ICAR - CSWRI

भा.कृ.अनु.प.–केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान, अविकानगर

ICAR - CENTRAL SHEEP AND WOOL RESEARCH INSTITUTE, AVIKANAGAR

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NEWS LETTER

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Contents

From the Director's Desk

Dear Esteemed Colleagues and Stakeholders,

As we traverse through another significant phase in our journey at ICAR-Central Sheep and Wool Research Institute, it is with great pleasure that I reflect on our collective achievements and the promising path ahead. Our institute has always been at the forefront of advancing research and innovation in sheep, rabbit, goat and wool. With each passing year, we deepen our commitment to excellence in scientific inquiry, ensuring sustainable practices in small ruminant husbandry and enhancing the productivity of our livestock. We understand that sheep husbandry encompasses a range of issues and challenges varying across regions; it includes climate change & environmental pressures, disease outbreaks, feed fodder availability, economic constraints, market access, and socio-cultural practices affecting the management, productivity, and sustainability of sheep and goats worldwide. Furthermore, the country's wool market faces several challenges that impact its growth, sustainability, and competitiveness. This volatility in demand often leads to fluctuations in wool prices and coarser wool fibre, affecting the profitability of wool producers and traders. However, we are committed to addressing these challenges and have been streamlining new innovations for wool utilization, developing regulatory and supportive processes/ policies for the wool industry's development, and undertaking significant multi and interdisciplinary research initiatives to improve quality mutton production and enhance the utilization of coarse wool through various institute and externally funded projects. We have also received 2 patents i.e., "Liquid milk formula" and "Coarse wool fabric reinforced high strength composite and its preparation process".

This year, the institute has witnessed the eminent presence of high-profile dignitaries such as Honourable Vice-President of India, Shri Jagdeep Dhankhar, and Dr. Himanshu Pathak, Director General, ICAR. Recently, a regional workshop on "Promotion of Artificial Insemination and Machine Wool Shearing in Sheep in the Northern Temperate States of India" was organized on 29 June 2024. Dr. Sanjay Kumar, Chairman of the Agricultural Scientist Recruitment Board (ASRB), New Delhi, graced the workshop as the chief guest. The institute also organized its 63rd Foundation Day on 04 January 2024, which was graced by Dr. Inderjeet Singh, Vice-Chancellor, GADVASU, Ludhiana. Our institute was fortunate to welcome our new DDG (Animal Science) , Dr. Raghavendra Bhatta, at the Arid region campus in Bikaner to celebrate its foundation day as a Chief Guest for a Farmer's Scientist Interaction meeting on 6th April 2024. We have also organized the Zonal Farmer's Fair during the Foundation Day of NTRS, Garsa, on 9th February 2024, where Dr. S.P. Kimothi, Member, ASRB, was the Chief guest. The institute also organized 5 farmers' training, 4 Kisan sangosthi, and 8 health camps under MSSP, TSP, SCSP, and Farmer's first project. I am sure the information in the newsletter would be useful to farmers and stakeholders. I look forward to the continued support and dedication of our team as we navigate the opportunities and challenges that lie ahead. Let us forge ahead with determination and optimism, knowing that our efforts today will shape the future of agriculture tomorrow.

(Arun Kumar Tomar)
Director

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Research Highlights

Blue Sheep of Ladakh

Ashish Chopra

The Bharal, known as the blue sheep, is a caprine species native to the high Himalayas. It occurs in India, Bhutan, China (including regions like Gansu, Ningxia, Sichuan, Tibet, and Inner Mongolia), Myanmar, Nepal, and Pakistan. These medium-sized caprids have a dense slate grey coat, sometimes with a bluish sheen. Their underparts and legs are white, while the chest and fronts of the legs are black. A charcoal-colored stripe separates the grey back from the white belly. Both males and females have ridged horns, with males' horns growing upwards, then turning sideways and curving backward. Females have shorter, straighter horns. The Blue sheep inhabits high-altitude regions, often found in rugged mountainous terrain. It can graze like a sheep and climb cliffs like a goat. Blue sheep are active throughout the day, alternating between feeding and resting on the grassy mountain slopes. Due to their excellent camouflage and the absence of cover in their environment, blue sheep remain motionless when approached. Once they have been noticed, however, they scamper up to the precipitous cliffs, where they once again freeze and use camouflage to blend into the rock face.

Genomics for the identification of climate- resilient genes in sheep

K.A. Saravanan

As global temperatures fluctuate and extreme weather events become more frequent, identifying and understanding the genetic basis of climate adaptation in sheep is crucial for sustainable livestock production. At CSWRI, our research employs advanced genomic tools to analyze medium- density SNP chip data from diverse sheep populations worldwide. We aim to uncover specific genes associated with thermotolerance and other adaptive traits by focusing on selection signatures. Selection signatures are regions of the genome shaped by natural or artificial selection, indicating traits advantageous for survival. Our research involves identifying single nucleotide polymorphisms (SNPs) within these selection signatures linked to adaptation traits such as heat tolerance, disease resistance, and efficient feed utilization. This genomic information will be instrumental in future genomic breeding programs aimed at developing sheep that can maintain productivity and health in adverse environmental conditions and can contribute to the sustainability of sheep farming.

Cryopreservation of fibroblast cells derived from the skin of Katchaikatti Black sheep

G. Nagarajan

The Katchaikatti Black sheep are distributed in the villages of Vadipatti block of Madurai district in Southern Tamil Nadu. This meat-purpose sheep breed is at risk of extinction and is endangered. It is, therefore, imperative to conserve the highly valuable sheep germplasm of Indian origin. Research is being carried out with the aim of *ex-situ in vitro* conservation of this germplasm in the form of cryo cell bank repository. A total number of eight ear pinna samples were collected from Katchaikatti village and processed as per protocol. Standard cell culture protocol was followed for the initial tissue explant culture, and the resultant fibroblast cell subculturing was done up to the P4 level at the periodical intervals. Karyotyping was also carried out with other parameters like cell viability assay, population doubling time, etc., to use the skin fibroblasts in downstream processing. More than 300 vials of skin cells have been cryopreserved in LN_2 after the completion of the standard characterization regimen. The expected outcome of the present study could be preserving the elite germplasm of Katchaikatti black sheep under stringent conditions and exploring the germplasm for further studies soon.

Residual Feed intake: An effective tool for estimating feed efficiency

Srobana Sarkar

Feed accounts for 65–70% of the sheep industry's cost; thus, improving feed efficiency (FE) is an essential commercial aspect. FE is represented by the feed conversation ratio (FCR) or residual feed intake (RFI). FCR is defined as the ratio of feed intake to weight gain over a specific period and is traditionally used in meat and egg production; however, it has certain statistical and biological limitations. Besides, measuring the FCR is not cost-effective. RFI is regarded as a sensitive and accurate method for estimating FE. RFI is the difference between the actual feed intake and the predicted intake based on each animal's body size and performance. A low RFI indicates less feed consumption and waste generation without affecting the animals' weight, production, and body size. Thus, RFI may be a reliable indicator of the differences in FE that account for the diverse genetic background of animals. Thus, studying the regulation mechanism of RFI can not only reduce the cost of feed but also protect the environment by reducing the emission of carbon and methane.

Shelter design for integrated farming of sheep and Rabbits under sub-temperate climatic conditions

R. Pourouchottamane

The shelter design for housing sheep and rabbits in an integrated farming approach was developed to rear both species under a single roof. It is suited for marginal and small farmers who used to rear a few animals without migration. A total of 8 to 10 adult sheep and its followers and 15 rabbits can be housed. This outdoor unit has a slatted floor with options for protection from inclement weather using sandwich curtains made from tarpaulin and foam. It is designed in such a way that predatory attacks, which are common in high altitudes, can be minimized.

Enhancing Sheep Prolificacy: The Novel Role of Insulin-Sensitizing Drug Metformin in Boosting Follicular Number and Ovulation Rate

A. S. Mahla

Scientists and breeders aim to increase the prolificacy of sheep breeds that typically produce one offspring. Nutritional interventions, like flushing, have shown limited success in ewes with normal body conditions. Studies highlight the role of insulin-glucose metabolism in follicular growth, ovulation, and prolificacy. Our study found that n- 3 PUFA-rich fish oil supplementation promotes follicular growth and ovulation, modulating insulin-glucose metabolism and ovarian steroidogenesis. Both n-3 PUFA and metformin enhance insulin sensitivity, promote glucose uptake, and modulate the lipid profile, sharing common molecular pathways. Building on these insights, we studied metformin's effect on preovulatory follicles, ovulation rate, and prolificacy in Malpura sheep, which typically bear single fetuses. Administering 500 mg of metformin daily for 12 weeks increased the number of preovulatory follicles and ovulation rate by 53.2% and 67.4%, respectively, compared to controls. The MET group had significantly more ewes with multiple ovulations (82.6% vs. 30.4%) and higher rates of delivering multiple lambs (2.9 times more) than the CON group. Plasma estradiol, insulin, glucose, total cholesterol, and LDL-cholesterol levels were lower in MET ewes. This study shows metformin can enhance ovulation and prolificacy in ewes while reducing certain plasma levels, marking a first in livestock research.

Molecular markers: To predict sperm freezability

V. Ralte

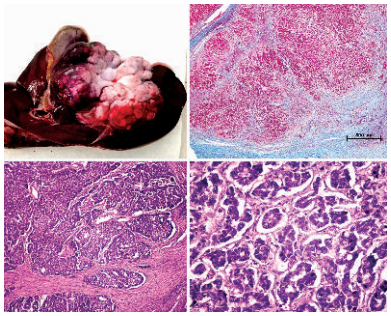
Sperm cryopreservation has been a pillar of assisted reproduction in animals. When the semen is frozen and stored in liquid nitrogen (-196°C), metabolic reactions of the sperm are stopped, allowing the preservation of seminal material for years. However, semen cryopreservation has challenges such as semen quality degradation with time,sensitivity to temperature, variation across species, seasons, latitudes and ejaculate time from the same animal. The post-thaw motility is measured using computer-assisted semen analysis (CASA), and the assessment of mitochondrial activity, DNA and acrosome integrity, and hypo-osmotic

resistance have been used to predict sperm fertility. Research efforts are now focused on identifying trustworthy fertility biomarkers in the sperm and seminal plasma of agriculturally essential and endangered species. Sperm cryo-resistance biomarkers are primarily related to sperm plasma membrane stability, antioxidant substances in sperm or seminal plasma, sperm cell energy metabolism, water and small molecule transport channels in the sperm plasma membrane, and antistress substances in sperm or seminal plasma. Markers that predict the cryo-tolerance of spermatozoa before freezing could significantly enhance the effectiveness of semen cryopreservation across various species.

Hepatocellular Carcinoma - an alarming neoplastic condition in Sheep

D. K. Sharma

Hepatocellular carcinoma is a condition in sheep that develops the cancerous situation in the liver and causes chronic debility, anaemia, anorexia, jaundice, etc. A total of 22 necropsies of these animals revealed severe enlargement with neoplastic growths. These cases were affected with solid, rounded, white colour neoplastic mass of variable size, resulting in the entire liver lobe enlargement. The mass was covered with a thick capsule and contained a central area of necrosis. In some cases, the central part of the tumor revealed white colour invasive tissues extended anteriorly, which resulted in round finger-like projections. The liver parenchyma also found multiple foci of small white neoplastic nodules. Metastasis of these lesions is found in the lungs with multiple small white nodules in all the lobes of the lungs. Histologically, the normal architecture pattern of the liver was lost, and the liver wall was thickened with fibrous connective tissue proliferation; massive fibrosis divided the liver parenchyma into different channels. Sections from tumor mass consisted of irregular cords and trabeculae of polygonal cells with discrete cytoplasmic borders and abundant finely granular cytoplasm. There was marked anisocytosis and anisokaryosis, as well as marked nuclear atypia with low mitotic figures. As such, the neoplasm has no definitive aetiology, but the chemicals and fungal or plant toxins need to be explored. It is an alarming situation in sheep flocks, which have no definitive diagnosis, prevention, or cure for animals.



Artificial Insemination in rabbits – Farmer Participatory achievement

S. J. Pandian

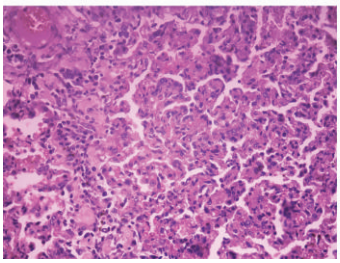
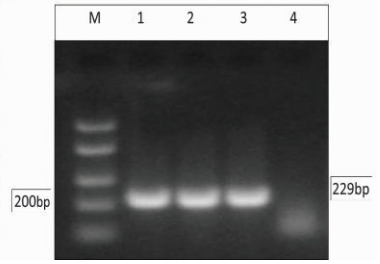
Southern Regional Research Centre (SRRC) trained young entrepreneurs to establish a rabbitry enterprise, M/s. NexGen Rabbitry (p) Ltd. at Karuvelampatti, Madurai. Summer infertility in rabbit bucks is a common problem in the tropics, so their rabbit production suffers during hot months. Although this temporary infertility reverses on its own as the season changes, it heavily impacted the profit of the enterprise. To overcome this glitch, SRRC scientists helped NexGen Rabbitry with an artificial insemination procedure. They imported an Artificial Insemination kit from Spain (KUBUS MRA-BIT®) and sought SRRC's hand-holding support to standardize the technique, including semen collection, dilution, and insemination. On the first occasion, 11 does were inseminated, and 8 were kindled successfully; on the second instance, 10 does were inseminated, and 9 were kindled successfully. Now, the farmers are fluent and regular in performing AI in rabbits.

Enzootic nasal adenocarcinoma (ENA)-an emerging nasal turbinate bone neoplasm in Sheep

G.G.Sonawane

In Rajasthan, a new disease in adult sheep has been reported with ethmoid bone tumor, and clinical symptoms resembled Enzootic nasal adenocarcinoma (ENA). ENA is a contagious neoplasm of the ethmoid turbinate mucosa gland cells associated with a *β- retrovirus*. In sheep, this retrovirus is known as enzootic nasal tumor virus 1 (ENTV-1) and is close to Jaagsiekte Sheep Retro Virus (JSRV). The first incidence of the disease was recorded in September 2019 with 400 animals in Tonk, followed by September 2020 in Jaipur. The incidence reoccurred in 2023. The flocks were investigated thoroughly using molecular and pathological aspects. The ENA is clinically characterized as continuous thick/ bloody nasal discharge from nostrils, Unilateral or bilateral protrusion of the eyeball (exophthalmos), vision loss, respiratory distress, dyspnea, stertorous breathing and frontal skull bone deformity, productive cough, open-



mouthed breathing, emaciation, head tilt, circling, unable to graze the grasses and on necropsy examination revealed a white to grey color, soft, friable, irregular mass of tumor with discrete areas of necrosis in the caudal part of the nasal cavity obstructing the nasal passage leading to dyspnoea and death of affected animals. The nasal adenocarcinoma was diagnosed by histopathology, and the presence of retrovirus was by molecular test. Further molecular investigation and etiological confirmation of this disease are in progress.

Development of Linen-wool/angora, Linen- wool/ camel and Linen-camel/wool/nylon union fabrics

Seiko Jose

To develop apparel quality fabric using fine count blended yarns viz. wool/angora (70:30), Dromedary camel/BM wool (30:70), and Bactrian camel/wool/ nylon (40:20:40) yarns, union fabrics were prepared with pure linen yarn (33 Nm) as warp direction in combination with above-blended yarns as weft direction in rapier shuttleless loom. A total of 90 meters of fabrics were prepared in five different shades of off- white, Mustard, Pink, Red, and Ferozi, and two brown shades of natural camel color. The physical properties were evaluated in addition to its colour properties. The results inferred that incorporating linen along with wool increases the tensile strength and durability of the textiles. The developed fabrics were suitable for gents' and ladies' garments. The washing fastness, dimensional stability, and abrasion resistance of linen/wool blend fabrics were good.

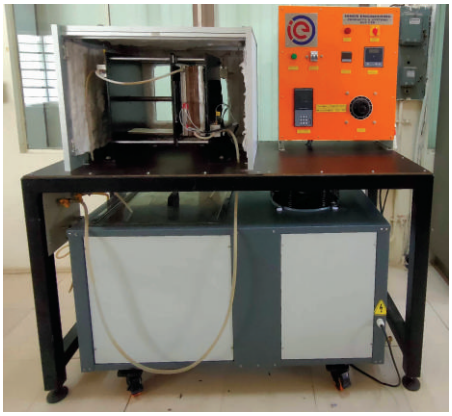
Mechanical properties of Linen/wool blend fabrics

Fabric properties	Direction	Linen-Angora	Linen-Bactrian camel	Linen-Dromedary camel
Tensile strength (MPa)	Warp	35.1	30.4	31.1
	Weft	19.9	20.8	31.5
Elongation at break (%)	Warp	13.7	16.1	12.6
	Weft	22.1	16.8	32.9

Development of a unique setup to measure the thermal conductivity of porous wool felts and non-porous wool composites

Vinod Kadam

Wool is well known for thermal insulation. However, a reliable setup was missing to measure the thermal insulation of thick delts and nonporous wool composites. This new setup can measure the thermal insulation of porous and non-porous materials of various thicknesses at any given temperature of 5-60°C. This setup comprises a test section, a control panel, and a cold bath. The temperature gradient across the test material is measured when subjected to heat on one side and cooling on another. The sample size 300 x 300 mm can be tested, and the temperature across insulation can be measured using 16 sensors. The testing apparatus is a closed-loop versatile system that can measure the conductivity of flexible textiles and complex composites. The measurement is quicker due to less time needed to obtain steady-state conditions. This apparatus was developed in collaboration with M/S Inner Engineering Limited, Ahemadabad, Gujrat. A patent application has been filed (202311062633).



Patents

1. Liquid Milk Formula (LMF): The present invention provides a supplementary liquid formula (LMF) for feeding lambs with high survivability and support for higher weight gain. The LMF closely resembles the ewe's milk in its nutrient and chemical composition and is fortified with constituents supporting early development of the rumen, resulting in earlier and better digestibility of nutrients so that the lambs may gain more by consuming less feed.

2. Coarse wool fabric reinforced high-strength composite: This invention improved the interfacial adhesion of wool with synthetic resin. The stepwise process allows the preparation of high-strength composite from coarse and weak wool fiber through chemical and mechanical interventions.

Agri-business Incubation

CHETNA-2024 incubation program

ICAR-CSWRI's first Agribusiness incubation program, Chetna 2024, was held from March 4 to 15. A total 16 selected entrepreneurs and startups from eight states participated in the program, engaging in insightful discussions and presentations on their entrepreneurial journeys. Most of them registered under ABI and joined hands with CSWRI for business growth.

The new ventures and collaborations will pave the way for a vibrant future in the sheep agribusiness value chain.

Training on commercial sheep, goat, and rabbit farming by ICAR-CSWRI and CEAD Foundation

The ABI at ICAR-CSWRI, Avikanagar, in collaboration with the CEAD Foundation, organized a series of 10 training sessions under the EDP. These training sessions focused on commercial sheep, goat, and rabbit farming. The program aimed to equip participants with essential skills and knowledge for successful agribusiness ventures, fostering entrepreneurship and innovation in the livestock sector.

Aarambh Workshop

On October 16, 2023, ICAR-CSWRI, Avikanagar, in collaboration with the CEAD Foundation, hosted the "Aarambh" workshop on entrepreneurship in sheep, goat, and rabbit farming. Dr. O. P. Chaudhary, Joint Secretary (NLM/PC) (DAHD, MoFAH&D, GoI), and Dr. Bhawani Singh Rathore, Director, AHD (Rajasthan) graced the workshop as guests. The event was attended by 427 participants from 17 states, focused on addressing sector challenges, promoting innovative technologies, and recognizing standout startups in the field.

Events organized

XXVII Meeting of ICAR Regional Committee-VI

On November 3, 2023, ICAR-CSWRI, Avikanagar, hosted the XXVII Meeting of the ICAR Regional Committee-VI. Dr. Himanshu Pathak, Director General of ICAR, graced the event. The meeting provided a platform for discussions on advancements and strategies in sheep and wool research, reinforcing the institute's role in driving agricultural innovation. Many dignitaries across the region actively participated in the meeting.

Workshop on Artificial Insemination and Machine shearing

Under the National Livestock Mission project, a one-day artificial insemination and machine shearing workshop was held on June 29, 2024, at the North Temperate Regional Station, Garsa. 140 Participants attended the event. Dr. Sanjay Kumar, Chairman of ASRB, was the chief guest. Dr. Parvender Sheoran and Dr. Sujit K. Dutta also graced the event.

Scientist Stakeholders Interaction

Farmers from Dungarpur, Udaipur, and Dausa districts were taken to an educational tour to DRR, Bharatpur, DUVASU, Mathura, IARI, New Delhi, NDRI, Karnal, DWR, Karnal, YSPUH&F Nauni, DMR, Solan, NTRS Garsa, IARI, Regional Station, Katrain, GADVASU, Ludhiana, LUVAS, Hisar and Sheep Breeding Farm, Fatehpur. During this visit, farmers interacted with scientists/extension specialists and progressive farmers in different areas/regions.

Kisan Sangosthi

Four Kisan sangosthi/Awareness programs were organized at Avikanagar, Desmi, Gopalpura, and Balapura Village. About 638 farmers participated in these programs. A team of Scientists from the institute addressed the queries of sheep and goat breeders and farmers on the spot at village-level programs. A farmer-scientist interaction program was also organized at Avikanagar, and about 500 farmers participated.

Health Camps organized

Eight health camps were organized in the TOT area to ensure healthcare support to the farmers and increase awareness

regarding advanced health practices. About 219 farmers participated with their animals, and about 1704 sheep, goats, cows, and buffalos were treated during the health camps. All the farmers were given necessary medicines and health care advisory guidelines.

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Celebrations

63rd Foundation Day: ICAR-CSWRI

Dr Inderjeet Singh, Honorable Vice-Chancellor GADVASU, Ludhiana, presided as the chief guest for the 63rd institute foundation day on 04.01.24. Directors Dr. A. Sahoo (NRC Camel), Dr. M. K. Chatli (CIRG Makhdoom), and Dr. A. K. Mohanti (CIRC Meerut) were special guests. A technology exhibition was displayed, and the Institute elite germplasm of Sirohi goats was distributed on the occasion.

62nd Foundation Day: NTRS Garsa

On 09.02.2024, Dr. S. P. Kimothi, Honourable Member, ASRB, chaired the foundation day and inaugurated the farmer fair. Around 400 farmers attended the fair. Dr. Vinay Bhardwaj, Director, ICAR- NRC on Seed and Spices (Ajmer, Rajasthan), Sh. Surender Shourie, MLA, Banjar (Kullu) were among the dignatries. “AviHill- Fine wool sheep” was also released.

51st Foundation Day: ARC, Bikaner

On 07.04.2024, Arid Region Campus (ARC), Bikaner, celebrated its 51st foundation day in the presence of Dr. S P Kimothi, ASRB Member and Dr. Raghavendra Bhatta, DDG (Animal Science). They emphasized doubling farmers' income by adopting scientific sheep husbandry management practices. Directors Dr A Sahoo (NRC on Camel) and Dr. J. Rane (ICAR-CIAH) also addressed the gathering. About 75 sheep farmers participated in the program.

Dignitary visits

Honourable Vice President of India, Shri Jagdeep Dhankhar on 14.09.2023


Honourable Director General, ICAR, Dr. Himanshu Pathak on 03.11.2023


Honourable Member of Parliament, Dausa, Smt. Jaskaur Meena and Honourable State Cabinet Minister, PHED visited the institute on 01.12.2023 and 23.12.2023 (Kisan Diwas), respectively.


Australian Delegation at NTRS, Garsa on 28.02.2024


Dr. Sanjay Kumar, Chairman of ASRB at NTRS, Garsa on 29.06.2024 & Dr. Raghavendra Bhatta, DDG (Animal Science) at ARC, Bikaner on 07.04.2024

भा.कृ.अनु.प.-केन्द्रीय भेड़ एवं ऊन अनुसंधान संस्थान
अविकानगर - 304501
दूरभाष : 01437-220162, फैक्स : 01437-220163
ईमेल : director.cswri@icar.gov.in • website : www.cswri.res.in
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