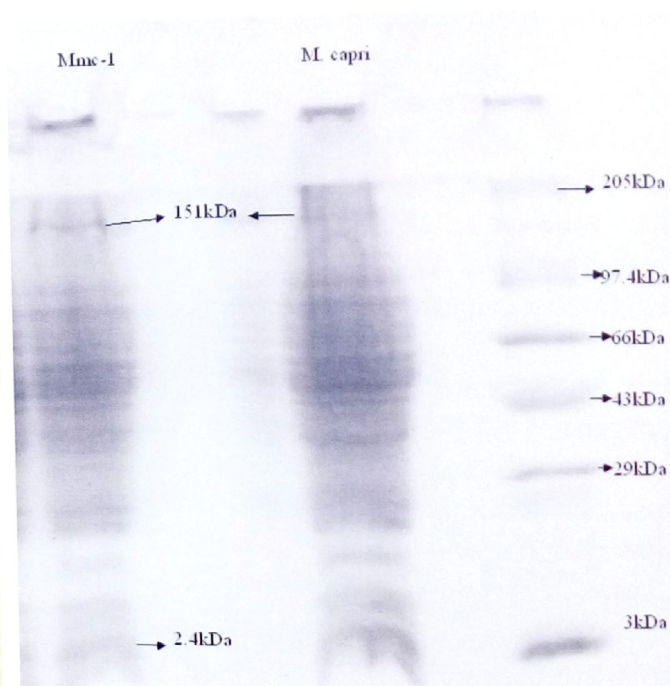


Fig 1: SDS PAGE of *M. mycoides* subsp *capri* (native isolates) exhibiting protein bands from 151 kDa to 2.4 kDa

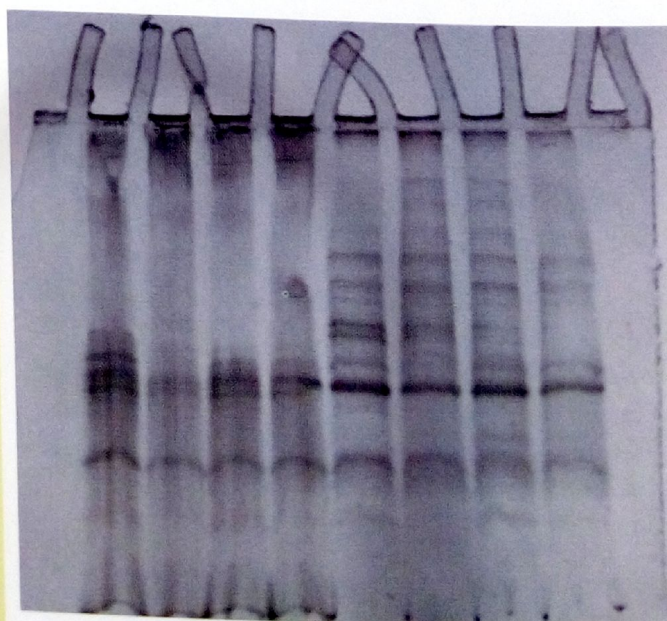


Fig 2: SDS PAGE of 4 native *M. mycoides* subsp *capri* isolate with 2 different protocols

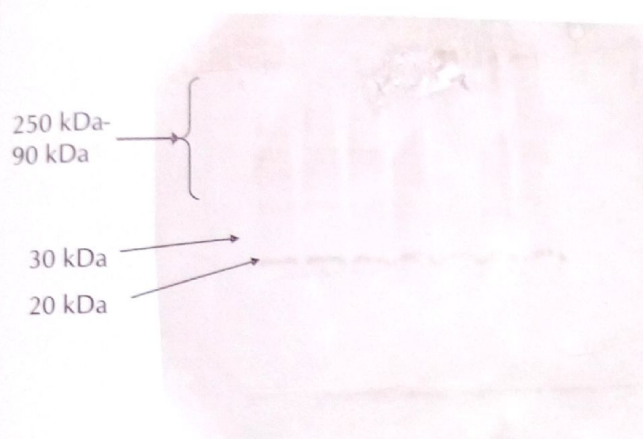


Fig. 3: Western blot analysis of native *M. mycoides* subsp *capri* isolate exhibiting various immunoreactive bands in lower and higher protein range

XI/GH-2.5: Field trials of indigenous vaccine against Johne's disease in goats and sheep farms located in different agro-climatic regions of the country

S.V. Singh

Following trials of the first 'Indigenous Inactivated Johne's Disease Vaccine' (IIJJDV) were conducted in goats and sheep, after the success of 'in-house trials'. Presently extended field trials are underway.

I. Vaccination of new flocks

- A. Semi-arid zone: Sirohi, Barbari, Jamunapari, Jakhrana and local goat flocks at CIRG, Makhdoom and Jamunapari goat flock at Etawah.
- B. Arid Zone: WRC, CSWRI, Bikaner, Rajasthan
- C. Temperate zones: SRC, CSWRI, Mannavanur, TN

II. Monitoring of vaccinated flocks

A. Semi-arid zone (CIRG, Makhdoom): Jamunapari and Barbari (south west UP), Sirohi and Marwari (Rajasthan) and Non-descript (local) goatherds of CIRG, were endemic for JD. After the success of 'In-house' trials (1 classical trial with double challenge proved 'prophylactic efficacy' and 2 trials on advance

clinical cases of JD proved 'Therapeutic effects' of this 'Indigenous inactivated vaccine' using 'native strain of MAP, 'Indian Bison Type' - S 5 strain), the policy of JD control through vaccination was extended to breeding farms.

i. Prevalence of JD in Barbari and Sirohi goats of farmer's flock:

Fecal and serum samples of 66 goats were screened by ELISA and two types of sero-reactors were identified.

- a. Type I sero-reactors: Goats in strong positive category of S/P ratio were considered positive.
- b. Type II sero-reactors: goats in positive and strong positive categories were taken as positive.

By microscopic examination prevalence of map was 31.8% in farmer's goats of 2 breeds (40.5 and 20.6% in Sirohi and Barbari). By ELISA sero-prevalence of map was 19.6% in 2 breeds (Sirohi- 29.7% and Barbari- 6.8%), in type 1 reactors. In type ii reactors, sero-prevalence was 75.8% (Sirohi - 83.8% and Barbari 65.5%). Goats in strong positive, positive, weak positive and suspected categories were shedding map, but correlation was high with strong positive and positives categories. Indigenous ELISA kit had substantial to nearly perfect proportional agreement with microscopic examination.

Post vaccination performance of goats: Average body weights of different goat breeds recorded steady improvement in 10 months post-vaccination. Of the 5 breeds, average gain in body weights at the end of 10 months period were similar in Barbari, Jamunapari and Sirohi goats followed by non-descript and Marwari (Fig. 1). Male goats as compared to females showed higher response to vaccination. Of the 150 goats monitored up to 10 months, 9.3% lost in body weights and rest 90.7% showed increase in body weights.

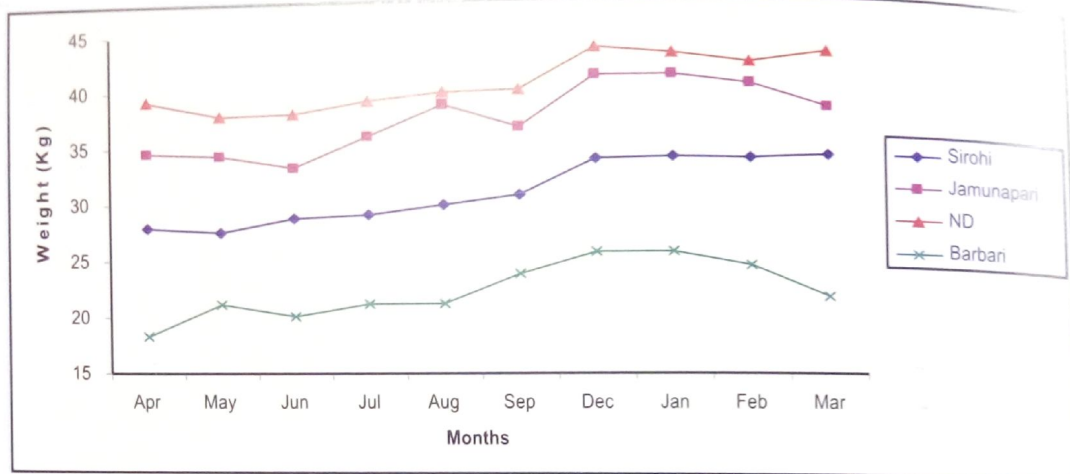


Fig. 1: Average body weights of goats at CIRG at monthly intervals post-vaccination

Monitoring of the humoral immune response of vaccinated goats: Humoral immune response was monitored by 'Indigenous ELISA kit'. Peak titers were achieved 3 months post vaccination and in next six months, titers showed gradual decline, however at the end of 9 months, titers remained higher than the initial titers. Male goats exhibited better immune response to vaccine as compared to female goats.

Morbidity and mortality rates: Morbidity due to diarrhea (suspected JD) reduced consistently in the post vaccination period.

ii. Jakhrana goat flock: Prevalence of JD: Screening of 30% goats for JD on vaccination day by ELISA and microscopic examination (shedding status), 45.2 (Type II reactors) and 38.0% goats were positive, respectively. Physically 35% of the sampled goats were clinical cases of JD (weak, skin hard, rough and ruffled).

Vaccination trial: Goats after vaccination showed immediate gain in body condition, body coat luster and apparent improvements in physical conditions. As compared to females, males showed significantly higher response to vaccine. Average body weights of females were doubled at the end of 10 months from the pre-

vaccination average body weights. There was 30.0% increase in milk production. Frequent diarrhoeal episodes in the flock recorded sharp decline. There was positive gain in all production parameters. Of the 167 goats vaccinated, 28.0% goats lost in body weights, whereas 72.0% goats recorded increase in body weights. Male Jakhrana goats showed significantly higher increase in body weights both in weight and number of high responders. However number (36.1%) of females lost weight since Jakhrana goats are high milk yielder (Fig. 2). After vaccination, antibody titer against MAP increased slowly and peaked at 3 months post vaccination and afterward showed decreasing trend for next 6 months. However at the end of 9 months titers remained above initial titers.





Fig. 2: Average body weights of Jakhrana goats at monthly intervals after vaccination

Morbidity and mortality rates: Morbidity due to diarrhea and weakness were reduced after vaccination as compared to before vaccination in adults and young age groups (Fig. 3). In comparison to un-vaccinated goats, mortality rates in the vaccinated goats, were significantly reduced and showed downward trend.

Improvements in Production traits: Vaccinated animals showed improvement in body coat shining and luster. Female goats recorded increase in twining rate, milk production birth weight, growth rate and overall improvement in 'flock health' and 'productivity'.

Improvement in Milk yield: Average milk yield/ week/ goat in the 4th month after kidding in vaccinated goats recorded increase of 3.7 liters.

This increase was significantly higher in vaccinated goats lactating between May to October, 2007 as compared to January to April, 2007.

B. Arid zone (WRC, Bikaner, Rajasthan):

Marwari was reported to be resistance to JD as compared to Magra. of 94 serum samples of Magra sheep, 42 were positive in 'ELISA kit' (Type II category). Body weight gain ranged from 0.2 to 4.6 kg and 0.4 to 5.6 kg in vaccinated males and females, respectively. Rate of shedding of MAP was also reduced. Of the 10 control sheep, 9 also showed improvements in body weights (0.6 to 5.8 kg). Vaccinated sheep showed peak titer at 3 months post vaccination and in next 6 months there was gradual drop in vaccination titer but was above the initial titer.

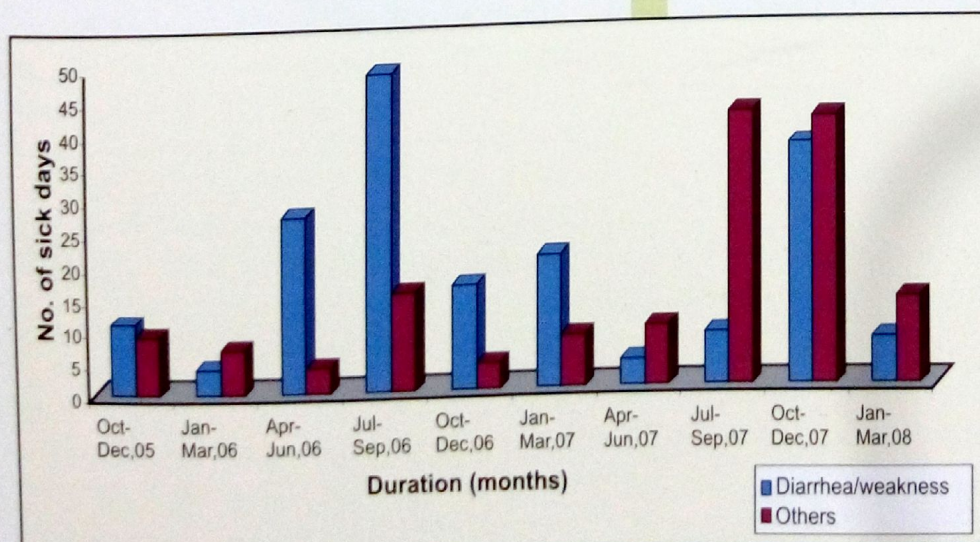


Fig. 3: Morbidity rates before and after Johne's disease vaccination

III. Temperate zone (SRC, Mannavanur, TN)

Sheep flocks (Bharat Merino and Avikalin):

Prevalence of JD was observed in the flock with 50.8% sheep shedding MAP.

Vaccination of sheep flock: A total of 145 sheep were vaccinated. The animals showed very good response with marked reduction in cases of diarrhea and there was no mortality due to JD.

Jamunapari goat flock at CIRG, Makhdoom:

Profiles of Jamunapari herd vaccinated for JD (Indigenous vaccine) was 526 (male: 161, female: 365) in different age groups on the day of vaccination.

Growth rates and body weights: Vaccinated goats (> 3 months) showed marked improvements in health and body weights. Improvement was significant in body weights of goats in different age groups.

Culling rate: Of the 34 stunted kids listed for culling were vaccinated. Of these, 24 recovered to normal health within 5 months of vaccination. Kids examined for MAP by microscopic examination were negative.

Mortality rates: Mortality rates due to JD and weakness in 2006 (Pre vaccinated) were 28.6% indicating high MAP infection in herd. After vaccination Oct-Dec, 2006 there was no mortality due to JD. Over all mortality was also reduced significantly.

Humoral response in goats: Humoral response was measured by ELISA for 1 year post vaccination. Sero-conversion rate was higher during each of next interval up to 5 mpv and after that titer was maintained by vaccinated goats.

Shedding of MAP: From initial shedding rate of > 32.0%, shedding rate in different times at the end of 1 year of vaccination was 5.8% (average) in random screening of Jamunapari goats at 15 days intervals.

A. Prevalence of MAP (CIRG goat farms):

Samples from 399 goats suspected for JD submitted time to time were screened by microscopic examination. Of 399 fecal samples screened, prevalence of JD was 27.0%. The prevalence of MAP was high (37.1-53.3%) in un-vaccinated goats. Prevalence was low (12.8 to 24.3%) in vaccinated herds.

Prevalence of MAP (Other sheep and goat farms): In Jamunapari farm (Etawah, UP), prevalence of MAP was 26.2 to 51.1%. JD prevalence in sheep located in temperate (Bharat Merino and Avikalin) and arid zones (Magra and Marwari), was 27.8 and 52.6%, respectively.

B. Screening of young kids for Johne's disease:

Serum and fecal samples of 30 newly purchased young kids (2-3 months) from local markets (Farah) were screened for MAP. Prevalence of MAP in young kids was 60.0 and 30.0% by ELISA and microscopic examination, respectively. Vaccinated kids showed increase in humoral immune response 2 months after vaccination as compared with control kids.

Molecular Epidemiology of *Mycobacterium avium* subspecies *paratuberculosis* in Northern India:

Study was conducted to know molecular diversity of Indian *Mycobacterium avium* subspecies *paratuberculosis* isolates recovered from animals, commercial milk and human beings in different regions of North India. Genotyping of MAP isolates was done by, IS1311 PCR-REA. 'Bison type' was predominant genotype (83.7%) recovered from North India followed by 'Cattle type' (16.2%). 'Bison type' genotype was recovered exclusively from goats, sheep, buffaloes and blue bulls surveyed in the vicinity of CIRG, Makhdoom. From cattle, human beings and bovine milk samples both 'Bison type' and 'Cattle type' genotypes were recovered. 'Bison type' was major genotype recovered from herds located in CIRG (Makhdoom). 'Cattle type' was major genotype from New Delhi and Agra cities. 'Sheep type' genotype of MAP was not recovered in surveyed regions of North India.

Standardization of amplification of MHC-II DRB gene in goats: There is considerable evidence that resistance / susceptibility to infectious disease in animals has a genetic basis and that additive genetic variation exists among animals in their response to various infectious challenges. This study is now started in Jamunapari breed of goats and before associating this genotype with disease resistance / susceptibility, conditions for nested PCR (using nested primers as described by Amills *et al.*, 1995) and further restriction digestion has been standardized.

- i. DNA isolation: DNA was isolated from blood using Bangalore Genei (DNA isolation from blood) kit.
- ii. Polymerase chain reaction (PCR):

Primers: The amplification of the second exon of the caprine DRB gene was achieved using primers DRB 1.1: TAT CCC GTC TCT GCA GCA CAT TTC and DRB 1.2: TCG CCG CTG CAC ACT GAA ACT CTC. Red dye PCR master mix (Bangalore Genei) kit was used for amplification. A 50 μ l of PCR cocktail consist of 1.0 μ M of both forward and reverse primers, 40 μ l of red dye PCR master mix and 100 ng of template DNA.

PCR reaction mixture and cycling conditions: After initial denaturation at 94°C for 3 min. the PCR reaction was cycled for 1 min at 94°C, 2 min at 60°C and 1 min. at 72°C for 30 cycles.

Restriction polymorphism: Initially only one PCR product was tested for digestion with two restriction enzymes namely *Pst* I and *Taq* I (Fast Digestive RE, Fermentas, USA) according to manufacturer instruction. Amills *et al.*, 1995 have reported presence of polymorphic *Taq* I restriction site at 122 bp (two possible restriction pattern 'T'- 122 bp and 163 bp, or 't'- 285 bp) and polymorphic *Pst* I restriction site at position 244 bp (two possible restriction pattern 'P'- 226 bp, 44 bp and 15 bp, or 'p'- 270 bp and 15 bp) of the amplified product. *Taq* I REA resulted in single bands of 285 bp (absence of polymorphic site at 122 bp) and showed t restriction pattern. *Pst* I REA resulted in bands of 226 bp, 44 bp and 15 bp (P restriction pattern) (Fig. 4).



Fig. 4.1

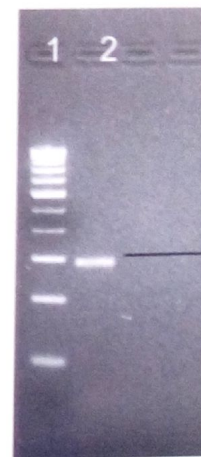


Fig. 4.2

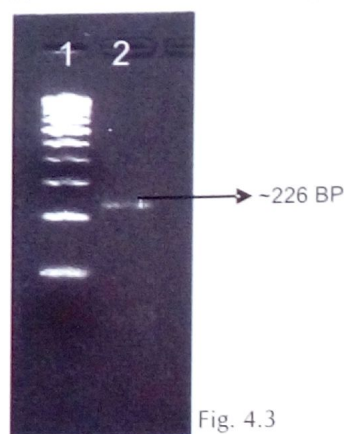


Fig. 4.3

Fig. 4: (4.1) Lane 1- 100 bp DNA ladder; Lane 2-3, PCR products of expected size (~285 bp). (4.2) Lane 1- 100 bp DNA ladder; Lane 2, *Taq* I digested PCR product of ~285 bp). (4.3) Lane 1- 100 bp DNA ladder; Lane 2, *Pst* I digested PCR products of ~226 bp.

Identification and characterization Cell Wall Deficient (CWD) forms of MAP: Recently large number of Cell Wall Deficient (CWD) colonies were observed on the surface of dried medium of HEYM with mycobactin J on prolonged incubation (> 6 months after regular MAP colonies seen in culture) of negative culture tubes (for typical MAP) colonies. CWD colonies were like tiny dew droplets (1-3 mm) or large droplets (> 4 mm). On over incubation (> 120 days), 50.7 and 38.3% colonies of CWD were seen on earlier negative (for typical MAP colonies) HEYM with mycobactin J dried slants. Usually CWD colonies appeared alone late and on further incubation some of these colonies developed opaque 'typical MAP colonies'. Some times CWD colonies appeared along with typical MAP colonies on the same slants.

Typical CWD colonies were acid fast negative and of irregular shape. However, the DNA from these CWD colonies was isolated by freeze and thaw method and resultant DNA was characterized using IS900 PCR. On further sub-genotyping of these CWD colonies by IS1311 PCR-REA, these colonies were identified as 'Bison type'. Similar CWD colonies were observed in culture of tissues (mesenteric lymph nodes and intestine) from goats (50.1%) and sheep (41.0%). The 37.9% CWD colonies were observed in addition to 26.3% typical MAP colonies cultured from commercial pasteurized milk samples. In a typical outbreak of Johne's disease, where all the animals (young and adults) were infected with MAP. However on screening of 35.% goats by fecal culture only 77.1% goats were found positive for typical MAP colonies. However, in further incubation of MAP negative HEYM slants, CWD colonies were observed on large number of these slants and collectively with typical MAP gave prevalence of 91.4%, which gave realistic picture of the outbreak of JD and number of clinical cases of JD.

EXTENSION EDUCATION AND SOCIO-ECONOMICS SECTION

EESE 8.14: Multi-Disciplinary Project on Transfer of Technology for Sustainable Goat Production System

Project coordinator: N.P. Singh

Transfer of technology programme was undertaken in the four villages namely Pohpa Burj, Pauri Shahjadpur, Jalal and Barka Nagla adopted under this project. A team of subject matter specialists visited the adopted villages every week.

1. Extension Education Component:

R.L. Sagar, Braj Mohan and Khushyal Singh

Visits and advisory services

In all 170 visits were made by the extension scientists and the technical staff to the four adopted villages and made individual contact with about 500 goat farmers/ farm women at

their home. They were educated and motivated about the scientific/ commercial goat rearing and convinced them to take the services from the Barbari Breeding bucks which were distributed in the adopted villages under TOT programme for the purpose of breed improvement.

Extension activities

- i. Organized a *Field day* cum Scientist-Farmers interaction in the adopted village Jalal on 21 July 2007. About 150 goat farmers/ farmwomen from Jalal participated in the Scientist-Farmers Interaction.
- ii. A *health camp* was also organized at Jalal village on 21.07.2007. In all 182 goats were examined by Veterinary Officers, among them 132 were vaccinated against FMD and 50 were treated for various ailments.
- iii. Coordinated an *on-campus training* programme for the goat farmers/ farmwomen of Barka Nagla village on 18.01.2008, wherein 9 goat farmers and 13 farmwomen participated.
- iv. Organized four *one-day off-campus trainings* on goat reproduction, nutrition, breeding and goat health in the adopted villages, wherein 61 goat keepers participated.
- v. Organized 8 *group discussions* on improved goat husbandry practices two each in every adopted village. About 100 goat farmers got benefited from the group discussion.
- vi. Helped in conducting vaccination, deworming and treatment of goats and



arranging demonstration on preparation of goat milk paneer in the adopted villages.

Following leaflets were prepared and distributed to the farmers/farm women in the adopted villages:

- i. Unnat Bakri Palan se Sambandhit September ke Mah Mein Dhyani Rakhne Yogya Mukhya Jankariyan
- ii. Vaigyanik va Unnat Tarika se Bakri Palan ke Liye October ke Mah Mein Mukhya Sujhav November mah mein kya Karen?

Visits to villages of Baldeo and Goverdhan Blocks of Mathura

A team of the scientists/collaborators of the TOT programme visited the 6 villages of in Baldeo Block and 5 villages of Goverdhan Block of Mathura District to collect information on goats in connection of establishing a TOT Centre of the Institute. The villages in Baldeo and number of goats therein were as follows: Chholi Meerpur (700 goats), Khapparpur (200 goats), Noorpur (700 goats), Nabipur (200 goats), Nagla Khutia (300 goats) and Hyatpur (1500 goats).



Benchmark survey of adopted villages conducted in 2006-07

During the year 2007-08 the data were compiled on different aspects of goat production of goat farmers in all four adopted villages i.e. Pauri Shahjadpur, Pohpa Burj, Jalal and Barka Nagla. Some of the important findings of benchmark survey on the project are presented here.

Utilization of mass media (agriculture and animal husbandry practices)

The goat farmers of all the four adopted villages were not regularly receiving the information on improved agricultural technology, animal husbandry practices and goat production technology through mass media. The major mass media sources were exhibitions/ kisan melas (67.94%), television (41.22%), newspapers (26.72%) and radio (25.95%). Farm publications, educational films, and poster were used quite low by the goat farmers because they were not easily approachable to them.

Utilization of personal cosmopolite sources of information

The major personal cosmopolite sources of information of the goat farmers were neighbours (87.79%) followed by farmers of other villages (64.89%), scientists from CIRG, Makhdoom (36.64%) and Village Development Officer (9.92%). Specialists from Department of Animal Husbandry, Block Development Officer were used quite low by the goat farmers because they were not easily available to them. Extension Officer and Bank Personnel were not used at all by the goat farmers for getting the information about agriculture as well as animal husbandry practices and goat production technology.

Credit position of goat farmers loaning agencies in the adopted villages

The goat farmers of the adopted villages have been utilizing credit facilities provided by the private money lenders and nationalized banks. The goat farmers received total loan of Rs. 1,54,000 from banks and private money lenders, of which Rs 40,000 has already been paid back with Rs. 1,14,000 outstanding. Most of the amount (Rs. 1,24,000) was taken by the marginal goat farmers and Rs. 30,000 by the landless goat farmers for the development of goat and animal husbandry. It has been observed that loan amount taken by the landless goat farmers had not been returned at all whereas 22.62% and 52.50% loans were repaid to the banks and private money lenders respectively by the marginal farmers. The small

farmers did not take any loan. Five goat farmers took loan from private money lenders and 04 from nationalized banks. Nationalized banks advanced loan worth Rs. 84,000 (54.55%) and Private Money Lenders worth Rs. 70,000 (45.45%).

Disease status

In all 125 animals of different age group were affected from various diseases. Maximum 54 animals of 0-3 month followed by 43 animals above 9 months and 28 of 3-9 months were affected from various diseases in all adopted villages. In case of diseases, 45 animals were affected from diarrhoea followed by 23 from FMD, 21 from pneumonia, 17 from ectoparasite, 8 endoparasite and 4 from abortion. A few animals were affected with mastitis and mange. In all 41 animals were died from various diseases. In these 41 animals, 16 were died from pneumonia followed by 13 from diarrhoea, 6 from abortion, 4 from FMD and 2 from ecto parasitic load. Maximum (22 animals) died at the age of 0-3 months, followed by 10 above 9 months and 9 at the age of 3-9 months.

Adoption of technologies

The goat farmers were not aware of vaccination against infectious diseases in goats. As a result the adoption of vaccination in goats was nil. The adoption of artificial insemination in goats was nil due to lack of awareness, motivation and non-availability of AI facility in the adopted villages

Production status of milch goats in the adopted villages

The age at puberty, age at first kidding, lactation period, kidding interval, number of services per conception, litter size and average milk yield in one lactation had been observed 9.77 months, 14.90 months, 3.16 months, 6.98 months, 1.44 number, 1.98 and 103.57 kg milk respectively in case of Barbari goats. In case of non-descript goats these values were 11.76 months, 17.15 months, 3.12 months, 6.99 months, 1.83, 1.51 and 138.25 kg (one lactation), respectively.

Marketing of goats

Most of the goat farmers (93.34%) sold their animals by guess/estimate. Rest of the goat farmers sold their animals 4.00 % and 2.66% by weight and age, respectively. The majority of the goat farmers marketed their animals directly to the butcher (48%) and middlemen (48%) and rest to other goat farmers (4%). Almost all the goat farmers sold their animals inside the village in all adopted villages. Not a single animal was sold outside the village. In all 155 goats of which 34, 57, 38 and 26 were sold in Pohpa Burj, Pauri Shahjadpur, Jalal and Barka Nagla respectively. An amount of Rs. 2,29,650 was obtained by selling of 155 goats. On an average a goat was sold about Rs. 1482. In Pauri Shahjadpur the goat were sold on higher price @ Rs. 1646 per goat while the goat farmers of Barka Nagla sold their goat on lower price @ Rs. 1181 in comparison to other villages.



2. Socio-Economics and Marketing Component

Shalander Kumar

A total of 44 visits were made to the adopted villages during this year. The major objective was to motivate farmers to adopt improved technologies and appropriate marketing strategies. Hence understanding existing production and marketing system and capacity building and training of farmers was the focus of this component. In that order participated and contributed in 19 scientists-farmers group discussion and interaction meetings and made 308 individual contacts with the goat farmers to motivate them to integrate scientific goat rearing

in the existing farming system and adopt innovative and efficient marketing strategies to sale their surplus goats. Accordingly for organizing the resource poor goat keepers, motivated and supported 10 of them to form a self help group (SHG) namely Shri Ganesh Bakri Palan Svyam Sahayata Samuh in the village Bar ka nagla. To promote TOT efforts, coordinated a video shooting of on 15th January 2008 by Delhi Doordarshan being telecasted on its Krishi Darshan programme.

A Krishi Darshan team of Delhi Doodarshan comprising of three persons visited Jalal village on 15.1. 2008. The team covered (Video and Audio) various R and D activities related to goat rearing in the village. Subsequently this video documentary was telecasted on Krishi Darshan Programme of DD1 (6.30 am) on several occasions.

Goat rearing and marketing interventions

Majority of the goat keepers were illiterate (Fig. 1) and resource poor with a small flock size of goats as subsidiary activity. One of the reasons for low income from goat rearing was identified as poor realization of market price by farmers for their surplus live goats. Due to lack of knowledge and certain constraints, farmers were not taking benefit of lucrative prices during Eid festival and for good quality pure breed animals (Table 1 and 2). Scarcity of feed during winter, paucity of housing space during rainy season, urgent cash needs, poor health of animals and low level of awareness were the major factors for poor realization of price and distress sale.

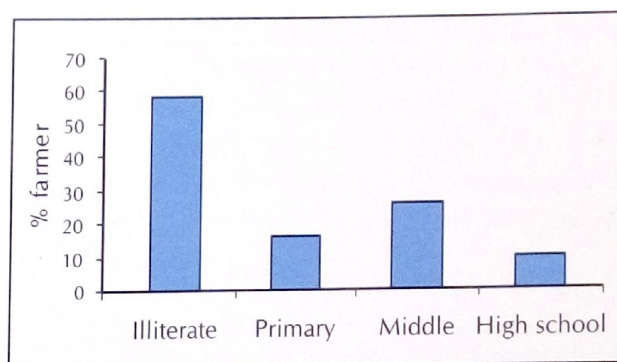


Fig. 1: Educational status of goat farmers

Table 1: Flock Size of goats in adopted villages

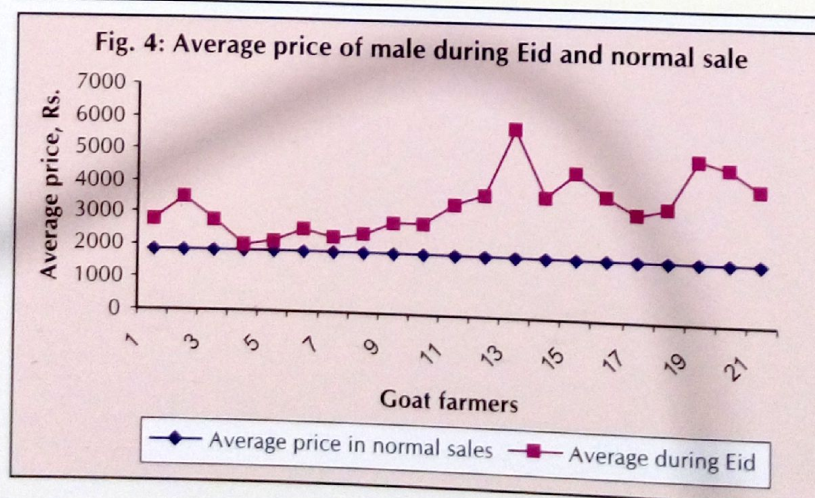
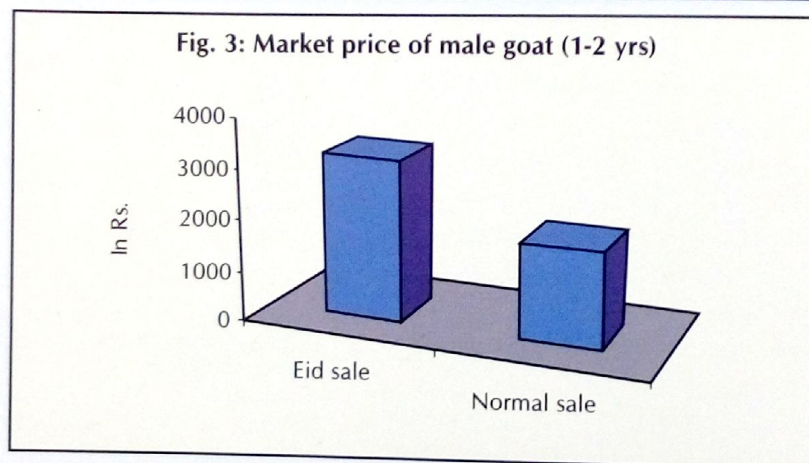
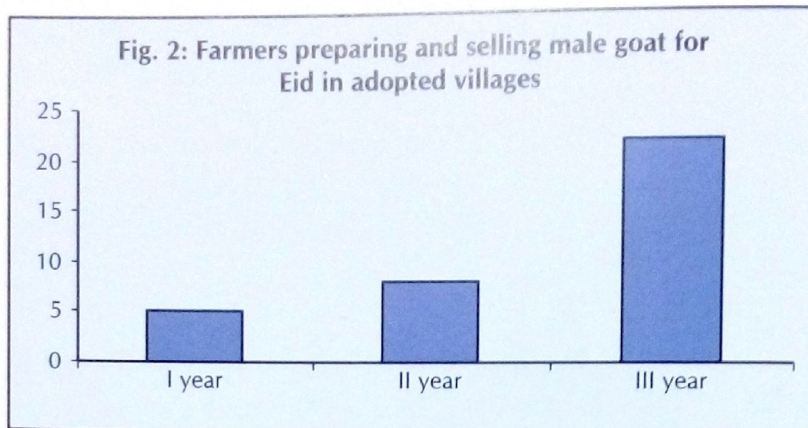
Villages	Adult male	Adult female	Kids	Total flock size
Jalal	0.11	3.89	4.56	8.56
Nagla Bar	0.63	6.25	6.00	12.88
Pohpa Burj	0.00	2.33	2.33	4.66
Pouri -Shahajadpur	0.09	3.46	5.00	8.55
Pooled	0.23	4.16	4.87	9.26

Table 2: Farmers' preference for timing of sale of goats

Preferred timing of sale	Reason	Farmer %
Any time	Need of cash	38.71
Winter	Fodder scarcity/ better price	38.71
Eid	Better price	9.68
Rainy season	Risk of disease	19.35

With our capacity building efforts, the goat farmers could learn about appropriate marketing strategy viz. the type of goats to be sold, place of sale, right time and age of sale and right method of sale of goats. There was a considerable change in the attitude of farmers. A number of farmers started preparing castrated male goats for selling them during the festival of Eid (Fig. 2). The average price realization during Eid for a male of 1-2 years of age was about 70 per cent higher than the price realized during normal sale in the villages (Fig. 3). This year farmers in the adopted villages sold 32 castrated males during Eid (Fig. 4). During the normal sales the goats in the villages fetched a price of Rs. 60- 65 per kg of live body weight, while it fetched Rs. 100- 150 per kg of live body weight

during Eid festival. The farmers were also sensitized and made aware of the fact that the pure breed goats (Barbari in this area) sold to breeders/ rearers also attract much higher price as compared to goats sold for meat.



3. Breeding Component

M.K. Singh

Fifty-four visits were performed in four adopted villages during the period from April 2007 to March, 2008. The goat farmers of these four villages were motivated to adopt breeding technologies/interventions developed by the institute through individual interaction, organizing camps, farmers' day, and demonstrations at their villages. Two elite Barbari buck were provided in addition to already supplied four bucks to cater the need as most of goat farmers preferring to cover

their does with Barbari buck. These bucks used to provide services to 67.5, 70.0, 56.0 and 76.8% goats in Jalal, Bar Ka Nagla, Popa-burj and Pauri-Sahjadpur village, respectively. Effectiveness of TOT programme motivated new persons to set up goat units in the adopted villages and many others in surrounding villages of the institute. The impact (2007-08) of buck distribution (2006) resulted in an increase of Barbari and Barbari type of adult goats from 52.2 to 61.2% in Jalal, from 7.6 to 10% in Bar Ka Nagla, from 22.7 to 29.1% in Popa burj and from 21.6 to 27.5% in Pauri-Sahjadpur. The provided by the institute will be part of gene pool of these adopted villages. The per centage of Barbari/Barbari type kids born out of total kids born were 87.5, 70.0, 69.0 and 78.9%, respectively in the village Jalal, Bar ka Nagla, Popa-Burj and Pauri- Sahjadpur, respectively. The multiple births recorded were 32.5, 53.3, 62.9 and 76.7%, respectively in the village Jalal, Bar ka Nagla, Popa Burj and Pauri- Sahjadpur, respectively. The body weight of kids born during the year was recorded with respect to breed/type, type of birth, sex and buck used. The overall body weight of males in Jalal was 2.76 ± 0.13 , 7.8 ± 0.4 , 13.0 ± 1.04 and 18.2 ± 0.9 kg, and for females were 2.78 ± 0.13 , 8.0 ± 0.3 , 12.8 ± 0.6 and 16.8 ± 0.9 kg, respectively. The corresponding estimates in Bar- Ka- Nagla for males were 2.73 ± 0.07 , 8.21 ± 0.2 , 13.8 ± 0.3 and 19.0 ± 2.09 kg, and for females were 2.5 ± 0.11 , 7.37 ± 0.2 , 12.8 ± 0.4 and 18.3 ± 0.7 kg, respectively. The corresponding estimates in Popa-Burj for males were 2.82 ± 0.05 , 7.92 ± 0.2 , 13.7 ± 0.3 , 22.5 ± 1.7 kg, respectively and for females were 2.56 ± 0.07 , 7.21 ± 0.2 , 12.0 ± 0.4 and 15.7 ± 0.8 kg, respectively. The corresponding estimates in Pauri-Sahjadpur for males were 2.87 ± 0.06 , 9.35 ± 0.4 , 16.2 ± 0.3 , 21.5 ± 1.5 kg and for females were 2.80 ± 0.07 , 8.80 ± 0.3 , 15.3 ± 0.5 , 18.3 ± 1.5 kg, respectively.

Table 1: Breed composition of adult goats and kids

Village (s)	No of Goat Keepers	Year	Breed composition in adult goats (%)			Breed composition in kids (%)		
			Barbari	Barbari type	Non descript	Barbari	Barbari type	Non descript
Jalal	26	2006-07	10.8	41.9	47.2	0.0	92.3	7.7
		2007-08	25.0	43.7	31.5	40.0	47.5	12.5
Bar ka Nagla	26	2006-07	0.0	7.6	92.4	0.0	30.8	69.2
		2007-08	2.7	6.8	90.0	20.0	55.0	25.0
Popa -Burj	29	2006-07	0.0	22.7	72.3	4.5	68.2	27.3
		2007-08	3.6	25.4	70.9	6.8	62.0	31.0
Pauri - Sahjadpur	29	2006-07	4.0	17.6	78.4	12.0	60.3	27.6
		2007-08	5.0	22.5	72.5	10.5	68.4	21.0

Table 2: Status of Service provided by the institute buck in adopted villages

Village	Institute buck (%)	Local buck (Non descript) (%)
Jalal	84.3	15.6
Bar ka Nagla	70.0	30.0
Popa Burj	56.0	46.0
Pauri-Sahjadpur	76.8	23.2

Table 3: Status of Type of birth in adopted villages (%)

Village	Single	Twins	Triplets
Jalal	67.5	32.5	0.0
Bar ka Nagla	47.2	45.0	83.0
Popa Burj	37.0	53.0	90.0
Pauri-Sahjadpur	23.3	66.7	10.0

Table 4: Overall body weight of kids at different ages in adopted village (kg)

Village	Sex	Body Weight	3 month Weight	6 month Weight	9 month Weight
Jalal	M	2.76 ± 0.13 (17)	7.8 ± 0.4 (14)	13.0 ± 1.04 (9)	18.2 ± 0.8 (5)
	F	2.78 ± 0.13 (20)	8.0 ± 0.3 (16)	13.0 ± 0.6 (13)	16.8 ± 0.9 (4)
Bar Ka Nagla	M	2.73 ± 0.07 (34)	8.21 ± 0.2 (20)	13.8 ± 0.2 (23)	19.0 ± 2.4 (3)
	F	2.51 ± 0.11 (27)	7.37 ± 0.2 (22)	12.8 ± 0.4 (13)	18.3 ± 0.7 (11)
Popa Burj	M	2.82 ± 0.05 (42)	7.92 ± 0.2 (37)	13.7 ± 0.2 (27)	22.5 ± 1.1 (2)
	F	2.56 ± 0.07 (31)	7.21 ± 0.15 (30)	12.0 ± 0.4 (17)	15.7 ± 0.8 (10)
Pauri-Sahjadpur	M	2.87 ± 0.06 (21)	9.35 ± 0.4 (21)	16.2 ± 0.3 (11)	21.0 ± 1.5 (4)
	F	2.80 ± 0.07 (28)	8.89 ± 0.34 (22)	15.3 ± 0.2 (16)	18.3 ± 1.5 (4)

M: Male, F: Female

4. Reproduction Component

A.K. Goel

To achieve the goal, regular visits (60) were undertaken in all (4) adopted villages. Existing reproductive practices in terms of breedable age and weight of goats, mating practices and inter kidding period were studied by recording information on prescribed schedule developed for this purpose. Participated in a Field day ScientistsFarmers Interaction and Health Camp in Jalal Village on 21.7.07. Contributed as SMS during Village Seminar and Clinical Camp organized at Pauri Shahjadpur. Developed and distributed a Pictorial hand-out of Reproductive Health Calendar for Goats in operational villages. A total of 124 goats were covered by improved Barbari and village bucks. Pregnancy diagnosis was carried out in 106 goats. Anoestrus and abortions were encountered as major (59.00%) reproductive problems in farmer's goats. Reproduction related parameters of 174 goats kidded during the period were recorded and analyzed. Multiple births occurred to the tune of 51.00%. Kidding rate averaged 1.51.



Reproductive Health Calendar for Goats:

A colored pictorial handout Reproductive Health Calendar (Reproductive Cycle in Goats) was developed and distributed to goat farmers in all the adopted villages.

Services Provided in Terms of Reproductive Technologies

Mating of Goats in Operational Area by Barbari Bucks: Farmers were emphasized to mate oestrous goats at appropriate stage of oestrus (heat) for increased pregnancy rate. A total of 105 goats were covered in different villages by Barbari buck provided by the institute.

Pregnancy Diagnosis in goats: Goats (106) of different villages were diagnosed for their gestational stage by abdominal palpation around 2.5 to 3 months of post-mating. This was done for profitable goat production. In all 106 goats were screened for pregnancy status. Goat owners were taught for care and management of does before, during and after kidding and importance of timely feeding of colostrum.

Diagnosis and Treatment of Reproductive Diseases in Goats: Reproductive health care of affected goats of different adopted villages was undertaken. In total forty one cases of specific reproductive ailments were diagnosed and appropriately treated in all four villages. Caesarean sections were

also performed in four goats to relieve dystocia/facilitate kidding. The incidence of various diseases was of moderate degree (Table 1 and Fig. 1).

Table 1: Occurrence of Reproductive diseases in adopted villages

Disease	No.
1. Anoestrus	17
2. Abortion (3 -4 M)	7
3. Dystocia	5
4. Retention of Placenta	5
5. Parturition failure	3
6. Pre mature/Still birth	2
7. Repeat Breeding	2
Total	41

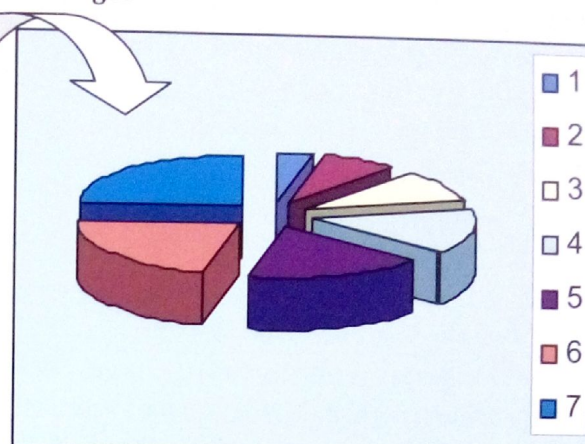


Fig.1: Reproductive diseases in village goats

Reproduction Rate and Multiple births in Village Goats:

Kidding rate is largely determined by ovulation rate but is also modified by fertilization and embryonic and foetal losses. In total 174 kidding occurred in the adopted villages. The incidence of twinning was 48.27%, indicating good prolificacy (Fig. 2). A few goats (2.87) also kidded with triplets. Kidding rate in different villages ranged 1.23 to 1.69 (average: 1.51) as shown in Fig. 3.

Number of kids born per doe per year: 1.51

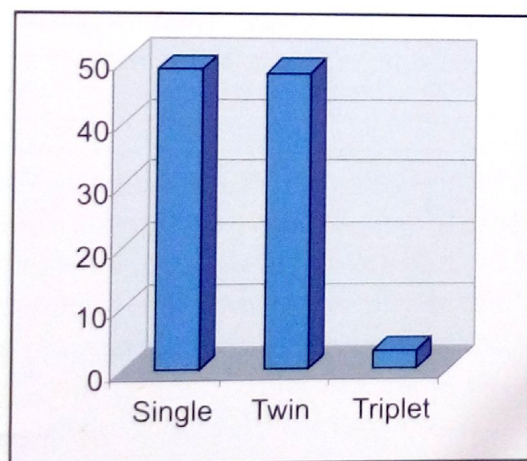


Fig. 2: Kidding Frequency in village goats

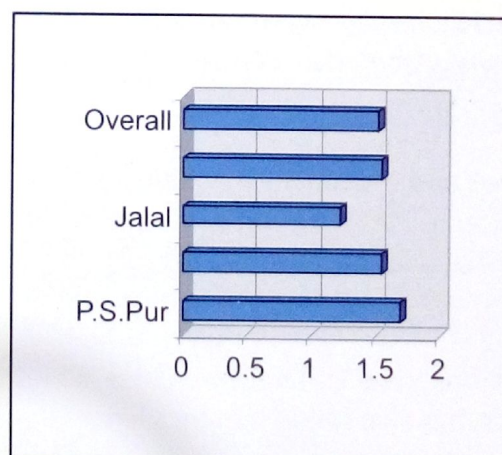


Fig. 3: Kidding rate in village goats

5. Management Component

B. Rai and Dharma Singh

Goats in the villages are being kept under extensive system of management and in zero input. The goats found in this area are Barbari, Barbari type and admixture of other breeds. The flock size is small (5-10) and they are let out for grazing at lease for 4-6 hrs per day. The goats are mainly dependent on grazing and they are offered feed/fodder in a meager quantity in the form of supplementation. Farmers do not provide separate housing for goats. Some of the goat keepers maintain small paddock for their goats (Fig. 1). The goat keepers of two adopted villages provided 20% goat housing, where as in other two villages the goat housing was only 13.33% (Table 1). Sanitation, deworming and vaccination were not commonly practiced by the farmers. With the

intervention of TOT programme, the farmers were sensitised for these inputs. Farmers were also advised on clean milking, watering and appropriate housing for their goats. A total of 25 visits were made in four adopted villages during the period under report. Three large flock owners, two farmers from Bar Ka Nagala and one farmer from Jalal, were selected for demonstration of improved goat houses in the villages. Three model goat houses were erected in the adopted villages with the help of goat keepers by using institute's resources.



Fig.1: Goat housing in the adopted villages

Table 1: Status of Goat Housing in Adopted Villages

Sl. No.	Name of the village	Housing provided (%)	Housing not provided (%)
1.	Pauri Shahjadpur	20.00	80.00
2.	Popa Bhurj	20.00	80.00
3.	Jalal	13.33	86.67
4.	Bar Ka Nagla	13.33	86.67

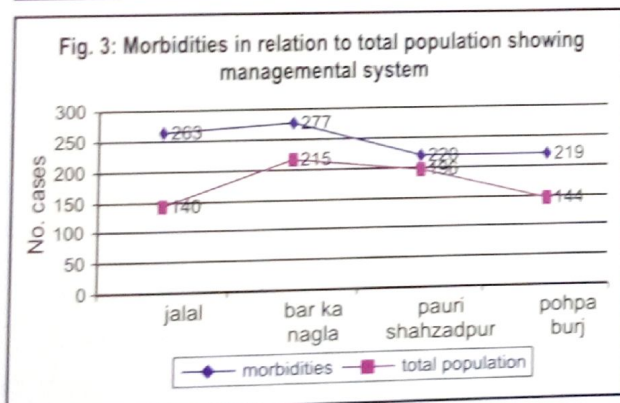
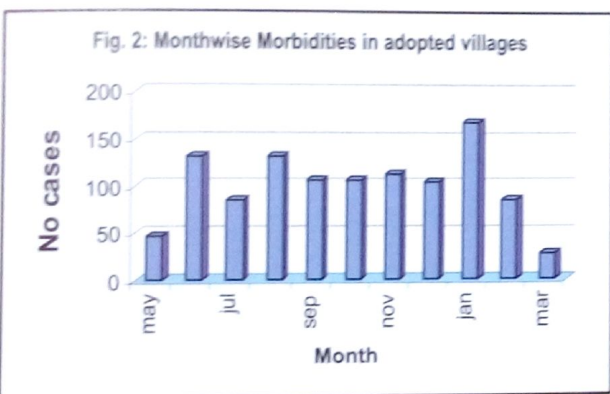
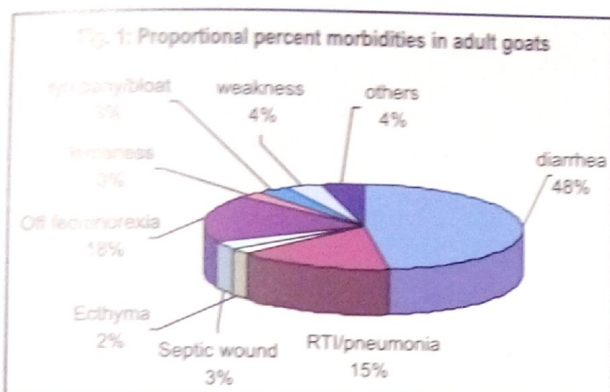
6. Health Component

Ashok Kumar and H.A. Tewari

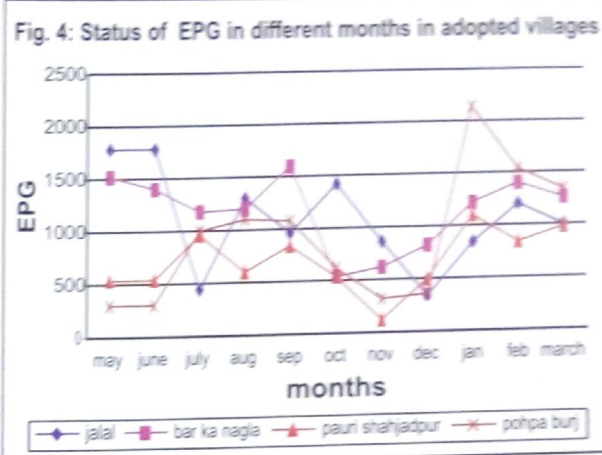
Health technologies were applied to prevent important infectious diseases and parasitic infestation, particularly with timely vaccination, deworming, ectoparasitic injection as well as treatment.

Morbidities and Mortalities: A total 1109 clinical registries were recorded during the Year (May, 2007 to March, 2008) for the treatment of different goat diseases. The proportional morbidities (%) were highest due to diarrhoea (47.5) and followed by RTI/ pneumonia (15.4), off fed/anorexia (17.9), tympany/bloat (3.7), weakness/emaciation (3.68), septic wounds (2.96), lameness (2.55), Ecthyma (2.35), and others (4.41), which includes mastitis, endoparasitic infestations, abortion, skin infections) (Fig 1). Diarrhea (58.5 %) and Pneumonia (36.9%) were major clinical problems also in kids. It is also noted that Incidence of pneumonia was higher in kids than adult goats. Winter season is more prone for both diarrhoea and pneumonia in adult as well kids, followed by rainy season and clinical problem are least in summer season.

The proportional morbidities (%) were 4.3, 11.9, 7.8, 11.9, 9.6, 9.6, 10.2, 9.5, 15.1, 7.7, and 2.5 from May to March respectively (Fig. 2). The clinical problems were highest in winter (42%), followed by Rainy (39%) and summer (19%), indicating that farmers need to improve managerial system in rainy and winter season. Relationship between number of clinical cases and total population was analysed, which revealed that higher clinical cases relate to poor adoption and managerial system. In this way, Bar ka nagla and Pohpa burj were poor responder. There was no outbreak of infectious diseases in these adopted villages because of timely vaccination, however, nearby villages of Mathura district and some of Agra district faced mortalities due to PPR, ET and Goat Pox. In these villages, kids mainly died due to pneumonia in winter season, associated with poor shelter in extreme cold.



Endoparasitic infestation and Deworming: The EPG levels in different months revealed that January (1330.6), February (1240.52) and March (1145.4) have higher EPG range followed by in August (1054.85), September (1113.9); and May (1038.3) and June (1007.2), which indicated that rainy and winter season are conducive for internal parasitic infections (Fig 4). Highest EPG were reported in Bar ka nagla (1162.41) and Jalal (1087.05) followed by Pohpa burj (918.00) and lowest in Pauri Shahzadpur (688.41), which is directly associated with quality of drinking water and managerial system. Parasitic Infections were mainly dominated by bursate worm (*Haemonchus contortus*), and other infection



includes Liver fluke and tape worm. Coccidial load were also present in adult animals. In preventive programme, two doses of anthelmintic were given in the month of June and July with Fenbendazole and second in September with Nilzan (Oxyclozanide + Levamisole). The number of goats were dewormed in Bar ka nagla were (131,113), Jalal (139,184), Pauri shahzadpur (45,126) and Pohpa burj (135, 156), covering 64.7 and 83.00 % population, respectively.

Vaccination: The goats were vaccinated in all four villages against FMD, Enterotoxaemia and Goat pox, in Bar ka nagla (201,247,133 goats), Jalal (121,75,223), Pauri shahzadpur (60,69,100) and Pohpa burz (182,107,100), respectively, that covered 81.3,72 and 80.1% population, respectively. Farmers showed active interest in vaccination except a few.

7. Nutrition Component

U.B. Chaudhary

During the period of report, 36 visits of adopted villages were performed with the aim to improve the productivity of farmers' goats through nutritional interventions. Necessary knowledge related to balanced feeding was disseminated to goat farmers of the four adopted villages during each and every visit. Feeding practices of four breeding bucks distributed to each adopted village were monitored and pelleted feed (@ 9.0 Kg/month/buck) was made available by the Institute for maintenance of proper health of these bucks.

Farmers' goat feeding practices in different seasons:

Observations were collected on 200 goats regarding their feeding practices during summer season. It was revealed that goat farmers allowed 6-8 hours of grazing daily. Harvested field of wheat containing fallen wheat and weeds were the major feed resources for goats during grazing. Considering health status of goats in four adopted villages, it was observed that available feed resources were adequate to meet out the Dry matter and nutrient requirement of goats for maintenance and production up to certain extent. Some of the farmers were practicing supplementary feeding to goats. Health of dry and adult male goats during summer season was observed good but lactating and pregnant goats were needed supplementation in terms of roughages as well as concentrate for improved productivity.

During rainy season, observation from 183 goats maintained in four adopted villages were collected for record of prevailing feeding practices and available feed resources. During rainy season goats were restricted for 3-4 hours daily grazing in order to avoid more consumption of moist feed. Grazing material available for goats was constituted of seasonal grasses of high moisture contents (>82% moisture contents). In addition to grazing, goat farmers were supplementing harvested grasses and grain (in few cases). On dry matter basis, grasses were containing 28% DM, 10.15% crude protein, 2.57 % ether extract, 12.45 % ash. Health of goats of all categories was observed very poor due to intake of inadequate quantity of high moisture feed. In order to cope up the problem goat framers were advised for supplementation of leguminous straw, grains along with salt.

During winter season, observations from 222 goats were collected. Most of the goats were maintained strictly on grazing (6-8 hours daily). Grazing materials available to the goats was constituted of local bushes, tree leaves and

grasses. On account of availability of variety of natural bushes in grazing area of Yamuna river to the goats of Pauri Sahjadpur, performance of these goats was observed better in comparison to goats of remaining three adopted villages.

Through organizing small gosthi and personal discussion in adopted villages, knowledge of balanced feeding and its importance for improved productivity was disseminated amongst the goat farmers. In Jalal village, encouraging results were obtained as with continuous persuasion and constant efforts most of the goat farmers of the village, purchased good quality Arhar straw for feeding the goats during winter season. Feeding of small quantity (100-150 g/d) of straw resulted in better health of goats in comparison to the other goats. Intake of 100-150 g of Arhar straw daily costing around Rs.8-9 per month resulted in better health of the goats in comparison to non-arhar straw fed groups.

Products Technology Component

R.B. Sharma

A total of 32 Visits were undertaken to the adopted Villages and made interaction with the farmers on clean milk production and value addition in goat milk. Contributed as a subject matter specialist in the Scientists Farmers Interaction and Health Camp organized in Jalal village on 21st July 20007 and Village Seminar and clinical camp organized by ARS Probationers (NAARM) on 28th March 2008 in village Shahjadpur. Conducted Demonstration on paneer making technology at village Jalal during the visit of Krishi Darshan team of Delhi Doordarshan on 15-01-08, which was telecasted by Doordarshan several times on DD1. The goat keepers of all 4 villages were taught the medicinal value of goat milk. The goat keepers were selling the goat milk @ Rs. 9/- per litre, which was quite lower than its real market value. The awareness among goat keepers was created for selling the surplus milk, if any, at a better price or by making several value added products.

Variation in goat milk composition in the adopted villages

Milk samples (71) from individual goats reared in all four adopted villages were collected and milk yield was recorded. The overall mean values for fat, SNF, TS, protein and ash content were 5.81, 8.04, 13.83, 2.81 and 1.00 per cent, respectively. The fat content in goat milk was higher and SNF content was lower in Bar ka Nagla, and Pouri villages. However, The TS content was highest in goat milk of village Jalal followed by Bar ka Nagla, Pophu Burj and Pouri. Protein content was noticed higher in Pophu Burj and Jalal. The Milk yield was obtained highest in Jalal and Podi villages followed by Pophu Burj. Milk yield of goats was noticed lowest in Bar ka Nagla village. The fat content was observed higher with the goats yielding less quantity of milk and vice versa. The results are presented in Table 1.

Table 1: Variation in goat milk composition in adopted villages

Village	Fat	SNF	TS	Protein	Ash	Milk Yield
Pophu- Burj	5.33	8.27	13.59	3.33	0.74	0.834
Jalal	5.41	9.2	14.69	3.22	1.71	0.925
Bar ka Nagla	6.05	7.84	13.88	1.77	0.75	0.340
Pouri Shahjadpur	6.45	6.86	13.17	2.91	0.81	0.925

Influence of goat breeds on milk composition

The milk samples were collected from non-descript and Barbari type goats reared in the adopted villages and the samples were analyzed for proximate composition. Fat and ash content was obtained higher in the milk of Barbari type goats. However, protein content was noticed higher with non-descript animals. The pH values were similar in both the cases. The results obtained from field were compared with goat milk composition of our farm animals. It was found that the fat and ash content was higher in the milk of field goats and SNF, TS and protein content was higher in our farm goats. The results have been presented in Table 2.

Table 2: Influence of goat breeds on milk composition

Source	Breed	Fat	SNF	TS	Protein	Ash	pH
Field	Non-descript	4.78	8.61	13.39	3.19	0.73	6.55
	Barbari Type	5.18	8.11	13.29	2.11	0.83	6.55
Farm	Barbari	4.30	10.68	14.98	3.47	0.77	-

Demonstrations on Paneer making

Farmers were motivated and demonstrations on paneer making technology from goat milk were conducted in all four adopted villages. Some of the goat keepers have shown interest to adopt the technology and 12 goat keepers have started making paneer from goat milk.

Demonstrations on clean milk production

The goat keepers were motivated to produce clean milk. The advantages of clean milk and the transmission of different infectious diseases through dirty milk were taught in all the four adopted villages. They were advised not to use dirty utensils for milking and to keep milk for longer duration. They were also given demonstrations time to time on different aspects of clean milk production.

XI/EESE 1.1 Development of Tests, Scales to Measure Knowledge and Attitude of the Goat Farmers Towards Selected Goat Husbandry Practices

R.L. Sagar, Khushyal Singh and Braj Mohan

A survey of goat farmers' knowledge and attitude require reliable tests and scales for the adoption of goat husbandry practices. The tests and scales are not available at present on the goat husbandry practices. It is believed that the goat farmers who have more knowledge and favourable attitude towards goat husbandry practices are more likely to obtain higher production from their goats. Keeping this in view an attempt has been made to develop tests and scales to measure the goat farmers' knowledge and attitude towards some selected goat husbandry practices. In the light of research project some relevant studies in connection with the knowledge level and attitude towards innovations conducted in various parts of India have been consulted and reviewed.

The Knowledge Tests

In the present study the knowledge tests for measuring level of knowledge of the selected goat husbandry practices viz H.S., F.M.D., PPR., ET and goat pox and vaccination against them, de-worming in small ruminants, artificial insemination in goats, feeding of mineral mixture and goat milk paneer are being developed.

Item Collection: The content of knowledge that is composed of questions called items. Items for the test were compiled from different sources, such as literature, field extension personnel, subject matter specialists in animal and agricultural sciences and the researchers' own experience. The questions were designed to test the knowledge level of goat farmers about goat husbandry practices. The items were collected in relation to vaccination against knowledge about H.S., F.M.D., P.P.R., E.T., deworming in small ruminants, artificial insemination in goats, feeding of mineral mixture and goat milk paneer.

Initial Selection of Items: The selection of items was done on the basis of the following criteria.

- It should promote thinking rather than rote memorization, and
- It should differentiate the well informed goat farmers from the poorly informed ones and should have a certain difficulty value.

The procedure followed in selection of the test items was on the lines used by Jaiswal (1965), Chaudhari (1978), Sagar (1983) and Goswami (1987).

Based on these two criteria 190 items were initially constructed out of which 67 were about H.S., F.M.D., P.P.R., E.T., goat pox and vaccination against them, 25 about deworming, 46 about artificial insemination in goats, 22 about feeding of mineral mixture and 30 about goat milk paneer. A schedule was prepared with these 190 items for administering to the goat farmers for item analysis and screen out further items. All the 190 items collected for construction of the knowledge test were in objective form and were in dichotomous or multiple-choice format.

The Attitude Scale

In order to construct the attitude scales for quantitative measurement of the selected goat husbandry practices viz. vaccination against contagious diseases, deworming in small ruminants, artificial insemination in goats, feeding of mineral mixture and goat milk paneer, a modified form of Likert technique is being used. Having decided on the scaling technique, actual preparation of the scales has been undertaken.

Collection of Items Attitude Statements: The particular situation or object that evokes the response is called an item. The first step in developing the scales is the collection of items (Statements) in such a manner that the acceptance or rejection of each one implies a different degree of favourable or unfavourable attitude towards the innovation being studied so that the important and relevant statements could

be delineated and selected. As such, on the basis of relevant literature, informal discussions with the specialists and goat farmers of Transfer of Technology villages of the Institute, 60 statements for vaccination against contagious diseases, 52 for deworming in small ruminants, 58 for artificial insemination in goats, 38 for feeding of mineral mixture and 42 for goat milk paneer were initially prepared. The criteria as suggested by Edwards (1969) have been utilized for editing scale items or statements. The statements are ready to be sent to the judges for rating.

XI/EESE 1.2 Study on Adoption of Goat Production Technology

Braj Mohan, R.L Sagar

Conducted preliminary survey in Daulatpur non-operational village of Farah Block of Mathura District, U.P. About 389 hectares irrigated land was available with farmers in Daulatpur village and non-irrigated land was nil. Out of 305 households, maximum number of households were observed of Jatav community and found to be 150 families followed by Thakur (100), Baghel (50), Balmik (04) and Brahmin (01). The highest number of goat keepers were observed in Jatav community and found to be 100 numbers whereas in Baghel (12), Thakur (03) and Balmik (01). The total goat keepers were 116. The goat population was observed to be in quite good numbers and found to be about 400 goats of Barbari, Sirohi and non-descript breeds. Big flocks and maximum goats were with Baghel community. Similarly, Fatiha non-operational village of Farah Block of Mathura District, U.P., was also visited to collect basic information for the above project. About 91.53 hectares irrigated land was available with farmers in Fatiha village and non-irrigated land was nil. Out of 200 households, maximum number of households were observed of Thakur community and found to be 100 families followed by Jatav (60), Baghel (30), Koli (04), Balmik (04) and Barber (02). The highest number of goat keepers were observed in Baghel community and found to be 09 numbers

whereas in Thakur (07), Jatav (06), Balmik (04) and Koli (01). The total goat keepers were about 27. The goat population was observed to be in good numbers and found to be about 200 goats of Barbari and non-descript breeds.

An interview schedule was developed on socio-economic and psychological, agro-situational, extension communication, awareness, adoption, etc., of improved goat husbandry practices. Pre-tested and standardized the interview schedule for data collection. Data were collected from 11 goat farmers in operational and non-operational villages through personal interview with the help of structured schedule. All 11 goat farmers adopted goat husbandry practices such as vaccination like, P.P.R., E.T., F.M.D., H.S., etc., and deworming of animals. Five land owner goat farmers produced green fodder mainly for large animals and same was offered to their goats. Out of 11 goat farmers, 2 adopted goat milk paneer technology and only 1 was feeding mineral mixture. Non used the Burdizzo castrator for castration and artificial insemination was also nil.

XI/EESE 1.3 Impact of Improved Technologies and Emerging Market Conditions on Goat Production System

Shalander Kumar, K. Singh and M.K. Singh

The information on diffusion of superior breeding goats and improved technologies from CIRG in the last five years was collected. The information and 850 addresses were also gathered about persons acquired superior germ plasm and training on improved goat farming from CIRG and so also the commercial goat farms operating in different parts of the country. A questionnaire was developed to elicit information from the above beneficiaries of the improved germ plasm and improved technologies. This questionnaire was posted to 835 beneficiaries. Twenty beneficiaries have responded yet. A preliminary analysis of data collected from these 20 goat farmers have been presented below:

Table 1: Details of flock size of goat keepers

Category	No. of goat keepers	Adult male	Adult female	Kid	Total goats
I (< 50 goats)	10	1.67	14.50	8.78	23.90
II (> 50 goats)	10	14.10	96.90	47.20	158.20
Overall	20	7.8	55.7	27.55	91.05

The flock size of goats (no. of does) of different farmers ranged from 2 to 245. The goat farmers were post-stratified into two categories, namely, category I (< 50 goats) and category II (> 50 goats) with average flock size of 15 and 97 does respectively (Table 1). Barbari breeding male constituted the largest share among the total goats supplied by CIRG to farmers (Fig. 1). The mortality in adult goats supplied from CIRG to the field was quite high mainly due to sudden change in the environment and heavy transit stress and sometime due to poor access to prophylactic measures. The adult mortality in the overall flocks of the farmers was not very high with less than 10 per cent. There was large variation in the kid mortality rate among different flocks (Fig. 2). A number of flocks suffered with high mortality in kids. There may be many factors of high mortality like low adoption of improved practices, non-availability of critical inputs, low awareness, size of flock, type of housing, etc. However, the detailed analysis to know the reasons of variation in mortality is being carried out.

Fig. 1: Details of goats supplied

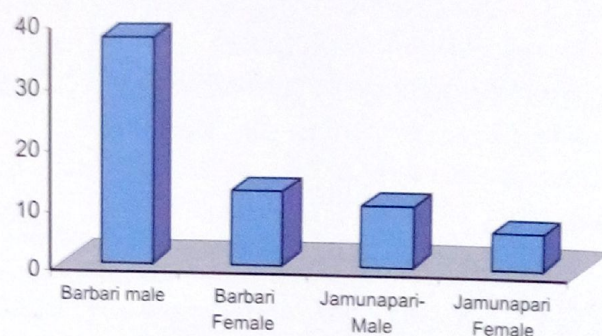
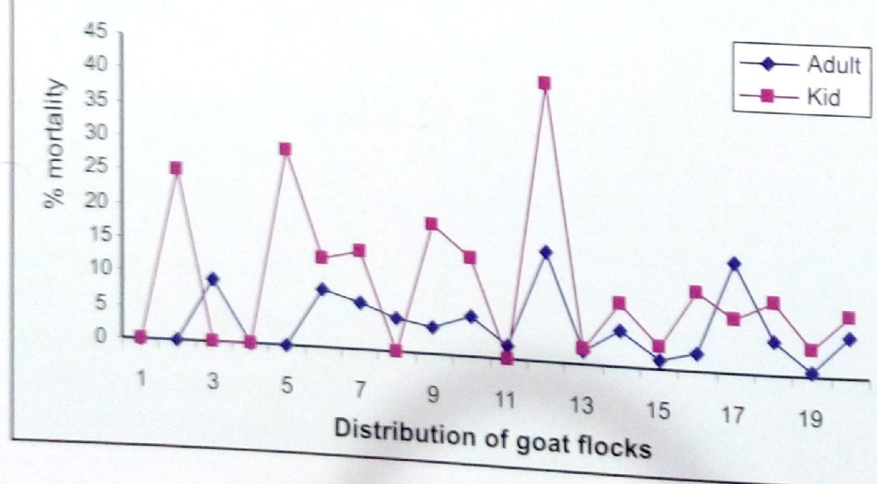


Fig. 2: Annual mortality rate in adult goats and kids in farmers flock



Majority of the farmers were rearing pure breed animals of Sirohi, Barbari, Osmanabadi, Boer cross, Jamunapari breeds. Sirohi was liked by the maximum farmers (40 %) followed by non-descript. The farmers had awareness about the advantages of rearing pure breed goats (Fig. 3). Comparatively higher market price and good reputation among the goat breeders were the main attractions of rearing pure breed goats. In farmers' perception the Sirohi was the most hardy breed capable of surviving under adverse conditions followed by local non-descript and Osmanabadi breeds (Fig. 4).

All the farmers had some exposure of training and interaction with the CIRG / other relevant institutions and their awareness of improved technologies of goat production was very high as indicated in the Fig. 5. The level of adoption of these technologies was also reasonably good. The

variation in the level of adoption and impact of technologies is being analyzed using appropriate analytical tools.

Fig. 3: Farmers perception of rearing pure breed

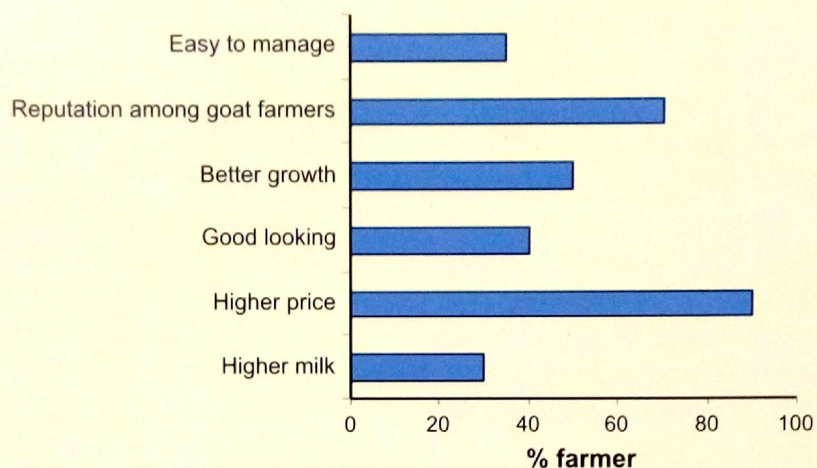


Fig. 4: Farmers perception of advantages of pure breed goats

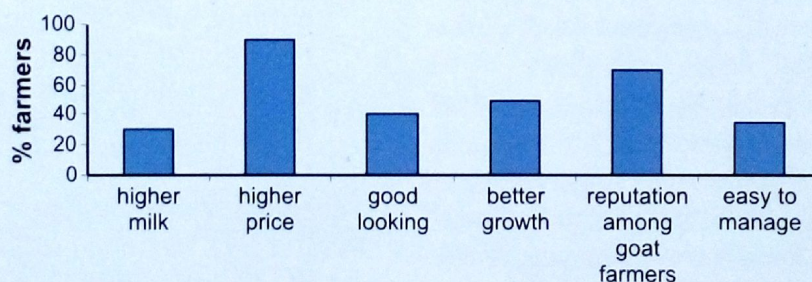
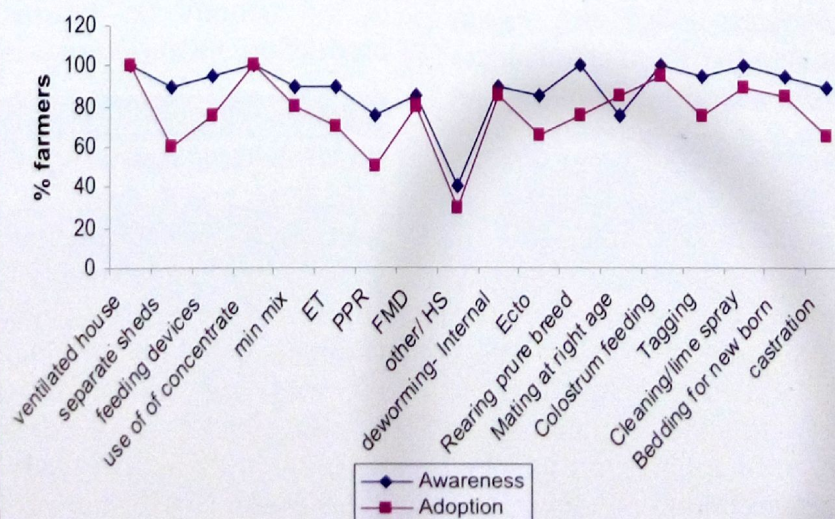


Fig. 5: Level of farmers' awareness and adoption of technologies



XI/EESE 1.4 A Study on Impact of Various Training Programmes on Commercial Goat Farming

Khushyal Singh, R.L. Sagar and Braj Mohan

The review of literature was collected on impact of training programmes on goat farming. An interview schedule was developed to collect information on the socio-economic aspects, sources of information, marketing problems, knowledge utilization and constraints in commercial goat farming etc. Interview schedule was pre-tested and standardized. A list of addresses was prepared of trainees who attended the national training programme on commercial goat farming and scientific goat rearing trainings for mailing questionnaire/ interview schedule.

EXTENSION EDUCATION

Organization of exhibition

- An exhibition was organized during the National Goat Fair and Scientists-Entrepreneurs- Farmers Interactive Meet held at CIRG, Makhdoom on March 1-3, 2008. In this exhibition, 15 stalls were put by the ICAR Institutes, Agricultural University, KVKs, Pharmaceuticals, Book Publishers, NGOs, etc. The main objective of the exhibition was to enlighten the goat farmers, entrepreneurs, scientists and development officers with the latest technology of goat farming and allied areas. About 1500 people visited the exhibition.



Participation in exhibition/ Kisan Mela

- Participated and put a stall in the Kisan Mela evam Krishi va Pashu Pradarshani at Pt. Deen Dayal Upadhyay Veterinary University and Cow Research Institute, Mathura, U.P. on March 25-26, 2008.
- Participated and put a stall in the exhibition of Agro-Food and Value-added Products of ICAR at New Delhi on the occasion of ICAR Foundation Day at NASC Complex, New Delhi on July 16-17, 2007.
- Participated and put a stall in the exhibition of Indian Agro- Industry Expo-2007 at Pragati Maidan, New Delhi on August 16-18, 2007.
- Participated in Krishi evam Gramya Vikas Pradarshani at Nagla Chandra Bhan (Deen Dayal Dham) Farah on 7-9 October, 2007.
- Participated put a stall in Kisan Mela and Pashu Vigyan Pradarshani at IVRI, Izatnagar, Bareilly, U.P. on November 1-3, 2007.
- Participated and put a stall in Bhed Mela, Kisan Goshthi and Pradarshani at CSWRI, Avikanagar (Raj.) on 4.1.2008

Technical correspondence

In all 1,371 technical inquiry letters of which 1,187 in Hindi and 184 in English were received from different categories of aspirant farmers and development agencies covering different parts of the country on various aspects of goat production. All the letters were replied suitably.

AICRP ON GOAT

AICRP on Goat Improvement

N.P. Singh and B. Rai

Jamunapari farm Unit is located at CIRG, Makhdoom. The opening and closing balances of Jamunapari flock were 549 and 634. The population growth rate during the year was 100.99%. The overall survivability of the flock was above 93%. Mean body weights of kids at birth, 3, 6, 9 and 12 months of age were 3.28 ± 0.03 , 11.99 ± 0.14 , 16.41 ± 0.22 , 21.54 ± 0.38 and 27.06 ± 0.38 kg, respectively during the 2007-08. Male kids were born with higher birth weight and maintained this superiority up to 12 months of age. The



heritability estimates for body weight at birth, 3, 6, 9 and 12 months of age were 0.272 ± 0.068 , 0.169 ± 0.076 , 0.230 ± 0.064 , 0.213 ± 0.003 and 0.327 ± 0.073 respectively. Average milk yield in 90 days, 140 days, Total lactation Yield and lactation length were 103.11 ± 2.04 , 143.68 ± 2.94 , 152.78 ± 4.17 liters and 169.98 ± 3.09 days, respectively of the does kidded in the year 2007. The average age at first kidding, weight at first kidding and kidding interval for the year 2007-08 were 754 ± 21 days, 32.6 ± 0.5 kg and 323 ± 5 days, respectively. The Multiple birth rates and litter size were 34.2% and 134%, respectively. Thirty-three males and twenty-two females were supplied to farmers, SAUs, NGOs and other research institutions for improvement and conservation of Jamunapari goats under field conditions.

Barbari Farm Unit is located at CIRG, Makhdoom. In the beginning of the year, out of



744 Barbari goats in the farm, 280 were adult females, 98 adult males and 346 were kids below 12 month of age. During the year, 838 kids were born. It worked out to 1.78 kids per available adult doe in the beginning of the year. The overall population growth was 164% the best over the years. The body weights of kids born during the year 2006 at birth, 3, 6, 9 and 12 month were 1.84 ± 0.01 , 6.11 ± 0.10 , 2.38 ± 0.18 , 17.19 ± 0.10 and 23.58 ± 0.28 kg, respectively. Year of birth had significant effect on the weights at different ages. Overall mean for 90 days milk yield, lactation yield, and lactation length among the does kidded during 2007 were 58.81 ± 1.52 , 62.21 ± 1.84 liters and 109.80 ± 1.32 days respectively, which was higher in comparison to previous years. The h^2 estimates for MY 90, LMY and LL were 0.333 ± 0.071 , 0.303 ± 0.068 , 0.107 ± 0.052 , respectively. The selection differential at 9 months body weight was 5.16 kg during the year and for 90 days milk yield it was 20.6 liters. Topping per centage was 156.7% and kidding rate was 1.53. One hundred sixteen (116) males and fifty eight (58) females were supplied to farmers, SAUs, NGOs and other research institutions for improvement and conservation of Barbari goats under field conditions.

Sirohi goat unit has been established in the breeding tract of Sirohi goats, since December 1976 at CSWRI, Avikanagar (Rajasthan). Performance of this breed at farm for the year 2007-08 with regards to body weight at birth, 3,



6, 9 and 12 months of age were 3.09 ± 0.44 , 12.23 ± 0.18 , 15.48 ± 0.31 , 19.07 ± 0.30 and 23.74 ± 0.33 kg, respectively. The milk yield of the does kidded during 2007-08 averaged 74.43 ± 1.58 for 90 days, 97.24 ± 2.21 kg for 150 days and 107.93 ± 3.36 kg for total lactation. Lactational length was 175.49 ± 4.17 days. The tupping and kidding per centage on the basis of does available were 90.07 and 83.83 respectively. The selection differentials of selected male kids from population for 9 months body weight and their dam's 1st lactation at 150 days milk yield was 4.75 and 13.81 respectively. 71 males and 03 females (total 74 animals) were sold to breeders to genetically improve their goat flocks.

Jamunapari Goat Field Unit is going on in the two villages of Chakarnagar, block of Etawah district (U.P). The flock strength of Jamunapari Goats in the two villages was 293 during the year 2007-08. The body weight of the kids at birth, 3, 6 and 9 Months of age were 2.42 ± 0.05 ,



14.53 ± 0.16 , 21.14 ± 0.39 and 26.24 ± 0.49 kg, respectively. The multiple birth was 64.6 per cent and fertility was 75.45% during the year. The kidding rate was recorded 148 per cent under field conditions. The average daily milk yield was 1.134 ± 0.015 lit. The total milk yield at 30, 60 and 90 days of lactation were 32.52, 72.12 and 110.82 lit, respectively. The milk yield up to fourth fortnight with respect to birth status was observed as 65.640, 69.075 and

82.005 lit in single, twins and triplet kidded does, respectively.

Ganjam Goat Field Unit is located at OUA and T, Bhubaneswar. The information regarding production and reproduction parameters was collected from 1453 goats in the adopted area. The average body weights of male kids at birth, 3, 6, 9 and 12 months of age were 2.35 ± 0.02 , 6.82 ± 0.02 , 9.36 ± 0.03 , 13.30 ± 0.04 and 17.33 ± 0.06 kg respectively. The average daily milk yield was 418.28 ± 9.54 ml with total milk production of 73.86 ± 1.25 litres in 176.58 days of lactation. The kidding per centage on the basis of does tupped was 68.99. A total number of 2003 goats were provided prophylactic assistance in the form of vaccination and deworming in the project area. The Socio-economic studies revealed that in the Ganjam district of Orissa state the goat is a primary source of income of tribals (Gola). The goat rearing contributed 70.00 per cent of their annual income.

Malabari goat field Unit is located at KAU, Trichur. A total of 468 goats were registered during the year 2007-08. Out of these only 299 (63.89%) were available for recording data till the end of year. The means weight at birth, 3, 6, 9 and 12 Months of age were 2.28 ± 0.07 , 9.04 ± 0.14 , 16.17 ± 0.56 , 18.09 ± 1.00 and 24.63 ± 0.94 kg, respectively. The average lactation length yield was found to be 45.72 ± 3.94 lit. the average gestation length,



age at first kidding and inter kidding interval were 147.37 ± 1.42 , 394.47 ± 25.73 and 274.0 ± 21.3 days, respectively. The incidence of single, twins, triplet and quadruplet births were 43.37, 49.34, 5.96 and 1.33 per cent, respectively. The kidding rate was 1.65. The selection differential was 5.74 kg and genetic gain was 1.00 kg. 25 bucks were distributed during the year 2007-08.

Surti Goat Field Unit is located at Navsari Agriculture University, Navsari (Gujarat). The survey work on the Surti goats was conducted in 3 centres of the Bharuch district. Flock statistics data for the year 2007-08 presented in the annual report indicated that during the year the opening balance was 145 and closing balance was 186. The overall means for body weight at birth 3, 6, 9 and 12 months of age were 2.90 ± 0.06 , 9.23 ± 0.26 , 12.85 ± 0.39 , 15.40 ± 0.54 and 20.38 ± 1.01 kg respectively. The pooled milk yield for 90 and 120 days was 158.44 ± 6.25 and 215.58 ± 10.62 liters. The kidding rate was 1.63 under field conditions. Multiple birth was 56.15%. The improvement of 5.61 per cent was observed at 3 months body weight due to use of elite bucks under field condition.

Sirohi Goat Field Unit is located at Livestock Research Station, Vallabhnagar, MPUAandT, Udaipur (Rajasthan). The closing balance of the registered flock was 1023 animals including 820 females. During current year, 491 kids were born out of which 230 were males. Population growth of 84.53% was recorded. The least square means for body weight at birth, 3, 6, 9 and 12 months of ages were 2.30 ± 0.03 , 12.43 ± 0.17 , 16.00 ± 0.18 , 19.04 ± 0.23 and 22.37 ± 0.35 kg, respectively. The overall least square means for milk yield over 90 days, 150 days, lactational yield and lactational length were 54.45 ± 0.178 , 83.13 ± 2.71 , 85.43 ± 2.77 lit and 156.04 ± 0.83 days, respectively. The kidding rate (litter size) was 1.22. During current year 1577 animals were dewormed, ectoparasiticide was used in 1478 animals. Further,

1504 and 976 animals were vaccinated for ET and PPR, respectively. The overall mortality was 2.62%.

Black Bengal Goat Field Unit is located at WBUAandFS, Kolkata. Socio-economic survey, management practices and housing pattern were studied among adopted villages. The closing balance of Black Bengal goats including all centers was 1426, with a population growth of 56.63%. The body weights of Black Bengal goats at birth, 3, 6 and 9 month of age were 1.17 ± 0.01 , 5.28 ± 0.06 , 7.82 ± 0.09 and 10.91 ± 0.15 kg, respectively. The average weekly milk yields for first, second and fifth week were 1.58 ± 0.13 , 1.66 ± 0.14 and 0.97 ± 0.18 kg respectively. The average daily milk yield is directly proportional to type of birth. Secondly, the amount of total milk yield increased from 6th parity. This breed is highly prolific and having 83.72% multiple birth. The kidding rate was 1.80, which is highest among all the goat breeds of the country. The age and weight at first kidding was 378 ± 2.12 days and 13.52 ± 0.22 kg. After selective breeding almost 99% of total kids born are pure black and few kids are born black with small patches of brown or white. The Socio-economic studies revealed that in the Nadia district of West Bengal state the goat rearing proved more beneficial to the goat keepers having basic knowledge of animal husbandry. The result indicated that the income from the goat farming does not relate with education status of farmers.



Marwari Goat Field Unit is located at Rajasthan Agriculture University, Bikaner. The overall means for body weight at birth, 3, 6 and 12 months of age were 2.58 ± 0.011 , 9.68 ± 0.29 , 18.33 ± 0.46 and 27.41 ± 0.81 kg respectively. The average milk yield was 38.30 ± 0.27 kg in 30 days, 85.24 ± 1.88 kg in 60 days and 121.15 ± 1.03 kg in 90 days of lactation. The kidding per centage ranged from 68.25 to 82.12



in different location. The twinning per centage ranged from 1.85 to 2.51 in the progenies of elite sires. A total of 20 young bucks of Marwari breed were selected on the basis of body weight and growth rate from the breeding tract of this breed and distributed to the registered breeder of field centers Deshnoke (09), Moonsar (05) and Kalyansar centers (06).

AICRP ON SHEEP

Genetic evaluation and improvement in Muzaffarnagari sheep for body weight and wool yield

Gopal Dass, S D Kharche, A K Das, V K Gupta and Hari Prasad

Muzaffarnagari, the heaviest sheep breed of India, is mainly distributed in Muzaffarnagar, Meerut, Bulandshahar, Saharanpur and Bijnor districts of western Uttar Pradesh and in the some parts of Delhi and Haryana. The breed is known for higher growth rate and good adaptability than other Indian sheep breeds. The Institute is maintaining a flock of pure bred

Muzaffarnagari sheep under a "Network Project on Sheep improvement" since 1992. Data on various parameters like growth, meat quality, reproduction, greasy fleece yield recorded in Muzaffarnagari sheep besides survey report and performance of the breed in its home tract. The detailed managerial practices as well as performance of this breed both in farm and field conditions are described below:

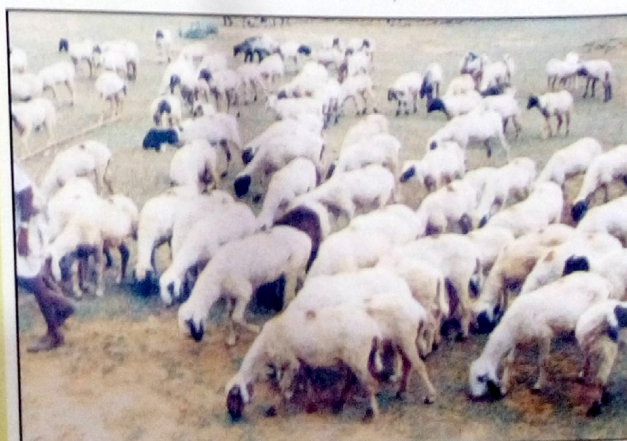
Performance at farm:

Genetic evaluation of different traits of interest viz. body weights at birth, 3, 6, 9 and 12 month age and greasy fleece yield, was under taken with Muzaffarnagari sheep with an aim to improve the breed for mutton and wool through selective breeding.

Management practices

Animals were maintained under semi-intensive system of feeding management where they were provided 100-400g ration to growing lambs at various ages, 6 hrs grazing and some dry and green fodders. The concentrate feed provided was consisting of 72% TDN and 16% DCP. Essential ingredients of this ration were maize (15%), barley (20%), ground nut cake (35%), wheat bran (20%), molasses (7%), mineral mixture (1.5%) and salt (1.5%). Ewes of 100 days onwards pregnancy and during lactation and breeding rams during service period were provided additional ration. Dry ewes were fed with only maintenance ration.

Controlled breeding was practiced to improve the managerial efficiency. The ewes were



bred during May-June and October-November followed by lambing in the months of October-November and March-April, respectively. The lambs were weaned at 2 months of age due to poor milk production as well short lactation period of their dams.

All the sheds and corrals were disinfected frequently with lime. Regular treatment and strict prophylactic measures were practiced for vaccination against Enterotoxaemia, Foot and Mouth Disease, Sheep Pox, H.S., PPR etc. De-worming with different anthelmintics was practiced at pre-monsoon and post monsoon seasons and as and when required. Dipping was done after 15-20 days of each shearing.

Flock statistics

Flock strength of Muzaffarnagari sheep as on 01.04.2007 was 147 sheep (58 male and 89 female, out of which 67 breeding females) while the closing balance on 31.03.2008 was 223 (61 male and 162 females, out of which adult females were 110). The addition was due to birth of 100 lambs (47 males and 53 females) and purchase of 27 adult females from breeding tract while the reduction was due to death, culling and sale of animals.

Culling and mortality

The overall culling in 0-3, 3-6 and 6-12 age groups was nil, while in adults it was 12.35%. The overall culling in all age groups was 7.66%. The mortality was recorded to be 1.85, 2.56, 2.25 and 0.42% in the 0-3, 3-6, 6-12 age group and in adults, respectively. The overall culling and mortality was 7.66 and 3.65%. This year the overall mortality and culling was lowest of previous many years. The overall culling on health ground was 1.09%. The replacement rate for the breeding ewes was 28.2%.

Growth performance

The overall least-squares means of body weights of lambs at birth, 3, 6, 9 and 12 month age were 3.26 ± 0.08 , 16.90 ± 0.53 , 25.92 ± 0.71 , 32.75 ± 1.49 and 37.91 ± 1.72 kg, respectively during the year under report. The effect of sex

was highly significant ($P < 0.01$) on all body weights. Male lambs gained higher weights as compared to female lambs at all stages. As compared to previous two years the lambs showed highly significant improvement in body weights at all growth stages.

Average daily weight gain (ADG) and meat quality attributes

The average daily weight gain of Muzaffarnagari lambs during 0-3, 3-6, 6-12 and 3-12 months were 151.23 ± 5.45 , 99.00 ± 4.12 , 63.80 ± 6.27 and 79.03 ± 4.27 g under semi-intensive feeding management. Similar to body weights, male lambs showed higher ADG than female lambs for all age groups intervals. Significant improvement was recorded in all ADGs during the year as compared to previous two years. A total of 3 rams maintained under semi-intensive feeding management were slaughtered for evaluating important carcass and non carcass attributes in adult stock. The mean values for carcass traits viz. slaughter age, slaughter weight, empty body weight, carcass weight, dressing per centage (SW), dressing per centage (EBW), fore quarter, hind quarter, loin eye area and total body fat were $1035. \pm 3.38$ days, 54.00 ± 3.21 kg, 48.17 ± 0.54 kg, 27.64 ± 1.76 kg, 50.20 ± 0.40 %, 57.51 ± 0.69 %, 15.37 ± 0.96 kg, 12.30 ± 0.84 kg, 14.28 ± 0.13 cm² and 2.95 ± 0.51 %. The averages for non-carcass traits viz. blood %, head %, skin % and GI tract % were 4.64 ± 0.14 , 6.23 ± 0.09 , 9.88 ± 0.06 and 6.10 ± 0.12 , respectively.

Reproductive performance

Tupping, lambing on ewes' available basis and lambing on ewes bred basis were respectively 66.7, 61.6, 92.5% and 95.2, 88.9, 93.5% in first and second season. The annual tupping, lambing on available basis and lambing on bred basis were 93.7, 89.3 and 95.6.9. The overall twinning during the year of report was recorded 11.0%. Tupping, lambing and twinning significantly improved during this year as compared to previous many years. The averages for weight at first service, age at first service, age

at first lambing and ewes' weight at lambing were 35.1 kg, 571 days, 726 days and 39.5 kg, respectively.

Greasy fleece yield

The overall least squares means for lambs' 1st and 2nd six monthly and adult annual clips were calculated to be 478.53 ± 39.98 , 466.62 ± 20.09 and 1117.68 ± 30.88 g, respectively. Sex had highly significant ($P < 0.01$) influence on lambs and adult clip. The males produced significantly higher greasy fleece yield than females in all the clips which might be due to larger surface area for wool growth in males as compared to females.

Genetic and phenotypic parameters

The h^2 estimates of birth, 3, 6, 12 month body weights and first six monthly clip were 0.050 ± 0.061 , 0.095 ± 0.072 , 0.343 ± 0.127 , 0.242 ± 0.105 and 0.450 ± 0.148 , respectively. The h^2 estimates of birth and 3 month weights were low and un-reliable might be because of great influence of maternal and other environmental effects on the growth of lambs. All the genetic and phenotypic correlations of body weights and greasy fleece weights were positive. The genetic correlations between and among body weights were relatively lower as compared to phenotypic correlations. The phenotypic correlations of body weight with body weights and fleece yield with body weights decreased with the increase in age.

Selection of breeding rams

The selection of breeding rams was done through selection index comprising of 6 months body weight and first 6 monthly greasy fleece yield of lambs. The selection differential for the traits under selection were 5.2kg and 170g. The selection index value of the selected and un-selected rams were 2.91307 and 2.46968, respectively. Following selection index was used for the ranking of breeding rams:

$$\text{Index} = 0.11029 \times 6\text{-Month body Weight} + 0.00176 \times \text{First Shearing Wool Yield.}$$

A total of 10 breeding rams were selected for breeding of ewes during the year. All 10 rams were screened for their breeding soundness in terms of semen qualities. Semen collection of rams was carried out in six replicates at weekly intervals. Five rams donated semen in all six trials. One ram for five times, one ram in four trials, one in 3 trials, one in single time and one ram did not ejaculate at all. 7 rams showing better libido and semen qualities in terms of volume of semen, sperm concentration, mass motility, individual motility, live and dead sperm count per centage abnormal sperms, were finally selected and used as breeding rams in the flocks.

Distribution of rams: A total of 17 breeding rams were supplied for breed improvement in farmers flocks through CVO, Animal Husbandry Department, Muzaffarnagar, Uttar Pradesh.

Field survey

Survey was conducted in the breeding tract of Muzaffarnagari sheep during January, 2008 to record important production and morphometric traits and managerial practices of the breed. It was found that breed is generally reared by Pal/Gadaria and Khatik communities belonging to low income group. Flocks are maintained on extensive feeding management system in which animals were grazed for 6-8 hours grazing on the common grazing land or on the road and canal sides with zero supplementary feeding. The animals are taken for grazing at 10.00-11.00 AM and return with sunset after traveling 5-15 KM/day. The sheep owners mentioned that grazing land was on continuous decline due to availability of irrigation facilities and practicing of intensive cropping system. In general, the animals were kept in thatched sheds erected on Kuchcha floor and fenced with thorny/wooden materials and muddy walls. However, some breeders had sheds made up of bricks and cement along with Kuchcha/bricks flooring. Rams and ewes are grazed and housed together and usually one breeding ram is kept in a flock. The lambs below 2 months of age are kept loose

with their dams during nights and left behind at the home during the day time. The lambs are kept in house for about 15 days after birth and thereafter join the flock for grazing. The animals are generally brought to the water points (canal, ponds, tube wells) to drink water twice or thrice a day during the summer season.

In field, the breeding takes place throughout the year as breeding rams always stay with the flock. However, majority of breeding falls in the month of April-June and September-November with lambing in September-November and February-April. Muzaffarnagari sheep is primarily maintained for mutton purpose, although it also produces fleece from 800-1000g/annum. The fleece of this breed is coarse hence not suitable for carpet manufacture. The price of wool varied from Rs. 15-25/kg. The shearing is done two times in a year in the months of October/November and May/June. Some of the farmers shear the animals thrice a year in the month of March, June and September. The shearing is carried out either by farmer's themselves or by their relatives and usually sold locally or to the traders of Panipat city. Sheep are vaccinated against Haemorrhagic septicemia and sheep pox through Department of Animal Husbandry of U.P. state. No de-worming is practiced in farmers' flock. Dipping in ordinary water is done

twice a year. The medical cover is generally provided by Veterinary Hospital.

The overall least squares means of body length, height at withers, chest girth and tail length were 25.11 ± 1.09 , 33.91 ± 0.64 , 36.16 ± 0.55 and 21.86 ± 0.52 cm., respectively in the lambs of age group 0-1 month. The corresponding Fig.s of body measurements were 52.28 ± 0.79 , 57.41 ± 0.75 , 56.56 ± 0.84 , 36.94 ± 0.80 cm in 1-3 month, 56.79 ± 0.70 , 61.13 ± 0.47 , 63.39 ± 0.58 , 43.66 ± 0.50 cm in 3-6 month, 66.85 ± 0.96 , 69.98 ± 0.94 , 70.44 ± 0.95 , 43.17 ± 0.96 cm in 6-9 month, 81.67 ± 0.83 , 76.22 ± 0.78 , 79.91 ± 0.54 , 51.98 ± 0.76 cm in 9-12 month and 82.30 ± 0.43 , 83.31 ± 0.39 , 84.88 ± 0.45 and 53.04 ± 0.47 cm in adult animals.

The overall least squares averages for body weights during 0-1, 1-3, 3-6, 6-9, 9-12 month and adults age groups were 6.32 ± 0.53 , 14.80 ± 0.44 , 19.82 ± 0.37 , 22.75 ± 0.51 , 25.57 ± 0.48 and 42.33 ± 0.72 kg., respectively. Sex showed highly significant ($P < 0.01$) influence on 1-3, 3-6, 6-9, 9-12 month and adult age groups. Results indicated that males gained about 2.7 (1-3 month), 2.5 (3-6 month), 3.5 (6-9 month), 5.7 (9-12 month) and 12 kg (adult group) more weight than females.

CIRG

ANNUAL REPORT 2007-08

- Education and Training
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- Awards and Recognitions
- Linkages and Collaboration
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EDUCATION AND TRAINING

TRAINING PROGRAMMES ORGANIZED

The Institute imparts training on different aspects of goat rearing. The institute has programme for organizing trainings for groups of clients supported by National or International organizations for the benefit of farmers, extension workers or those related to goat production work. The fees vary for each of these courses depending on its period. The sponsors may request for details on specific training and its cost from the Institute.



National Trainings

1. Ten days National Training Programme on Commercial Goat Farming held from 21st to 30th May, 2007 and total 35 trainees participated.
2. Ten days National Training Programme on Commercial Goat Farming held from 13th to 22nd August, 2007 and total 21 trainees participated.
3. Ten days National Training Programme on Commercial Goat Farming held from 12th to 21st November, 2007 and total 30 trainees participated.
4. Ten days National Training Programme on Commercial Goat Farming held from 11th to 20th February, 2008 and total 48 trainees participated.

In these four training courses in all 134 participants from 12 states i.e. 62 from U.P. followed by M.P. 21, West Bengal 16, Rajasthan 14, Bihar 9, Haryana 4, Chhatisgarh, Orissa 2, one each from Uttarakhand, Jharkhand Punjab and Delhi participated.

International Training on Semen Biology and Embryo Transfer in Goats

A specialized training programme on Semen Biology and Embryo Transfer was organized in the institute for three Mongolian Scientists for a period of two months from 26th November 2007 to 25th January 2008. Trainees also visited I.V.R.I. Izatnagar, Bareilly; N.D.R.I. Karnal and C.S.W.R.I. Avikanagar, Rajasthan as a part of their course curriculum. The training programme was sponsored by the Ministry of External Affairs, Govt. of India under Indian Technical and Economic Cooperation (ITEC) Programme between two countries. Director of the Institute on the occasion of valedictory function on 25th January, 2008 emphasized the trainees to make liberal use of this training for augmenting livestock production in their country. He also expressed the hope that such training programmes will further strengthen the scientific and cultural relations between India and Mongolia.



National Goat Fair and Scientists- Entrepreneurs- Farmers Interactive Meet

A three day National Goat Fair and Scientists- Entrepreneurs- Farmers Interactive Meet was held at CIRG Makhdoom in collaboration with the Indian Society for Sheep and Goat Production and Utilization, during 1-3 March, 2008. It was organized to provide an opportunity of meeting and sharing of information among the major stakeholders for promoting commercialization of goat production in the country. Director of the institute during the inaugural session

4. Scientists- Entrepreneurs- Farmers Interactive Meet.
5. Scientists-Development Officers-Farmers Interactive Meet.
6. Goat Show and the Contests.



About one thousand participants comprising Commercial goat farmers, representatives from Meat Industry, State Animal Husbandry departments, Non Government Organizations, researchers, teachers, students, and development workers from 16 States of the country participated in the programme. The Interactive Meet was organized in three Technical Sessions viz. (i) Commercialization of goat farming: experiences from the field, (ii) Improved technologies and institutional support for commercial goat farming and (iii) Improved goat farming: constraints and options. In all, 12 Lead Papers were presented in Hindi language and included in the discussions. The commercial goat farmers and entrepreneurs actively participated in the deliberations. The issues and recommendations emerged from the above three Technical Sessions were later presented and discussed in the Plenary Session. The Interactive Meet greatly helped the commercial goat farmers and entrepreneurs not only in updating their knowledge on scientific goat production but



welcomed the delegates/ dignitaries, researchers and goat entrepreneurs. Hon'ble Minister of State for Agriculture, Food and Consumers' Affairs, Govt. of India, Shri Akhilesh Prasad Singh Ji inaugurated the National Goat Fair and Meet. The following activities/ events were organized:-

1. Live Exhibition of all the important Goat Breeds (Germplasm) available in the Country.
2. Pictorial and Live Exhibition on the Transferable Goat production Technologies developed by the Institute.
3. Exhibition Stalls of related ICAR Institutes, SAUs, Industry and State Development Departments.

also strengthened the linkages among them. On this occasion four progressive goat and sheep farmers including two women from Maharashtra were honored as Bakari/ Bher Pundits. Dr. V.S. Vihan was the organizing secretary of the National Goat Fair and Dr. Shalander Kumar and Dr. U.B. Chaudhary coordinated the Interactive Meets.

Teaching and Guidance

The Institute registered 10 students for master's degree and 12 for doctorate degree programme through Dr. B.R. Ambedkar University, Agra under different disciplines of goat production for pursuing their research work.



SUCCESS STUDY

PCR-RFLP for molecular typing of *Brucella* cultures

Brucella melitensis causes a worldwide zoonosis. It is one of the major causes of abortions in goats and sheep and the organism is secreted in the milk of infected animals. For molecular typing of *Brucella* isolates we have used the most promising molecular approach to date i.e. PCR-RFLP, which utilizes DNA polymorphism. We used the *omp2* gene of *Brucella* sp. as a locus of two nearly homologous repeated copies that differ slightly among *Brucella* species and biotypes in presence or absence of the *Pst* I site to differentiate between them. The *omp2* gene exists as a locus of two nearly homologous repeated copies (*omp2a* and *omp2b*) that differ slightly among *Brucella* spp. This information was utilized to design specific primers that amplify a 282-bp fragment, flanking *uPst* ream sequences of the 5 terminus of the two genes (*omp2a* and *omp2b*) and expanding downstream of the *Pst* I sites. Our results revealed that DNA fragments obtained from *B. melitensis* standard 16M strain and two isolates from seropositive goats identified as *B. melitensis* Rev1 strain produce three bands, an intact 282-bp fragment from the amplified *omp2a* gene that lacks the *Pst* I site and two smaller fragments of 238 and 44 bp, the product obtained from digestion of the *omp2b* amplified fragment. In contrast *B. melitensis* biovar 3 produced only two smaller fragments from both genes; (*omp2a* and *omp2b*), a 238-bp fragment and a 44-bp fragment. Because of the existing *Pst* I site polymorphism between brucella strains, the test may distinguishes between different strains of *B. melitensis* Rev1 vaccine strain from *B. melitensis* biovar 3 field strain in less than 12 hours. This method can be used in clinical samples directly.

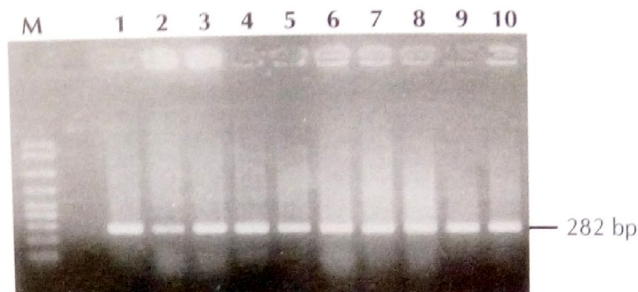


Fig. 1: Agarose gel electrophoresis of PCR-amplified *omp2* gene fragments from isolated *Brucella* strains. The Fig. shows a single band, a 282-bp DNA fragment.

Lanes 1: M, molecular size ladder (in base pairs);
2, negative control; 3 and 4, *B. melitensis* strain Rev1; 5, 6, 7 and 8, *B. melitensis* biovar 3

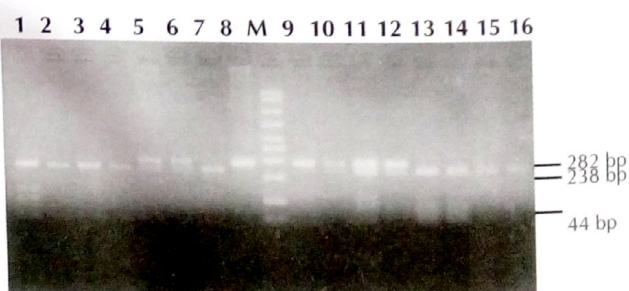


Fig. 2: Agarose gel electrophoresis of PCR-amplified *omp2* gene fragments from isolated *Brucella* strains.

Lanes 1: M, molecular size ladder (in base pairs);
Lane 2 and 3, *B. melitensis* strain 16M
Lane 4 and 5, *B. melitensis* strain Rev1;
Lane 6 and 7, *B. melitensis* biovar 3

TECHNOLOGY SERVICES

Consultancy and Visit

The Institute rendered consultancy services (paid/free) on establishment and management of commercial goat farms to 290 goat entrepreneurs, students and goat farmers during the year. During this period 430 visitors from India and abroad visited the institute.

Goat Germplasm Supplied

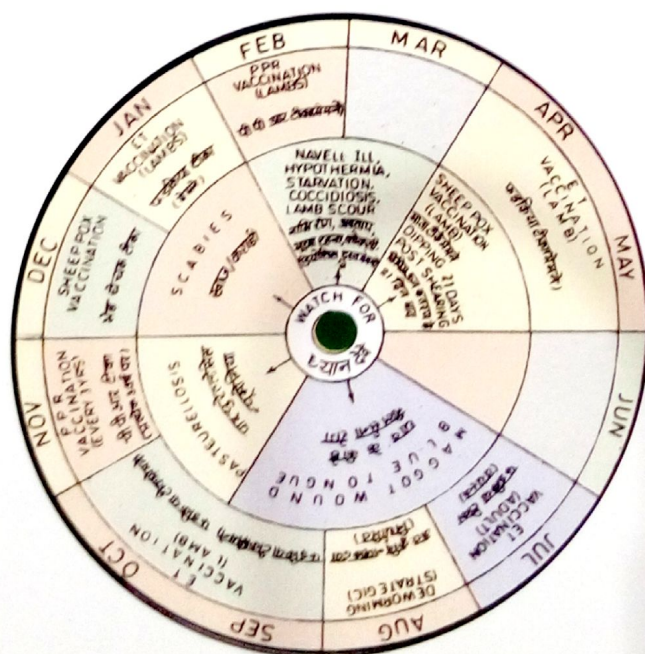
CIRG Makhdoom supplied 146 superior animals of Barbari, Jamunapari and Jakhrana breed to the progressive farmers and various government agencies for breed improvement programmes.

Indigenous ELISA kits sold

A total of 25 kits were supplied to different institutions including TANUVAS, Chennai; Veterinary colleges, Mathura and Pondicherry, respectively.

Diagnostic services provided

For the screening of map infection, samples (serum, fecal) from veterinary colleges, Mathura, Faizabad and Pondicherry and Regional centers of CSWRI, Avikanagar (SRC, Kodai Kanal and WRC, Bikaner) were recieved. These samples were screened by ELISA, microscopic examination, fecal culture and PCR.



LINKAGES AND COLLABORATIONS

- The institute has developed effective linkages with NIANP, Bangalore; IVRI, Izatnagar; NBAGR, Karnal, IGNOU, New Delhi; NAARM, Hyderabad and various agricultural universities of the country.
- Institute is also running a project in collaboration with Biovet Pvt. Ltd., Bangalore under Public-Private Partnership Programme.



AWARDS/HONORS RECEIVED

Dr. S.V. Singh

- Awarded 'Helping Hand Fellowship' and so also his two Ph.D. students (Mr A.V. Singh and P.K. Singh) to attend and present papers at 9th International Colloquium on *Paratuberculosis*, Tsukuba Science City, Japan from 29.10.2007 to 2.11.2007.
- Awarded '2 years (2007-2009) membership' for International Association of *Paratuberculosis* by IAP, USA.

Dr. Gopal Dass

Received "BHARAT JYOTI AWARD" for meritorious services, outstanding contributions and commendable role in the improvement and conservation of small ruminants (sheep) during a national seminar on "Economic growth and national integration" organized by India International Friendship Society (IIFS), New Delhi on 28.03.2008.

METEOROLOGICAL OBSERVATIONS

(April 2007 to March 2008)

Month	Max. temp. (°C)	Min. temp. (°C)	Mean daily temp. (°C)	Vapour pressure (mmHg)	Relative humidity (%)	Rainfall (mm)/ wet days	Sun shine (hr)
April, 07	43.00	20.92	31.96	15.28	34.03	nil	296.0
May	44.73	24.02	34.37	18.95	39.84	8.0 (2)	286.50
June	42.92	28.43	35.68	22.76	52.57	71.0 (7)	181.9
July	37.37	26.16	31.77	25.43	72.11	55.60 (10)	180.1
August	37.27	25.53	31.40	25.27	74.59	132.4 (4)	182.3
September	37.22	23.62	30.42	23.29	66.96	22.20 (5)	248.2
October	37.40	13.92	25.66	12.02	39.24	nil	277.0
November	32.88	9.97	21.43	11.51	51.60	nil	221.9
December	25.24	5.58	15.41	9.09	45.56	nil	200.3
January, 08	22.44	4.18	13.31	8.15	59.18	nil	210.7
February	25.91	5.45	15.68	8.72	51.28	nil	251.4
March	36.87	13.58	25.23	11.47	41.57	nil	264.8

Max. temp.

50.0 C on June 9, 2007

Min. temp.

-1.5 C on February 2, 2008

Annual Rainfall

289.2 mm in 28 days

संस्थान द्वारा सम्पन्न राजभाषा कार्यक्रम

परिषद से प्राप्त निर्देश के अनुपालन में दिनांक 14 से 28 सितम्बर, 2007 के तक संस्थान में हिन्दी पखवाड़ा मनाया गया। इसके अन्तर्गत दिनांक 14.9.2007 को संस्थान के केन्द्रीय सभागार में एक विचार गोष्ठी का आयोजन किया गया, जिसमें संस्थान के विभिन्न वक्ताओं ने 'राजभाषा के प्रगामी प्रयोग का देश के सर्वांगीण विकास में महत्व' विषय पर अपने विचार व्यक्त किये। वक्ताओं द्वारा राष्ट्रभाषा का तात्पर्य, राष्ट्रभाषा की आवश्यकता, राष्ट्रभाषा के रूप में हिन्दी के विकास में उत्पन्न बाधाएँ तथा हिन्दी भाषा के प्रति हमारा कर्तव्य आदि विषयों पर व्यापक विचार प्रकट किये गये।

- 14 सितम्बर से प्रारम्भ इस पखवाड़े में संस्थान के कर्मचारियों एवं महिलाओं के लिए हिन्दी श्रुतलेख, हिन्दी हस्ताक्षर, हिन्दी अनुप्रयोग एवं हिन्दी अनुवाद प्रतियोगिता तथा बच्चों के लिए आओ बताओ इनाम पाओ तथा हिन्दी श्रुतलेख प्रतियोगिता का आयोजन किया गया। पखवाड़े का मुख्य आकर्षण हिन्दी शोध पत्र सम्मेलन रहा, जिसमें वैज्ञानिकों द्वारा अपने शोध पत्रों का हिन्दी में प्रस्तुतिकरण किया गया। हिन्दी पखवाड़ों का समापन एवं पुरस्कार वितरण समारोह का आयोजन निदेशक की अध्यक्षता में संस्थान केन्द्रीय सभागार में आयोजित

किया गया। अपने सम्बोधन में निदेशक एवं अध्यक्ष संस्थान राजभाषा कार्यान्वयन समिति अपने विचार प्रकट करते हुए कहा कि राष्ट्रभाषा किसी राष्ट्र की जनता की भाषा है। किसी भी देश की राष्ट्रभाषा वही हो सकती है जिसका अपने देश की संस्कृति, सभ्यता व साहित्य से गहरा सम्बन्ध हो तथा बहुसंख्यक जनता द्वारा बोली व समझी जाती हो। जिस प्रकार राष्ट्रगान, राष्ट्रीय ध्वज किसी स्वतंत्र राष्ट्र के गौरव, स्वाभिमान व र्मिता के प्रतीक होते हैं, उसी प्रकार राष्ट्रभाषा भी किसी राष्ट्र के स्वाभिमान की वाहक होती है। समारोह में राजभाषा पखवाड़े के अन्तर्गत आयोजित की गई विभिन्न प्रतियोगिताओं के विजयी प्रतियोगियों को निदेशक द्वारा पुरस्कृत कर सम्मानित किया गया।

- वर्ष 2007 में संस्थान समाचार 'अजामुख' के एक अंक (मार्च-दिसम्बर, 2007) का सफलतापूर्वक प्रकाशन किया गया। जिनमें बकरी पालन के विभिन्न विषयों से सम्बन्धित 10 लेख एवं 2 लोक गीतों को प्रकाशित किया गया।
- अनुभाग द्वारा वर्ष अन्तर्गत संस्थान राजभाषा कार्यान्वयन समिति की तीन त्रैमासिक बैठकों का आयोजन निर्धारित समयानुसार किया गया। जिसमें संस्थान के निदेशक एवं अध्यक्ष राजभाषा कार्यान्वयन समिति की उपस्थिति में प्रशासनिक/वैज्ञानिक कार्यकलापों में हिन्दी के प्रगामी प्रयोग से सम्बन्धित प्रगति का मूल्यांकन किया गया तथा निदेशक महोदय द्वारा समस्त विभागाध्यक्षों, अनुभाग प्रभारियों व प्रशासनिक अधिकारी को अपने दैनिक विभागीय कार्यों में हिन्दी के प्रयोग को





उत्तरोत्तर बढ़ते हुए निर्धारित 100 प्रतिशत की लक्ष्य सीमा को प्रत्येक दशा में प्राप्त करना सुनिश्चित करें।

- निदेशक एवं अध्यक्ष संस्थान राजभाषा कार्यान्वयन समिति द्वारा राजभाषा एवं विकास संस्था, गीता कालोनी, नई दिल्ली द्वारा दिनांक 7-9 मई, 2007 को गंगटोक (सिक्किम) में आयोजित 12वें हिन्दी सम्मेलन एवं कार्याशाला में सहभागिता की गई।
- श्री अरुण कुमार सिधल, स्टेनोग्राफर एवं श्री मोहन लाल सैनी, वरिष्ठ लिपिक द्वारा केन्द्रीय अनुवाद ब्यूरो, राजभाषा विभाग (गृहमंत्रालय) नई दिल्ली के माध्यम से दिनांक 18-22 फरवरी, 2008 को 'संक्षिप्त अनुवाद प्रशिक्षण कार्यक्रम' पर आयोजित कार्याशाला में सहभागिता की गई।



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Publications



PUBLICATIONS

RESEARCH PAPERS:

1. Bhooshan N and Kumar Puneet (2007). Profile of ovarian and thyroid hormones, alkaline phosphatase and cholesterol at oestrous cycle, gestation and early lactation in blood plasma of Marwari goats. *Indian Journal of Animal Sciences* 77 (12): 1233-1237.
2. Bhusan S and Rai B (2007). Growth performance of different category of Jakhrana kids up to weaning age. *Indian Journal of Small Ruminants* 13 (1): 70-74.
3. Bhusan S, Deepak Sharma, Rajkhowa C and Bujarbaruah KM (2007). RAPD profile for four mithun population. *Indian Journal of Animal Sciences* 77 (7): 630-632.
4. Biswas S, Das A K, Banerjee R and Sharma N (2007). Effect of electrical stimulation on quality of tenderstretch chevon sides. *Meat Science* 75: 342-346.
5. Chaudhary U B, Gupta, V K and Singh Monika (2008). Comparative evaluation of different DNA extraction methods from rumen fungi. *Indian veterinary Journal* 85:4-7.
6. Chaudhary U B, Gupta, V K and Singh Monika (2008). Molecular identification of Rumen fungi *Piromyces* and *Orpinomyces* Based on amplification of ITS1 region. *Indian veterinary Journal* 85: 476-480.
7. Das A K, Anjaneyulu A S R, Verma A K and Kondaiah N (2007). Effect of different level of full-fat soy paste on quality of goat meat patties. *Journal of Food Science and Technology* 44: 323-326.
8. Das A K, Anjaneyulu, A S R, Verma A K and Kondaiah N (2008). Effect of full-fat soy paste and soy granules on quality of goat meat patties. *International Journal of Food Science and Technology* 43: 383-392.
9. Das A K, Sharma R B and Singh N P (2007). Quality and storage stability of low acid goat meat pickle. *American Journal of Food Technology* 2: 550-554.
10. Dharm Singh and Ramachandran N (2007). Lactation performance of Sirohi goats under intensive production system. *Indian Journal of Small Ruminants* 13(2): 172-176.
11. Dutta T K, Rao S B N, Sahoo P K and Singh Nawab (2007). Evaluation of Arhar (*Cajanus cajan*) straw based pelleted feeds and prediction of *in vitro* gas production. *Animal Nutrition and Feed Technology* 7:161-168.
12. Dutta T K, Tripathi Prabhat, Singh R K and Gupta D L (2007). Goat farmers' profile, feeding management and nutrient content of grazing and tree lopping resources in Bharatpur district of Rajasthan. *Range Management and Agroforestry* 28(2): 423-425.
13. Dwivedi Deepak, Kumar A, Rana R, Mahour K, and Vihan V S (2007). Bioautogram and antibacterial activity of gurhal (*Hibiscus rosa sinensis*) Leaves and shisham (*Dalbergia sisso*) bark against *Escherichia coli* of goats. *Veterinary Practitioner* 8:48-49.
14. Dwivedi Deepak, Kumar Ashok, Rana R, Mahour K and Vihan V S (2007). Antibacterial activity of methanolic extract of some local plant against pathogenic *E coli* isolates from kid Diarrhoea. *Veterinary Practitioner* 8:119-120.
15. Garg G, Sharma D K, Agrawal R D and Raut P K (2006). Protective Response of Low Molecular Weight Protein and Crude antigen of *Haemonchus contortus* in Barbari goats. *Indian J. Anim. Sci.* 77(7): 538
16. Gopal Dass (2007). Production performance and management practices of Pugal sheep in the home tract. *Indian Journal of Animal Sciences* 77: 763-766.
17. Gopal Dass and Prasad Hari (2007). Morphological characteristics, live-weights and management practices of Muzaffarnagari sheep in the home tract, *Indian Journal of Small Ruminants* 13: 27-30.
18. Gupta V K, Kumar Ashok, Vihan V S and Sharma S D (2007). Prevalence of ketosis in goats maintained under organised farming system. *India veterinary Journal* 84 (11): 1169-1172.
19. Gupta V K, Verma D K, Singh S V and Vihan V S (2007). Serological diagnostic potential of recombinant outer membrane protein (Omp31)



from *Brucella melitensis* in goat and sheep brucellosis. Small Ruminant Research 70: 260-266.

20. Gupta V K, Rout P K and Vihan V S (2007). Induction of Immune Response in Mice with a DNA Vaccine Encoding Outer Membrane Protein (OMP31) of *Brucella melitensis* 16M. Research in Veterinary Sciences, 87: 305-313.
21. Kharche S D and Srivastava S K (2007). Dose dependent effect of GnRH analogue on pregnancy rate of repeat breeder crossbred cows. Animal Reproduction Science 99:196-201.
22. Kharche S D and Srivastava S K (2007). Fertility responses in repeat breeder dairy crossbred cows treated with human chorionic gonadotropin. Indian J. Anim. Science 77(4): 297-299.
23. Kharche S D, Majumdar A C, Tyagi S and Sharma G Taru (2008). Superovulatory response and embryo production efficiency in goats following pretreatment with hCG and Estradiol-17 β . Indian J. Animal Sciences 78 (2):150-153.
24. Kumar A, Rout PK, Mandal A and Roy R (2007). Identification of the CSN1S1 allele by PCR-RFLP method in Indian Goats. Animal, International journal of Animal Biosciences, 1(8): 1099-1104.
25. Kumar A, Vihan VS and Mahour Kanhiya (2007). Solvent selection for plant extracts dissolution for *in vitro* acaricidal experiments. India veterinary Journal 85:223.
26. Kumar P, Singh S V, Bhatiya AK, Sevilla I, Singh A V, Whittington R J, Juste R A, Gupta V K, Singh P K Sohal J S and Vihan V S (2007). Juvenile Capri-Paratuberculosis In India; Incidence And Characterization By Six Diagnostic Tests. Small Ruminant Research 73: 45-53.
27. Kumar S, Singh S V, Sevilla I, Singh A V, Whittington R J, Juste R A, Sharma G, Gupta, V K, Singh P K, Sohal J S and Vihan V S (2008). Lacto-Incidence And Evaluation Of 3 Tests For The Diagnosis Of Johne's Disease Using Milk Of Naturally Infected Goatherds And Genotyping Of *Mycobacterium avium* Subspecies Paratuberculosis. Small Ruminant Research 74: 37-44.
28. Kumar Shalander (2007). Commercial Goat Farming in India: An Emerging Agri-Business Opportunity. Agricultural Economics Research Review 20: 503-520.
29. Mahour K, Ashok Kumar, Rana R, Dwivedi D and Vihan V S (2007). Efficacy of *annona squamosa* plant leaves extract against *Haemonchus contortus* infection in goats. Veterinary Practitioner 8:52-54.
30. Mandal A, Dutta T K, Raut P K, Sinha N K and Sharma N (2007). Voluntary nutrient intake and growth performance of Muzaffarnagari lambs under intensive feeding system. Indian Journal of Animal Sciences 77(10): 1034-1038.
31. Mandal A, Rout P K, Roy R and Sinha N K (2007). Genetic analysis on growth of body dimensions in Muzaffarnagari sheep. Indian Journal of Animal Sciences, 77(9): 902-906.
32. Mandal A, Yadav N K, Sharma D K, Rout P K and Roy R (2007). Transformation methods for analysis of data on faecal egg count in sheep. Indian Journal of Animal Sciences, 78(4): 364-366.
33. Mohan B, Sagar R L and Singh K (2008). Socio-economic impact of the improved goat farming practices in adopted villages. Indian Research Journal of Extension Education, 8(1): 36-38.
34. Mohan B, Sagar R L, Singh K, Tripathi P and Vihan V S (2007). Present status of goat rearing under rural conditions. Indian Research Journal of Extension Education 7(1): 43-45.
35. Niddhi Arora, Vihan V S, Sharma S D and Ashok Kumar (2007). Evaluation of anthelmintic activity of *Azadirachta indica* (Neem) against *Haemonchus contortus* infection in goats. Indian Journal of Veterinary Medicine, 27(2): 95-98
36. Ramachandran N, Verma G S, Gupta A K, Raina V S, Mohanty T K and Singh M K (2007). Prediction of bull fertility based on frozen thawed seminal traits in Sahiwal bulls. Indian Journal of Animal Sciences 77 (8): 684-687.
37. Ranjan R, Singh S V and Upadhyay R C (2007). Status of antioxidant enzymes in different body organs of male buffaloes. Ital. J. Anim. Sci, 6 (Suppl. 2): 551-554.
38. Rout P K, Kumar Ajay, Mandal A and Roy R (2008). Characterization of CSN1S2 locus by PCR-RFLP in Indian Goats. Indian journal of Animal sciences, 78(2): 29-31.
39. Sahoo P K, Misra R P and Dutta T K (2007). Development of low cost feed pelleting machine for intensive goat rearing. Range Management and Agro-forestry 28(2): 274-275.



40. Sankhyan S K, Shinde A K, Singh N P and Verma D L (2007). Effect of concentrate supplementation on nutrient intake, utilization and performance of pregnant sheep maintained on community grazing land of semi-arid Rajasthan. *Indian J. Animal Sciences* 77(6): 477-480.
41. Sharma G, Singh S V, Sevilla I, Singh A V, Whittington R J, Juste R A, Kumar S, Gupta V K, Singh P K, Sohal J S and Vihan V S (2007). Evaluation of indigenous milk ELISA with m-culture and m-PCR for the diagnosis of bovine Johne's disease (BJD) in lactating Indian dairy cattle. *Research in Veterinary Science*, 84: 30-37.
42. Singh A V, Singh S V, Makharia G K, Singh P K and Sohal J S (2008). Presence and Characterization of *Mycobacterium avium* subspecies *Paratuberculosis* from Clinical and suspected cases of Crohn's Disease and in Healthy Human Population in India. *International Journal of Infectious Diseases* 12: 190-197.
43. Singh M K, Rai B and Sharma N (2008). Factors affecting survivability in Jamunapari kids under semi-intensive management system: *Indian Journal of Animal Sciences*, 78 (2): 178-181
44. Singh M K, Rai B, Singh S K and Singh N P (2007). Morphological and Physical Attributes of Zalawadi Goats. *Indian Journal of Animal Sciences*, 77 (12): 1334-1337.
45. Singh M K, Rai B, Tiwari H A and Singh N P (2007). Non-genetic sources of variation affecting average daily weight gains in Jamunapari kids. *Indian Journal of Small Ruminants*. 13 (2): 144-150
46. Singh S V, Singh A V, Sandhu K S, Singh P K, Sohal J S (2007). Sero-prevalence of Johne's disease in bovine breeding bulls using indigenous ELISA kit. *Haryana Vet* (dec, 2007) 46: 69-71.
47. Singh S V, Singh A V, Shukla N, Singh P K, Sohal J S, Gupta V K and Vihan V S (2007). Sero-prevalence of Johne's disease in prospective young bulls of Haryana breed by indigenous ELISA kit, using protoplasmic antigen from 'Bison type' genotype of *Mycobacterium avium* subspecies *paratuberculosis* of goat origin. *Indian Journal of Animal Sciences*, 77(8): 659-662.
48. Singh S V, Singh A V, Singh P K, Gupta V K, Kumar S and Vohra J (2007). Sero-Prevalence of *Paratuberculosis* in Young Kids Using 'Bison Type', *Mycobacterium avium* Subsp. *Paratuberculosis* Antigen in Plate ELISA. *Small Ruminant Research* 70: 89-92.
49. Singh S V, Singh A V, Singh P K, Sohal J S, Singh N P (2007). Evaluation of an indigenous ELISA for diagnosis of Johne's disease and its comparison with commercial kits. *Indian J. Microbiol* 47: 251-258.
50. Singh S V, Singh A V, Singh P K, Sohal J S, Vikram Y, Kharche S D (2007). Sero-prevalence of *Mycobacterium avium* subspecies *paratuberculosis* infection in Barbari and Sirohi breeds of goats in their respective home tracts in semi-arid regions of North India. *Haryana Vet*, 46: 104-106.
51. Singh S V, Singh A V, Singh R, Misra S, Shukla N, Singh P K, Sohal J S, Sharma S, Kumar H, Patil P K and Sandhu K S (2007). Real Time Estimates of SeroPrevalence of Johne's disease In Farmer's And Farm Goatherds in North India, Using Indigenous ELISA Kit and Fecal Culture. *The Indian Journal of Animal Sciences*. 77(11): 1074-1079.
52. Singh S V, Singh A V, Singh R, Sandhog K S, Singh O K and Sohal J S (2007). Comparisons of Multiple Diagnostic Tests for the Diagnosis of Bovine *Paratuberculosis* in Lactating Cows. *The Indian Journal of Animal Sciences*. 77 (11): 1115-1117.
53. Singh S V, Singh A V, Singh R, Sandhu K S, Singh P K, Sohal J S, Gupta V K and Vihan V S (2007). Evaluation of Highly Sensitive Indigenous Milk ELISA Kit with Fecal Culture, Milk Culture And Fecal-PCR for the Diagnosis of Bovine Johne's Disease (BJD). *Comparative Immunology Microbiology and Infectious Diseases*. 30: 175-186.
54. Singh S V, Singh P K, Singh A V and Sohal JS (2007). Non-chemical method of DNA recovery for the characterization of *Mycobacterium avium* subspecies *paratuberculosis* using IS900 PCR. *Indian Journal of Experimental Biology* 45: 812-816.
55. Singh S V, Singh P K, Singh A V, Sohal J S and Gupta V K (2007). Comparative efficacy of an indigenous 'Inactivated Vaccine' using highly pathogenic field strain of *Mycobacterium avium* subspecies *Paratuberculosis* 'Bison Type' with a



Commercial Vaccine for the control of Capri - Paratuberculosis in India. Vaccine. 25: 7102-7110.

56. Sohal J S, Singh S V, Subhodh S, Singh A V, Singh P K, Sheoran N, Sandhu K S, Narayanasamy K and Maitra A (2007). *Mycobacterium avium* Subspecies *Paratuberculosis* Diagnosis and Strain Typing: Present Status and Future Developments. Indian Journal of Experimental Biology 45: 843-852.
57. Tewari H A, Kumar A and Vihan V S (2007). A report on accidental closantel toxicity in goats. Indian J Small Ruminants 13(2): 219-220
58. Tripathi Prabhat and Lal Pyare (2008). Growth and yield attributes of transplanted rice as influenced by weed control methods. Internat. J. Agric. Sci. 4 (1): 355-358.
59. Tripathi Prabhat and Lal Pyare (2008). Weed control and Nitrogen losses through weeds in transplanted rice. International J. Agric. Sci., 4 (1): 404-407.
60. Tripathi Prabhat, Dutta T K, Upadhyay R S and Gupta D L (2007). Evaluation Of various rainfed pastures for goat production in yamuna ravines of Uttar Pradesh. Range management and Agroforestry 28 (2): 358-359.
61. Vihan V S, Kumar A and Arora N (2007). In vitro larvicidal activity of various ethanomedicinal plants extract on *Haemonchus contortus*. The Indian Journal of Animal Sciences 77(12): 1219-1223.
62. Vinod Gupta, Sharma S D, Vihan V S and Kumar A (2007). Influence of kidding season on prevalence of subclinical ketosis in goats under organized farm conditions. Indian J Small Ruminant 13:202-204
63. Vohra J, Singh S V, Singh A V, Singh P K and Sohal J S (2008). Comparative Distribution of *Mycobacterium avium* Subspecies *Paratuberculosis* in Target and Non-Target Tissues of Goats and Sheep Population in India. The Indian Journal of Animal Sciences. 78(4): 4-10.
64. Vohra J, Singh S V, Singh A V, Singh P K and Sohal J S (2008). Detection and Characterization of *Mycobacterium avium* Subspecies *Paratuberculosis* from the Vaginal Secretions of Post-Parturient Farm Goats, Using Culture, Is 900 and ELISA Kit. Indian Journal of Animal Sciences 78 (4): 337-438.

65. Yadav E N, Kharche S D, Goel A K, Jindal S K and Johri D K (2007). Comparative efficacy of different techniques for oocytes recovery from pre pubertal goat ovaries. Indian Journal of Animal Sciences 77(10): 988-990.
66. Yadav E N, Kharche S D, Goel A K, Jindal S K, Sinha N K and Johri D K (2008). Effect of serum source on in vitro maturation and fertilization of prepubertal goat oocytes. Indian Journal of Animal Sciences 78 (2): 146-149.
67. Yadav N K, Mandal A, Sharma D K, Rout, P K and Roy R (2008). Influence of reproductive stages on gastrointestinal nematodes of sheep. Indian Journal of Animal Sciences 78(2): 161-162.

POPULAR ARTICLE:

1. Bhusan S (2007). Genetic Distance at molecular level between high and low Milk producing Jakhrana goats. Goat News, volume 1, No.1, p. 4.
2. Bhusan S (2007). Study of the milk production potential of Jakhrana goats (Hindi). Ajaa Mukh, March-December, p. 4.
3. Dutta T K (2007). Goat production system in Rajasthan state: Nutritional status. In: Goat News published by Central Institute for Research on Goats, Makhdoom, Farah, Mathura, UP-281 122. pp. 9-10.
4. Goel A K and Kharche S D (2007). Striking Differences in Reproductive Characteristics in Goat and Sheep. Goat News 1(1): 6.
5. Goel A K and Kharche S D 2008. Aasay Hooga Vikas-Bakarion Kaa. Kheti (ICAR, Hindi) 60(10): 25-28 (January 2008).
6. Goel A K, Kharche S D and Jindal S K (2007). Techniques of Early Pregnancy Diagnosis in Goats by Sonographic Imaging. Goat News 1(1): 3-4.
7. Goel A K, Kharche S D, Jindal S K and Singh N P (2007). Diagnosis of Early Pregnancy in Goats. ICAR News - Promising Technology 13(1):2 (January-March 2007).
8. Gopal Dass (2008). Saghan pravandhan mein bhedon se adhik aay. Ajamukh, Hindi quarterly magazine, January-March, 2008, pp: 4.
9. Jindal S K and Sharma D K (2007). Bakri: Bhooth, Varthman Tatha Bhavishya. Ajamukh: 19: 6.
10. Kharche S D and Goel A K 2007. Stem Cell

- Technology - Future prospects. *Goat News* 1(1):3.
11. Kumar Puneet (2007). Bharat ki Vibhinna Jalvayu ki Bakri Naslen. *Ajamukh*. March-December, 2007, pp 7.
 12. Kumar Puneet (2007). Bharat ki Vibhinna Jalvayu mein Bakrion Ka Anukoolan. *Kheti*. Vol 60 (6): 3-7.
 13. Kumar Shalander and Singh N P (2007). Commercialization of Goat Farming. *Goat News, CIRG, Makhdoom*, 1(1):4-6.
 14. Kumar Shalander, Goel A K and Singh N P (2007). Commercial goat farming -Success Story. *ICAR News Spectrum* 13 (3): 23 (July September 2007).
 15. Kumar Shalander, Goel A K and Singh N P (2007). Commercial goat farming: a success story. <http://www.icar.org.in>
 16. Mohan B and Singh K (2007). Role of Information Communication Technologies (ICT) for developing better management skills in agriculture and allied sectors. *Agricultural Extension Review*, January-June, 2007 Vol. XIX, No. 1, pp: 33-38.
 17. Rajneesh Rana, Vijay Kumar, Ashok Kumar, Vinod Gupta, Vivek kumar Gupta and V S Vihan (2007). भेड़. बकरियों को रोगी न होने दें. *KHETI*. 60(8): 25-29
 18. Ramachandran N, Dharm. Singh, Khushyal Singh, Singh, M K and Singh, N P (2007). Vices and their corrective measures in goats. *Livestock International*, 11(6): 4-6.
 19. Rout P K (2008). Genetic origin of Indian goat. *Goat News, CIRG, Makhdoom*, 1 (1): 2-3.
 20. Sagar R L, Mohan B and Singh K (2007). Bakri Palan: November Mah mein kya Karen?, *CIRG, Makhdoom, Farah, Mathura, U.P., Patrak-3/2007-08*.
 21. Sagar R L, Mohan B and Singh K (2007). Unnat Bakri Palan Se Sambandhit September Ke Mah Mein Dhyani Rakhane Yogya Mukhya Janakariyan. *CIRG, Makhdoom, Farah, Mathura, U.P., Patrak-1/2007-08*.
 22. Sagar R L, Mohan B and Singh K (2007). Vaigyanik Va Unnat Tarike Se Bakri Palan Ke Liye October Ke Mah Mein Mukhya Sujhav. *CIRG, Makhdoom, Farah, Mathura, U.P., Patrak-2/2007-08*.
 23. Singh B and Singh N P (2007). *Bakri Palan: Sauda Labh Ka, Kheti*, New Delhi.
 24. Singh D (2007). Unnath Bakri Palan ka rozgar ki samasiya ke nirakaran me yogdan (In Hindi). "26 All India competition for Technical articles in Hindi" organized by Central Secretariat, Hindi Council, New Delhi.
 25. Singh D and Singh N P (2007). Sadhan avam ardhshadhan padhi dwara bakri prabhandhan. *Kheti*, May, pp 3-8.
 26. Singh M K, Ramachandran N and Singh D (2008). Aise Kare Bakri Palan. *Kheti*, January, pp 32-35.
 27. Singh N P (2008). Bakar Palan ka Mahatwa. *Dixit Times*. March 12, 2008
 28. Singh N P (2008). Bharatiya Krishi mne Bakarion ka Mahatwa aur Safalata. *Samkalin Chauthi Dunia* January, 2008:50-54.
 29. Singh N P (2008). Unnat bakari palan hetu vagyanik uplabdhi. *Dixit Times*.5:83. March 26, 2008.
 30. Singh N P (2008). Unnat Bakari Palan- Sidian Safalata ki. *Kheti*, March, 2008.

LEAD PAPER:

1. Kharche S D (2008). Recent advances in cryopreservation of embryo and ova in farm animals. In National training programme on Assisted Reproductive and Management Technologies for Genetic improvement of livestock from 25-3-2008 to 14-4-2008 at CAS, animal Genetic breeding NDRI, Karnal, p-118-124.
2. Kumar Puneet and Misra R P (2008). Role of newer information and communication technologies (ICTs) for socio-economic development of rural poor: A concept note. In: Proceedings of National Conference on Distance Education to Animal Farmers with Emphasis on Women Self-help Groups at Banaras Hindu University, Varansi. February 1-3, 2008, pp.31-34.
3. Kumar Shalander (2008). Marketing of goats and their products. In: V.S. Vihan, S. Kumar and N.P. Singh (eds.) 'Opportunities for commercial goat farming in India', CIRG, Makhdoom, Mathura, pp. 41-52.

4. Lal Krishna and Singh S V (2008). Farming practices for hygienic animal production and food safety. Scientists-entrepreneurs-farmers interactive meet, CIRG, Makhdoom march 1-3, 2008, pp. 21-29.
 5. Rout P K (2007). Breeding for GI nematodes resistance-a sustainable strategy to manage helminth problem in small ruminants in field condition. 10th Indian agricultural scientists and farmers congress, 16-17 February, 2008, BRCC, Allahabad.
 6. Rout P K (2007). Chasing the genes that control resistance to disease in Farm animal. National conference on Biotechnology, August 20-21, 2007, Maharshi Dayanand university, Rohatak, Haryana.
 7. Singh N P (2007). Bio - Diversity in Goats and its Conservation. Conference organized by the U.P. State Biodiversity Board on the occasion of International Day for Biological Diversity, May 22, 2007.
 8. Singh N P (2007). Breeding and feeding management of goats. ISAPM National Symposium on Recent trends in policy initiatives and technological interventions for rural prosperity in smallholder livestock production systems held at Venkataswara Veterinary University, Tirupati, June 20-22, 2007.
 9. Singh N P (2007). Conservation, improvement and management of goat genetic resources in India Compendium on the Training Programme organized at NBAGR, Karnal on Indigenous livestock and poultry conservation in field conditions, September 12-19, 2007.
 10. Singh N P (2007). Generic problems of grazing in forests: Goats the foe of the forest- Myth and realities. India-IIASA international Workshop on Economic, Societal and Environmental benefits provided by the Indian forests held at New Delhi on April 25-27, 2007.
 11. Singh N P (2007). Goat based farming system for livelihood security. National Symposium on "Integrated Farming System and its Role Towards Livelihood Improvement under Indian Context" organized by Farming Systems Research and Development Association at ARS (RAU), Durgapura, Jaipur, October 26-28, 2007.
 12. Singh N P (2007). Goat- Livelihood security for the rural poor. Seminar on Livestock linked livelihood and its impact on rural economy in Orissa organized by the Orissa Livestock Development Society and Indian Society for Sheep and Goat Production and Utilization at OUAT, Bhubneshwar (September 16, 2007).
 13. Singh N P (2007). Goat rearing for chevon production: National perspective. Winter School on "Small Ruminant Feeding System for Commercial Mutton Production and Value Addition to Augment Income Generation", CSWRI, Avikanagar, November 20-December 10, 2007.
 14. Singh N P (2007). Goat rearing under water stressed environments. South Asian Conference on "Water in Agriculture: Management options for increasing crop productivity per drop of water" organized by Soil Conservation Society of India at Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, November 15-17, 2007.
 15. Singh N P (2007). Productivity enhancement in goats under different systems of feeding management. National Symposium on "Rangeland and Forage Resource in Changing Socio-economic Scenario" organized by RMSI at IGFRI, Jhansi, November 15-17, 2007.
 16. Singh N P (2007). Sustainable intensive meat production system for goats and sheep in the tropics. International Tropical Animal Nutrition Conference organized by ANSI at NDRI, Karnal, October 4-7, 2007.
 17. Singh N P (2008). Goat - the poor man's cow and friend of the forest. 2nd International Conference of the Soil Conservation Society of India organized at NASC, New Delhi, February 12-16, 2008.
 18. Singh N P (2008). Technological interventions for enhancing productivity of goats under commercial goat production system. Scientists-Entrepreneurs-Farmers Interactive Meet, CIRG, Makhdoom, March 01-03, 2008.
- Technical Bulletin/ Manual:**
1. Gupta V K, Vihan V S and Singh N P (2007). Molecular and Immunological Techniques Laboratory Manual, CIRG, Makhdoom, Mathura.
 2. Singh Dharm, Goel A K and Singh N P 2008. Unnat Bakri Palan Ke Vagyanik Jankarian, CIRG, Makhdoom.

3. Singh N P and Jindal S K (2008). International Training Manual on "Semen and Embryo Transfer in goats". CIRG, Makhdoom. pp1-186.
4. Singh S V and Singh N P (2007). Diagnosis of Para tuberculosis ELISA KIT SERUM AND MILK for Goats, Sheep, Buffaloes and Human beings, CIRG, Makhdoom, Mathura.
5. Singh S V and Singh N P (2007). Molecular Diagnosis of *Mycobacterium avium* sub-species Para tuberculosis (The cause of Johne's disease in animals and Crohn's disease in human beings) IS 900 PCR from Faeces, Tissues, Milk, Culture, Vaginal Discharges and Serum. CIRG, Makhdoom, Mathura.
6. Singh S V and Singh N P (2007). Molecular diagnosis of Para tuberculosis CULTURE KIT (faeces, tissues, milk, blood, vaginal secretions) Goats, Sheep, Cattle, Buffaloes, Blue Bulls and Human beings, CIRG, Makhdoom, Mathura.
7. आर०बी० शर्मा, धर्म सिंह एवं एन०पी० सिंह (2008)। बकरी के दूध में खास क्या है- आओ जानें। प्रकाशक: निदेशक, के०ब०अनु०संस्थान, मखदूम (फरह), मथुरा।
8. आर०बी० शर्मा, धर्म सिंह एवं एन०पी० सिंह (2008) बकरी के दूध से पनीर बना कर अधिक लाभ कमायें। के०ब०अनु०संस्थान, मखदूम (फरह), मथुरा।
5. Kharche S D and Goel A K (2008). Granulosa and oviductal epithelial cell monolayer: Procedure and uses in embryo development. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. pp. 161-162.
6. Kharche S D and Goel A K (2008). In vitro Maturation, Fertilization and Culture in Small Ruminants. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. pp. 163-172.
7. Kharche S D and Goel A K (2008). Techniques of Artificial Insemination in goats. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. Pp 119-112.
8. Kumar Puneet (2008). Effect of climate on goat reproduction. In: A Training Manual for the Mongolian Scientists Trainees on " Special Training on Semen and Embryo Transfer in Goats, from 26.11.2007 to 25.01.2008, pp 61-69.
9. Misra R P (2008). Housing of Small Ruminants. In: International Training manual on "Semen and Embryo Transfer in goats". P52-59.
10. Ramachandran N and Ranjan R (2008). Semen collection Methods and Schedule. In: International Training manual on "Semen and Embryo Transfer in goats". P82-86
11. Singh N P and Jindal S K (2008). Nutrition in relation to reproduction in goats.. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. Pp. 35-41.

Chapter in Book/ Manual

1. Jindal S K (2008). Cryopreservation of gametes. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. Pp. 79-81.
2. Jindal S K (2008). Design, Layout, Equipment, Maintenance of aseptic preparation including laboratory safety and biohazards of tissue culture/IVF/IVF laboratory. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. Pp. 140-144.
3. Kharche S D and Goel A K (2008). Application of Laparoscopic Technique in Small Ruminants. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. Pp. 151-153.
4. Kharche S D and Goel A K (2008). Estrous synchronization in Small Ruminants. In Training manual on Semen and Embryo transfer in goats. Eds. N.P. Singh and S.K. Jindal. pp. 154-160.
12. Sinha N K and Ramachandran N (2008). A.I. History, Importance and Applications. In: International Training manual on "Semen and Embryo Transfer in goats". p 75-81
13. Sinha N K and Ramachandran N (2008). Management and feeding of breeding bucks and does. In: International Training manual on "Semen and Embryo Transfer in goats". p 91-93
14. Sinha N K and Ramachandran N (2008). Selection and Training of breeding bucks In: International Training manual on "Semen and Embryo Transfer in goats". p 87-90
15. Sinha N K and Ranjan R (2008). Diluents and dilution rate of buck semen. In: International Training manual on "Semen and Embryo Transfer in goats". pp 94-98.
16. Sinha N K and Ranjan R (2008). Semen evaluation. In: International Training manual on

"Semen and Embryo Transfer in goats". pp 103-112.

17. Sinha N K and Ranjan R (2008). Short-term preservation of buck semen. In: International Training manual on "Semen and Embryo Transfer in goats". pp 99-102.

RADIO/TV TALK:

1. Ashok Kumar (2008) Radio programme on "Pashuon mein Rog evam Bachav" answer of farmers question on telephone, All India Radio Mathura, 24 March, 2008 Bakri Palan Prashikshan on AIR, Mathura on 22.06.2007.
2. Dharm Singh (2007). आज की नसीहत: व्यवसायिक बकरी पालन में रोजगार के अवसर। AIR., Mathura on 27.7.2007
3. Goel A K (2008). Jadoun Main Bakri Palan Ka Sujhab (Hindi) All India Radio, Mathura on 07.1.2008 under Braj Gramin Programme.
4. Tripathi P (2007). 'Bahu-Udashiya Paudhon Ki Kheti' at AIR Mathura on June 21, 2007.
5. Rajneesh Rana (2007). बरसात में बकरी पालन के कार्य at A.I.R., Mathura on 28.7.2007
6. Rajneesh Rana (2008). बकरी पालन में नवीन तकनीकें at A.I.R., Mathura on 27.3.2008.

7. Shalander Kumar (2008). 'Ubharata Bakari Palan Vyavsay avam Arthshastra' at AIR, Mathura on 26.03.2008.

8. Braj Mohan (2007). 'Bakri Palan Prashikshan' at AIR, Mathura on 22.06.2007.

PERIODICALS PUBLISHED BY THE INSTITUTE:

1. GOAT NEWS A quarterly update on R and D related to goats
2. AJAAMUKH A quarterly News Letter in Hindi

SEMINARS/CONFERENCES/SYMPOSIA/WORKSHOP ORGANIZED:

Interaction workshop on "Goat husbandry based integrated approach for livelihood security in disadvantaged districts of Bundelkhand region" on 9-10 January, 2008 at CIRG, Makhdoom.

- Scientists- Entrepreneurs- Farmers Interactive Meet under the aegis of ISSGPU on March 1-2, 2008 at CIRG, Makhdoom
- Scientists-Development Officers-Farmers Interactive Meet under the aigies of ISSGPU on March 2, 2008 at CIRG, Makhdoom

CIRG

**ANNUAL
REPORT
2007-08**

- ☞ **Participation in Conferences etc.**
- ☞ **Training Programmes Attended**
- ☞ **Research Programmes of XI Plan**
- ☞ **On-going Research Projects**
- ☞ **Meetings**
- ☞ **Distinguished Visitors**
- ☞ **Personnel**
- ☞ **Personnelia**



PARTICIPATION IN SEMINARS/ CONFERENCES/ SYMPOSIA/ WORKSHOP

A.K. Goel

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Kishan Mela and Agriculture cum Animal Exhibition at U.P. Pt. Deen Dayal Upadhyay Veterinary University and Gau Anusandhan Sansthan, Mathura (25-26th March, 2008).

A.K. Das

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Ashok Kumar

State conference on recent advances and techniques in diagnostic methodology for sustainable livestock and poultry development under ASCAD at Regional Disease diagnostic laboratory Centre. Kota, Rajasthan on February 4-5, 2008

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Orientation workshop for the coordinators of field experience training at National Academy of Agricultural Research Management, Hyderabad (6-7 March, 2008)

Braj Mohan

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

B. Rai

IX Scientist Meet of AICRP on Goat Improvement held on 10-11 Oct., 2007 at MPUA&T Udaipur (Raj.)

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

D. K. Sharma

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

D. Singh

National Symposium on Recent Trends in Policy Initiatives and Technological Interventions for Rural Prosperity in Smallholder Livestock Production System held at College of Veterinary Science, Sri Venkateswara Veterinary University, Tirupati (A.P.) on June 20-22, 2007.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Gopal Dass

Symposia on "Recent trends in policy initiatives and technological interventions for rural prosperity in small holders' livestock production system" held at College of Veterinary Sciences, Tirupati, from June 20-22, 2007.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

H.S. Sisodia

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Hari Prasad

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Khushyal Singh

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

M.K. Singh

IX Scientist Meet of AICRP on Goat Improvement held on 10-11 Oct., 2007 at MPUA&T Udaipur (Raj.)

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

N. K. Sinha

IX Scientist Meet of AICRP on Goat Improvement held on 10-11 Oct., 2007 at MPUA&T Udaipur (Raj.)

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

N.P. Singh

Science-based Agricultural Transformation towards Alleviation of Hunger and Poverty in SAARC countries being jointly organized by IFFCO and ICAR NASC, New Delhi on 5-7 March, 2008.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute

for Research on Goats, Makhdoom from March 1-3, 2008.

IIASA Forestry Workshop-Follow up on commissioned papers convened by Department of Science and Technology, Govt of India. New Delhi on 14 December, 2007.

National Symposium on Rangeland and Forage Resource in Changing Socio-economic Scenario. IGFR, Jhansi, 15-17 November, 2007.

Meeting for finalization of Technical programme of AICRP on Goat Improvement and Foundation Day Ceremony of ASRB. ASRB, New Delhi, 5 November, 2007.

National symposium on 'Integrated farming Systems and its Role towards Livelihood Improvement under Indian Context'. RAU, Jaipur, 26-28 October, 2007.

IX Scientist Meet of AICRP on Goat Improvement at MPUAandT, Udaipur on 10-11 October, 2007.

Meeting of Governing Council and Annual General Meeting of Maharashtra Goat and Sheep Insitute. Phaltan, Satara on 17 August, 2007.

National Symposium on Recent Trends in Policy Initiatives and Technological Interventions for Rural Prosperity in Small Holder Livestock Production Systems. College of Veterinary Science, Tirupati on 20-22 June, 2007.

Hindi Workshop Rajbhasha Avam Prabandhan Vikas Sanstha at Gangtok on 7-9 May, 2007.

India-IIASA Joint Workshop on Economic Societal and Environment Benefits provided by the Indian Forests. New Delhi on 25-26 April, 2007.

N. Ramachandran

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Puneet Kumar

National Conference on Distance Education to Animal Farmers with Emphasis on Women Self-help Groups organized by The Indian Association for Animal Production and BHU, Varanasi. February 1-3, 2008.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

P. Tripathi

National symposium on "Range and Forage Resources in Changing Socio-economic scenario" Range management society of India IGFR, Jhansi, November 15-17, 2007.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

P.K. Rout

Annual Scientist's meet of the network programme on Buffaloes, April 4-5, 2007, CIRB, Hisar.

IX Scientist Meet of AICRP on Goat Improvement held on 10-11 Oct., 2007 at MPUA&T Udaipur (Raj.)

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Pratap Singh

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

R.L. Sagar

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

R. Rana:

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Ravi Ranjan

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

R.P. Misra

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

R. B. Sharma

Dairy Cluster Interactive Meet organized by National Development Research Centre on 4-01-08 at Mathura.

Interactive meeting of scientists on 09-04-07 at CSWRI, Avikanagar.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Interactive Workshop on "Goat husbandry based integrated approach for livelihood security in disadvantaged districts of Bundelkhand region" held at CIRG, Makhdoom during 9-10 January 2008.

S. Bhusan

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

RPC meeting of NAIP held on April 15-17, 2008, at Krishi Anusandhan Bhawan, PUSA, New Delhi.

Workshop / Interactive Meet on NAIP (Component 2 and 3) on 28.12.07 at NASC Complex, New Delhi.

Shalander Kumar

15th Annual Conference of Agri. Econ. Res. Association, UAS, Dharwad, 25-26 October 2007.

National Workshop on 'Impact assessment of new agricultural technologies', NCAP, New Delhi, 30-31 January 2008.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

S.D. Kharche

XXII Annual convention and National symposium on Challenges in improving reproductive efficiency of farm and pet animals at the, College of Veterinary Science and A.H, OUAT, Bhubaneswar from December 7-9, 2007.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

S.K. Jindal

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

S.K. Singh

IX Scientist Meet of AICRP on Goat Improvement held on 10-11 Oct., 2007 at MPUAandT Udaipur (Raj.)

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute

for Research on Goats, Makhdoom from March 1-3, 2008.

S.V. Singh

9th International Colloquium on *Paratuberculosis*, Tsukuba Science City, JAPAN, organized jointly by International Association of *Paratuberculosis* and Japanese Society for *Paratuberculosis*, 29 Oct., 2007 to 2., Nov., 2007.

National Seminar and workshop on Johne's disease, Indian Veterinary Research Institute, Izatnagar on 8-9, August, 2007.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Training cum workshop on cytokine assay, 26-27, Feb., 2008. Niche area of excellence, dept of microbiology and epidemiology. UPPDDU Vet. Science University, Mathura.

T.K. Dutta

National Symposium on "Rangeland and forage resources in changing socio-economic scenario" organized at Indian Grassland and Fodder Research Institute, Jhansi-284 003, India on November 15-17, 2007.

International Tropical Animal Nutrition Conference held at National Dairy Research Institute, Karnal, Haryana on 4-7 October 2007.

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Vivesk Kumar Gupta

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Vijay Kumar Gupta

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

Vinod Kumar Gupta

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

U.B. Chaudhary

National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

National Work-shop on status and Perspective of Biotechnology in Animal Feeds and Feeding, held at IVRI Izatnagar, on 11-12 March, 2008.
Review meet of AICRP on Improvement of feed Resources and Nutrient utilization in raising animal production, held at NIANP Bangalore on, 3.11.07.

Mr. Dinesh Prasad, Mr. Bhagwan Singh, Mr. Suresh Tiwari, Mr. Inder Pal, Mr. C.B. Pandey, Mr. U.C. Yadav, Mr. V.P. Singh, Mr. H.K. Himkar, Mr. Jagdish Singh, Dr. Balraj Singh, Mr. A.S. Prajapati, Mr. M.P. Agarwal and Mr. Dori Lal Gupta participated in "National Goat Fair and Scientists-Entrepreneurs-Farmers interactive meet" held at Central Institute for Research on Goats, Makhdoom from March 1-3, 2008.

TRAINING ATTENDED

N.P. Singh

Executive Development Programme in Agriculture Research Management. NAARM, Hyderabad, 18-21 September, 2007.

Ravi Ranjan

Successfully completed FOCARS training at NAARM, Hyderabad from 08-01-2007 to 07-05-2007.

Successfully completed 21 days National Training Programme on "Assisted reproductive and management technologies for genetic improvement of livestock" held at NDRI, Karnal from 25-03-2008 to 14-04-2008.

Gopal Dass

National training programme on "Genetic analysis of animal breeding data using advanced software packages" at Centre for advanced studies (CAS), National Dairy Research Institute, Karnal (Haryana) from October 10-30, 2007.

S.D. Kharche

7th training programme on 'Developing Winning Research Proposals' from April, 20-25, 2007 at NAARM, Hyderabad, India.

PROGRAMMES FOR XI FIVE YEAR PLAN

- Evaluation, conservation and genetic improvement of goats through conventional and molecular approaches.
- Development of resource based feeding systems for goats.
- Improving productive and reproductive efficiency through physiological and nutritional interventions.
- Management of goat diseases using state of the art technologies.
- Facilitating adoption of goat to impending climate change.
- Post harvest processing, value addition and marketing of goat products.
- Technology showcasing, dissemination and adoption.

RESEARCH PROJECTS

Project No.	Project Title	Investigators	Date of start	Date of completion
GOAT GENETICS AND BREEDING DIVISION				
XI/GGB-1: Evaluation and improvement of growth, milk, meat and skin traits in Indian goat breeds (Jamunapari, Barbari, Jakhrana, Beetal and Bengal goats) through Multi Disciplinary Approach.				
GGB-1.09	Improvement of sire evaluation of Jamunapari goats for milk and meat production (AICRP-Jamunapari).	M.K. Singh, T.K.Dutta and H.A. Tiwari	1997-98	March, 2012
GGB-1.10	Genetic improvement of Barbari goats for meat and milk production (AICRP-Barbari)	S.K. Singh and P.K. Rout	1997-98	March, 2012
GGB-1.11	Conservation and improvement of Jamunapari goats in their home tract (AICRP- Field Unit).	P.K. Rout, S. Bhusan, A. Mandal and R.Roy	1997-98	March, 2012
XI/GGB-1.1	Evaluation and Improvement of Jakhrana Breed through Open Nucleus Breeding System (ONBS).	Saket Bhusan (PI) Gopal Dass H.A. Tiwari R.B. Sharma	April, 2007	March, 2012
XI/GGB- 2:	Molecular analysis of major genes and quantitative trait loci influencing growth, reproduction and disease resistance traits in Indian goats	P.K.Rout (PI) A. Mandal, A. K. Das, S.K. Singh, M.K. Singh, R. Roy	April, 2007	March, 2012
NUTRITION, FEED RESOURCES AND PRODUCTS TECHNOLOGY DIVISION				
XI/NFRPT-1	Development of Fodder production, conservation and processing technologies for small holders and commercial goat farmers.	P.K. Sahoo (PI, up to December, 2007) P. Tripathi (PI) T.K. Dutta	April, 2007	March, 2012
XI/NFRPT-2	Development of economic feeding systems for improving goat production.	T.K. Dutta (PI) P.K. Sahoo R.S. Upadhyaya	September, 2007	March, 2012
XI/NFRPT-3	Studies on evaluation of Carcass traits, meat quality attributes and milk composition.			
XI/NFRPT-3.1	Quality evaluation of goat milk and development of various value added products.	R.B. Sharma (PI) A.K. Das	April, 2007	March, 2012
XI/NFRPT-3.2	Evaluation of Carcass traits, meat quality and products from goat meat.	A.K. Das (PI) R.B. Sharma	April, 2007	March, 2012

PHYSIOLOGY, REPRODUCTION AND SHELTER MANAGEMENT DIVISION

XI/PRSM-1: Improved productivity of goats through reproductive bio-technologies including refinement of frozen semen, strengthening of semen bank and augmentation of prolificacy.

XI/PRSM-1.1	Studies on refinement of frozen semen technology and strengthening of goat semen bank.	S.K. Jindal (PI) S.D. Kharche N.K. Sinha A.K. Goel N. Ramachandran Ravi Ranjan	April, 2007	March, 2012
XI/PRSM-1.2	Augmentation of Prolificacy by using biotechnological tools in goats.	S.D. Kharche (PI) A.K. Goel S.K. Jindal	April, 2007	March, 2012

XI/PRSM-2: Development of model goat production system including adaptability and environmental aspects for integrated rural development based on goat farming.

XI/PRSM-2.1	Model goat production systems with special reference to intensive and semi-intensive systems.	Dharm Singh (PI) S.K. Jindal N. Ramachandran B. Rai R.B. Sharma H.A. Tiwari	April, 2007	March, 2012
XI/PRSM-2.2	Production performance and adaptability of goats under different management system.	Puneet Kumar (PI) R.P. Misra	April, 2007	March, 2012

GOAT HEALTH DIVISION

XI/GH-1	Monitoring and surveillance of Important goat diseases in India.	D.K. Sharma (PI) V.K. Gupta R. Rana Ashok Kumar V.S. Vihan	April, 2007	March, 2012
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XI/GH-2: Diagnosis and development of prophylaxis and treatment for control of Brucellosis, JD and CCPP in goats.

XI/GH-2.1	Modulation of caprine coccidiosis through herbal therapy.	D.K. Sharma (PI) Ashok Kumar	April, 2007	March, 2010
XI/GH-2.2	Development of herbal anti-diarrhoeal drug for goats.	Ashok Kumar (PI) R. Rana V.S. Vihan V.K. Gupta	April, 2007	March, 2010
XI/GH-2.3	Control of Brucellosis in goats by molecular diagnosis and epidemiology.	V.K. Gupta (PI) S.V. Singh V.S. Vihan	July, 2007	June, 2010
XI/GH-2.4	Development of specific diagnostic for caprine pneumonia in goats using M-Mycoides sub-sp. Capri isolates.	Rajneesh Rana (PI) V.K. Gupta P.K. Rout Ashok Kumar V.S. Vihan	April, 2007	March, 2010
XI/GH-2.5	Field trials of indigenous vaccine against J.D. in goat and sheep farms located in different agro-climatic regions of the country.	S.V. Singh (PI)	April, 2007	March, 2010

EXTENSION EDUCATION AND SOCIO - ECONOMICS SECTION

XI/EESE- 1: Transfer of Technology and its impact on improving goat production.

EESE-8.14	Multidisciplinary project on transfer of technology for sustainable goat production system	N.P. Singh (PC) R.L. Sagar Dharm Singh A.K. Goel B. Rai Ashok Kumar U.B. Chaudhary Braj Mohan Shalendra Kumar M.K. Singh R.B. Sharma K. Singh H.A. Tiwari	June, 2005	June, 2009
XI/EESE-1.1	Development of Tests, Scales to measure the knowledge and attitude of the small ruminants livestock owners towards selected goat Husbandry practices.	R.L. Sagar (PI) Khushyal Singh Braj Mohan	April, 2007	June, 2009
XI/EESE-1.2	Study on adoption of goat production technology.	Braj Mohan (PI) R.L. Sagar	April, 2007	March, 2010
XI/EESE-1.3	Impact of improved technologies and emerging market conditions on goat production system.	Shalander Kumar (PI) Khushyal Singh M.K. Singh	April, 2007	March, 2011
XI/EESE- 1.4	A study on impact of various training programmes.	Khushyal Singh (PI) R.L. Sagar Braj Mohan	April, 2007	March, 2010

IMPORTANT MEETINGS

Research Advisory Committee (RAC)

- | | |
|---|-------------------------|
| 1. Dr. A.T. Sherikar
Ex. Vice Chancellor
Maharashtra Animal and Fishery
Science University, Nagpur | Chairman |
| 2. Dr. H.N. Singh
Ex. Dean, U.P. Pt. Deen Dayal Upadhyaya
Pashu Chikitsa Vigyan Vishwa Vidhyalay
Evam Go Anusandhan Sansthan, Mathura | Member |
| 3. Dr. B.C. Pantnayak
Ex. Director
CSWRI, Avikanagar | Member |
| 4. Dr. P.S. Lonkar, Director (Extension)
Maharashtra Animal and Fishery Science
University, Nagpur | Member |
| 5. ADG (AN&P)
ICAR, Krishi Bhavan, New Delhi | Member |
| 6. Dr. B.U. Khan, Ex. Director
CSWRI, Avikanagar | Member |
| 7. Shri Ashok Kale, Representative
Agricultural/Rural Interest | Member |
| 8. Shri Sayaed G.H. Rizwi, Representative
Agricultural/Rural Interest | Member |
| 9. Dr. N.P. Singh
Director, CIRG, Makhdoom | Member |
| 10. Dr. N.K. Sinha
PS and I/C PME Cell | Member Secretary |

Institute Research Committee (IRC)

A six days Institute's Research Council (IRC) meeting for 2007-08 was held at the institute from May, 26-31, 2008 under the chairmanship of Dr. N.P. Singh, Director of the institute. Dr. N. K. Sinha, Principal Scientist and Incharge PME section acted as Member Secretary. The meeting aimed to review the progress made under different research projects and also to discuss and decide the technical programme to be undertaken during XI Five Year Plan period. All the scientists and technical officers of the Institute participated in the meeting. The Chairman in his opening remarks appraised that keeping in view of the future thrust areas of research, the programmes have been revised by Animal Science Division of ICAR New Delhi.



The progress of the research projects for the year 2007-08 was reviewed. In total the progress of 16 major research projects was presented by the principal investigators and collaborators.

DISTINGUISHED VISITORS

Name and address	Comments
Pawan Tomar (I.R.S.), I.T. Office, Mathura	The short visit was interesting and educative. The sprawling campus is impressive.
Dr. V.S. Korikanthimath, Director, ICAR Research Complex, Ela, Old Goa	Indeed it was a great pleasure to visit CIRG, Mathura and go round the laboratories and fields. I congratulate the Director and all the dedicated scientists for their concern, commitment and persuasion on research the animal that is still playing a dominant role in not only livelihood securities but the nutritional security as well the small and marginal farmers. We wish to have a collaborative programmes with this pioneering national institute on goat. I wish all success.
Dr. Nguyen Kim Lin, Goat and Rabbit Research Centre of Vietnam	<p>It very nice for me to have opportunity to visit CIRG, Mathura. In Vietnam goat production is developing well now with Indian goats by local and their crosses with Vietnam local goats, but up to now Indian goats in Vietnam have inbreeding problem. So in order to help Vietnam to develop Indian goats sustainable in Vietnam, GRRC would like CIRG, Mathura, India support us in Science and Technology to research and develop goats production in future. Vietnam Govt. already in support for cooperation in Science and technology between India and Vietnam. So we would like to receive close cooperation from CIRG, India to develop goat wealth in Vietnam and through Vietnam in Lao and Combodia and other country in Asia.</p> <p>On behalf of GRRC I would like to Sincerely thank to you for your attention and help us Since 1994 up to now.</p>
K.M. Bujarbaruah, DDG (AS), ICAR, New Delhi.	<p>An Institute with relatively good infrastructure land/animal resources, scientific and other manpower committed to develop and provide the needed technology backstopping in the areas of goat milk, meat, skin etc. production. Over the years, it has been able to develop selected lines from different breeds, health protection technology together with nutritional technology and product processing technology. Much more, however needs to be done in the areas of biotechnology, integrated farming, technology validation at farmers' field so that goat rearers get benefited ultimately.</p> <p>It will be desired that suitable programmes are formulated for XI plan to address issues like productivity increase, climate change, market intelligence, value added products and goat economics to bring home the point of a better economic security for the rural poor through improved and tested technology and package. I wish the Institute all the best.</p>

<p>Prof. S.N. Jayadevappa Smt. Sheel Tiwari Sri. Samad Siddique Board members of Karnataka Veterinary, Animal and Fisheries Sciences, University, Bidar Sri N. Rajanna Prof. M.G. Govindaiah, Special Officer of University, K.V.A.F.S.U, Bidar Karnataka</p>	<p>CIRG is one of the prestigious and lead Institute on Goats, which being visited by Hon'ble Board of management committee, KVAFSU, Bidar on the afternoon of 16.11.2007.</p> <p>Every body interacted with the Scientists. Dr. Sinha provided information on activities of the Institute. The team visited the Goats Units, specially felt happy to see the Barbari, Jakhrana, Jamunapari and Sirohi goats and to learn the productivity of these breeds. This Institute will go a long way in goat research activities and would become a leader in goat research and development activities in future.</p>
<p>Mr. Franz Woekly - Chairman of Regional Bank of Credit Agricole, Paris</p>	<p>Most welcome in France.</p>
<p>Dr. Akhilesh Prasad Singh Ji Hon'ble Minister of State for Agriculture, Food and Consumers' Affairs, Govt. of India, New Delhi.</p>	<p>It is quite impressive to visit this Institute and at the same time exciting to see different varieties of goats from the globe.</p>
<p>Dr Williard L. B. Simukali, Chief Animal Production Officer and Dr Grace K. Nkhuwa, Chief Executive Officer, Micro Banker Trust, Lusaka, Republic of Zambia</p>	<p>It was an enriching experience to visit this Institute.</p>

PERSONNEL

NAME

DESIGNATION

Prof. (Dr.) M.C. Sharma

Director

GOAT GENETICS AND BREEDING DIVISION

Dr. R. Roy

Principal Scientist and I/C, Head

Dr. S.K. Singh

Principal Scientist

Dr. Gopal Dass

Sr. Scientist

Dr. Saket Bhushan

Sr. Scientist

Dr. P.K. Rout

Sr. Scientist

Dr. M.K. Singh

Sr. Scientist

Dr. A. Mandal

Scientist (Sr. Scale)

Shri Bhagwan Singh

Technical Officer T-6

PHYSIOLOGY, REPRODUCTION AND SHELTER MANAGEMENT

Dr. S.K. Jindal

Principal Scientist and I/C, Head

Dr. R.P. Misra

Principal Scientist

Dr. N.K. Sinha

Principal Scientist

Dr. Dharm Singh

Principal Scientist

Dr. D.K. Nandy

Principal Scientist (up to 31.8.2007)

Dr. A.K. Goel

Principal Scientist

Dr. Puneet Kumar

Sr. Scientist

Dr. S.D. Kharche

Sr. Scientist

Dr. Neeru (on deputation to UPCAR, Lucknow)

Scientist (Sr. Scale)

Dr. N. Ramachandran

Scientist

Dr. Ravi Ranjan

Scientist

Mr. H.K. Himkar

Technical Officer T-5

NUTRITION, FEED RESOURCES AND PRODUCTS TECHNOLOGY DIVISION

Dr. R.S. Upadhayay

Principal Scientist and I/C, Head

Dr. M.K. Agnihotri

Sr. Scientist (on deputation to Min. of Agril.)

Dr. U.B. Chaudhary

Sr. Scientist

Dr. T.K. Dutta

Sr. Scientist

Dr. P.K. Sahoo

Sr. Scientist (up to 31.12.2007)

Dr. R.B. Sharma

Sr. Scientist

Dr. Prabhat Tripathi

Scientist (Sr. Scale)

Dr. V. Rajkumar

Scientist (on study leave)

Dr. A.K. Das

Scientist

Mr. Dinesh Prasad

Technical Officer T-6

Mr. Dori Lal

Technical Officer T-5

GOAT HEALTH DIVISION

Dr. V.S. Vihan
Dr. S.V. Singh
Dr. D.K. Sharma
Dr. V.K. Gupta
Dr. Ashok Kumar
Dr. Rajneesh Rana
Dr. V.K. Gupta
Dr. H.A. Tiwari
Mr. Suresh Tiwari

Principal Scientist and I/C, Head
Principal Scientist
Sr. Scientist
Sr. Scientist
Sr. Scientist
Sr. Scientist
Sr. Veterinary Officer
Sr. Veterinary Officer
Technical Officer T-6

EXTENSION EDUCATION AND SOCIO-ECONOMICS SECTION

Dr. R.L. Sagar
Dr. Braj Mohan
Dr. Shalander Kumar
Dr. Khushyal Singh
Mr. U.C. Yadav

Principal Scientist and I/C
Sr. Scientist
Sr. Scientist
Scientist
Technical Officer T-5

AICRP ON GOATS

Dr. B. Rai
Shri. M.P. Agarwal

Principal Scientist
Technical Officer T-5

AICRP ON SHEEP

Dr. Gopal Dass
Dr. Hari Prasad

Sr. Scientist
Technical Officer T7-8

PLANNING, MONITORING AND EVALUATION SECTION

Dr. N.K. Sinha
Dr. H.S. Sisodiya

Principal Scientist and I/C
Technical Officer T7-8

AGRICULTURE RESEARCH INFORMATION SECTION

Dr. S.K. Singh
Mr. V.P. Singh

Principal Scientist and I/C
Technical Officer, T-5

MAINTENANCE AND AGRI. ENGG. WORKSHOP

Dr. P.K. Sahoo
Dr. R.P. Misra
Shri Jagdish Singh

Sr. Scientist and I/C (up to 31.12.2007)
Principal Scientist and I/C (w.e.f. 1.1.2008)
Technical Officer, T-5

HORTICULTURE SECTION

Dr. Dharm Singh

Principal Scientist and I/C

SECURITY SECTION

Dr. R.B. Sharma
Shri P.K. Sharma

Sr. Scientist and I/C
Security Officer

HUMAN DISPENSARY

Dr. V.K. Gupta
Mr. C.B. Pandey

Sr. Medical Officer
Technical Officer, T-6

LIBRARY

Dr. Pratap Singh

Technical Officer, T-9

AGRICULTURE FARM

Dr. T.K. Dutta
Mr. Indra Pal

Sr. Scientist and I/C
Technical Officer, T-6

ADMINISTRATIVE

Shri Kumar Vivek
Shri H.S. Sharma
Shri Ratan Singh
Shri S.R. Achary
Dr. Balraj Singh

Administrative Officer
Asstt. Admn. Officer
Asstt. Admn. Officer (on deputation)
Private Secretary
Technical Officer, T-5

AUDIT AND ACCOUNTS SECTION

Shri S. Philipose

Finance and Accounts Officer

PERSONNELIA

Transfer

Dr. P.K. Sahoo, Sr. Scientist transferred to IARI, New Delhi on 31.12.2007

New Assignments

Shri S.P.S. Negi, Assistant joined as Assistant Administrative Officer at NRC on Yak, on 30.08.2007.

Shri Shyam Baboo Sharma, Junior Account Officer joined as Assistant Finance and Account Officer at National Research Centre on Agro Forestry at Jhansi, UP on 11.01.2008.

Joinings

Dr. Ravi Ranjan joined as Scientist (Animal Physiology) on 18.05.2007.

Shri Chandan Singh appointed as S.S. Grade I on 17.03.2008.

Shri Jagdish Singh appointed as S.S. Grade I on 17.03.2008.

Retirements

Dr. D.K. Nandy, Principal Scientist (AP) superannuated on 31.08.2007.

Assessment Promotions

Dr. A.K. Goel, Senior Scientist was promoted as Principal Scientist.

Dr. S.V. Singh, Senior Scientist was promoted as Principal Scientist.

Dr. S.K. Singh, Senior Scientist was promoted as Principal Scientist.

Dr. B. Raj, Senior Scientist was promoted as Principal Scientist.

Shri Niranjan Prasad, SS Grade III promoted to the post of Junior Clerk.

Shri Yatendra Kumar, SS Grade II promoted to the post of T-I.

Shri Rama Swroop, SS Grade III promoted to the post of T-I.

Shri Rajan Singh Sarawast, SS Grade II promoted to the post of T-I.

Shri Krishna Kumar, SS Grade III promoted to the post of T-I.

Demise

Shri Ikram, SS Grade IV on 7.7.2007.



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