Volume 21 No. 1, January – June 2021

ICAR-DPR NEWS

SARDAR PATEL OUTSTANDING ICAR INSTITUTION
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Director's Column

It gives me immense pleasure to present the Newsletter for the period January-June 2021 of this Directorate. The staff of the Directorate have put in sincere efforts during these trying times to achieve the mandate of the Directorate. Backyard poultry farming, the priority program for the Directorate, has substantially helped the poor and landless farmers in providing nutritional security during these COVID times. These low/zero input birds have come to the rescue of the farmers to provide the needed protein for the children, elderly and pregnant women. The CRISPR/Cas based editing of Inhibin α gene has shown promising results in improving the egg production and egg quality traits in indigenous Nicobari chicken. The Directorate is in the testing stages of the transgenic bioreactor chicken for human Interferon α 2b. In an effort to make the nation a Swachh Bharat, the Directorate is successful in converting waste to wealth. The poultry litter is mixed with saw chips and high quality vermicompost was produced. The indigenous chicken breeds Aseel, Kadaknath and Ghagus were popularised by supplying fertile eggs and pure-bred chicks to the needy farmers. Molecular mechanisms at hormone level influencing the egg production were delineated in Vanaraja and Aseel chickens. The Regional Station has geared up in research and other developmental activities. The phenomics of the native Kuzi ducks and the nutritional requirements of Pekin ducks have been studied. The Directorate has been constantly striving for the upliftment of the SC and ST communities through input distribution for backyard poultry rearing. Capacity building programmes were also organised on virtual mode to field veterinarians and agripreneurs.

(R.N. Chatterjee)
Director

IN THIS ISSUE

ICAR-DPR Celebrates 34th Foundation Day

The ICAR-Directorate of Poultry Research, Hyderabad celebrated its 34th Foundation Day and National Science Day on 1st March 2021. Dr. V.K. Saxena, Assistant Director General (Animal Production and Breeding), ICAR, New Delhi graced the occasion as the Chief Guest. The ADG (AP&B) appreciated the significant contributions made in the improvement of poultry production, particularly the backyard poultry through the dissemination of improved chicken varieties. He also emphasized the need for rising beyond comfort zones to achieve the targeted objectives of the poultry sector. On this occasion, the ADG (AP&B) released a bulletin entitled "Multiplex PCR for simultaneous and differential detection of tumor viral diseases of chicken" authored by Dr. T.R. Kannaki and co-workers. He also distributed the prizes to winners of the games and sports competitions organized for the staff of the Institute.

Dr. V.K. Saxena addressing the staff

Dr. R.N. Chatterjee addressing the staff

Dr. R.N. Chatterjee, Director, ICAR-DPR presided over the function and highlighted the contribution of ICAR-DPR through its germplasm, technologies and extension activities. He also narrated the significance of celebrating the National Science Day programme in the Country highlighting the research work conducted by Sir C.V. Raman, which led to the discovery of the Raman Effect. Earlier, Dr. M.V.L.N. Raju, Principal Scientist presented the research activities of the Institute. Dr. U. Rajkumar, Principal Scientist and Chairman, Organizing Committee welcomed the dignitaries. Poultry farmers from industry, Officials from Veterinary University and Scientists from local ICAR Institutes and Regional Station, Bhubaneswar participated in this programme. At the end, Dr. L. Leslie Leo Prince, Principal Scientist proposed the vote of thanks.

Dr. V.K. Saxena, ADG releasing the bulletin

RESEARCH HIGHLIGHTS

Comparative studies on different factors influencing egg production in chickens

A total of 50 birds each of Vanaraja (V) and Aseel (A) hens of 24 weeks age were randomly divided into two equal groups. Each group had 5 replicates with five birds in each replicate. They were reared till 36 weeks of age. The control group (CG) was offered standard layer feed and the treatment group (SG) received supplement yeast enriched selenium (Se) product [0.15g/kg feed for vanaraja birds and 0.09 g/kg feed for Aseel birds] in addition to standard layer feed. All the groups were fed 110g feed /bird/day. Effect of supplementation of Se was observed on gene expression for amino acid transporters, melatonin and ghrelin receptors in the jejunum and magnum tissue of both the V and A hens at 26 and 34 weeks of age.

The concentration of plasma amino acids in SG of Vanaraja birds was more but only the amino acid transporter CAT increased and LAT4 decreased significantly in the jejunum, whereas in the magnum tissue, the transporters LAT2 and CAT increased significantly. In Aseel birds also supplementation increased the fold expression of LAT2, CAT and BAT in the magnum tissue only, but supplementation of Se did not cause a significant difference in the expression of amino acid transporters of jejunum, except for BAT between the CG and SG groups. The expression of ghrelin and melatonin receptors (GHSR, MET R) were downregulated in the jejunum of SG of Vanaraja birds, whereas in Aseel (SG) METR was upregulated. In the magnum, both the receptors were downregulated in Aseel, whereas in Vanaraja only METR was downregulated and GSHR was upregulated in SG when compared to CG. The difference was significant at least at $P<0.05$. Supplementation of Se had a differential effect on the expression of amino acid transporters in jejunum and magnum when compared between Vanaraja and Aseel hens. Upon supplementation of Se at 34 weeks of age, in A birds in the jejunum tissue hormone receptors, aa transporters BAT, CAT were expressed less with no significant change in the expression of other transporters. In the magnum tissue, except for LAT2 and GHRL expression of all transporters and METR increased significantly. In V birds, supplementation did not cause a significant change in the expression of hormone receptors in the jejunum and magnum. Only LAT4 and LAT2 aa transporters expression increased significantly in the jejunum and magnum, respectively and expression of remaining transporters was less in the tissues. When compared between the control groups of V and A birds at 26 and 34 weeks, except for LAT2 and LAT4 in the jejunum and magnum, respectively, rest of the amino acid transporters and hormone receptors expression was significantly more in V compared to A birds.

N. Anand Laxmi et al.

CRISPR/Cas based editing of inhibin alpha gene improved egg production in Nicobari native chicken

Inhibin alpha plays significant role in inhibiting synthesis of follicle stimulating hormone (FSH) in the pituitary gland and consequently affects follicular growth eventually required for initiating ovulation to release eggs in the reproductive tract leading to laying of eggs in chicken. Inhibin alpha gene was edited by CRISPR/Cas9 in Nicobari, an Indian native chicken breed. The exon1 sequence of inhibin alpha gene was edited by Cas9 enzyme creating substitution and addition of nucleotides in the sgRNA corresponding sequences in the inhibin alpha gene corresponding to amino acid substitution and frameshift mutation in the inhibin alpha protein. The egg production up to 46 weeks of age was significantly higher by 41% in gene edited birds as compared to the control birds (134 vs 95 eggs). Internal egg quality parameters were analysed, of which Haugh unit and yolk colour index were 19.8 and 17.5% higher, respectively, in the edited birds as compared to the control hens. It is concluded that the editing of exon1 of inhibin alpha gene increased egg production and affected Haugh unit and yolk colour index in Nicobari chicken.

T.K. Bhattacharya et al.

Transgenic chicken developed as bioreactor for production of human interferon alpha 2b

The transgenic construct of 5532 bp was prepared and transferred to the chicken. The positive transgenic birds were screened and a total of 4 transgenic chicks were hatched. Up to 25 weeks of age, two transgenic hens laid 26 and 39 eggs, respectively. The eggs were collected and the protocol was established for purification of interferon alpha 2b protein. The purified interferon alpha 2b was quantified and about 12.5mg interferon alpha 2b protein was isolated from each egg of the transgenic birds and the protein was detected through Western blotting, ELISA and MALDI-MS.

T.K. Bhattacharya et al.

A PCR assay developed for identification of Nicobari chicken

Breed identification is an important task in any livestock and poultry species for many purposes including breed characterization and improvement, breed registration, pure line breeding, admixture analysis, forensic analysis and traceability. In this regard, the whole genome sequence of 10 Indian native chicken breeds (Aseel, Ghagus, Nicobari, Kadaknath, Hansli, Mewari, Punjab brown, Ankleshwar, Haringhata black and Tellicherry) and two synthetic high-yielding exotic chickens (Broiler and Layer types) was explored under the Illumina Novaseq Next-generation Sequencing (NGS) platform at 10X coverage. SNP annotation revealed a point mutation present in all the breeds and was detected with an allele specific PCR assay. This assay confirms the Nicobari breed from the pool of Indian native breeds. This PCR assay will be useful for accurate identification of Nicobari native chicken without looking at the phenotypes of the breed.

T.K. Bhattacharya et al.

Real time PCR quantification of Newcastle disease virus (NDV) copy number based on N gene

PCR condition, standard curve with N gene plasmid and copy number calculation for SYBR green based real time quantification of Newcastle disease virus (NDV) from chicken tissues and allantoic fluid of chicken embryos using N gene was optimized. Standard curve generated with N gene plasmid showed the primer efficiency of 96%.

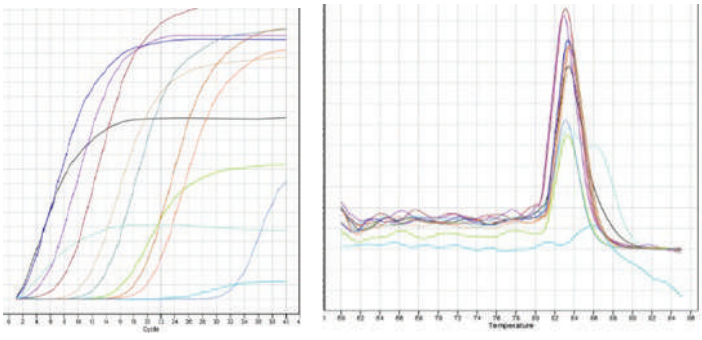


Fig. (a & b). Amplification plot and Melting Curves of NDV by using N gene Specific Primers by SYBR Green Real Time PCR Assay

T.R. Kannaki et al.

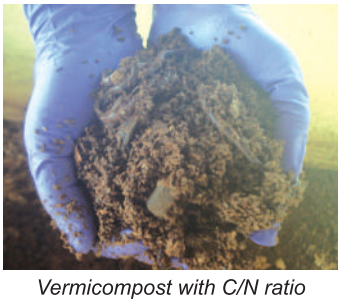
Poultry litter vermicompost preparation by mixing saw chips -Wealth from Waste

The poultry litter could be successfully be converted into compost by mixing with saw chips in proper ratio of carbon to nitrogen (C/N ratio) content present in the litter as well as in saw chips. Finally vermicompost was prepared from the compost by introducing earthworms into the pile of compost.

i) Vermicompost preparation with C/N ratio of 35:1

The compost was prepared having C/N ratio of 35:1 by mixing poultry litter with saw chips having relative humidity 50%, pH 5.0 and temperature 34°C. Fifteen kg of litter was mixed with 48 kg of saw chips. The humidity was maintained at around 50%. The temperature was changing due to the growth of the microbes inside the pile. The compost was ready on 70th day. Once the compost was ready, earthworms were introduced into the pile of compost for converting it into vermicompost. The final product (vermicompost) was ready on 80th day after introduction of earthworms. The relative humidity was 30%, pH was 6.0 and temperature was 25°C on 80th day.

Saw Chips



Vermicompost with C/N ratio of 35:1

ii) Vermicompost preparation with C/N ratio of 30:1

The compost was prepared having C/N ratio of 30:1 by mixing litter with saw chips as supplement having relative humidity of 50%, pH 5.0 and temperature 34°C. Eighteen kg of litter was mixed with 42 kg of saw chips. The compost was ready on 70th day. Once the compost was ready, earthworms were introduced into the pile of compost for converting it into vermicompost. The vermicompost was ready on 80th day after introduction of earthworms. The relative humidity was 35%, pH was 6.0 and temperature of the pile was 25°C on the final day.

iii) Vermicompost preparation with C/N ratio of 25:1

The compost was prepared having C/N ratio of 25:1 by mixing litter with saw chips as supplement having relative humidity 50%, pH 5.0 and temperature 25°C. 25 kg of litter was mixed with 36 kg of saw chips. The compost was ready on 70th day. After the compost was ready, earthworms were introduced into the pile for converting it into vermicompost. The final product (vermicompost) was ready on 80th day after introduction of earthworms. The relative humidity was 35%, pH was 6.0 and temperature was 25°C on the final day of vermicompost formation.

R.K. Mahapatra et al.

Production Performance of Kuzi ducks of Odisha

Production performance of the S1 generation of Kuzi ducks of Odisha was recorded under the DBT project entitled "Genetic up-breeding of duck production to strengthen livelihood security in NER of India by converging conventional and molecular techniques". A total of 462 ducks used for the study were hatched in three hatches and the ducks were reared under intensive system of rearing. Most of the ducks were multicoloured. The first egg of the flock was laid at 110.7±3.75 days. Age of the flock at duck house egg production of 20, 40, 50, 80 and 90 % was 128.7±4.49, 135.3±5.61, 153.7±4.10 and 167.7±6.06 days, respectively. The egg production per bird up to 40, 60, 72 and 80 weeks of age was 110.8, 181.6, 217.7 and 239.2, respectively. The body weight of drake at 40, 52 and 72 weeks of age was 1671±32, 1793±41 and 1824±51 g, respectively. Corresponding body weights in ducks were 1592±11, 1518±17 and 1656±23 g. The egg weight recorded at 20, 40, 60 and 72 weeks of age was 57.36±0.78, 64.26±0.48, 65.19±0.27 and 71.29±0.30 g, respectively. Though the ducks attained 90 % egg production at 24 weeks of age, the flocks were not able to continue with that performance and a lot of variation in respect to duck house egg production was observed. The egg weight increased as age advanced. The reduction in egg weight at 52 weeks of age may be due to better production during the period. The result indicates that the Kuzi ducks may be useful as an egg type breed and extra males maybe used for the meat purpose.

Flock of Kuzi ducks

M.K. Padhi et al.

Metabolizable Energy (ME) Requirement of White Pekin Ducks during Starter Stage.

To determine the optimum level of Metabolizable Energy (ME) requirements of White Pekin ducks during the starter stage an experiment was conducted on 216 day old ducklings up to 6th weeks of age. The ducklings were divided into three groups having six replicates in each group with twelve ducklings in each replicate. The three groups are named as ME-2700, ME-2900 and ME-2100 were offered with diets containing 2700 k ca ME/kg, 2900 k cal ME/kg and 3100 k cal ME/kg metabolizable energy, respectively. All the diets are iso-nitrogenous in nature. Care was taken to balance the levels of essential amino acids like L-Lysine and DL-Methionine. All the ducklings were reared under similar managemental practices in a deep litter system. Daily feed intake, weekly body weights were recorded up to 6th weeks of age. Blood samples were collected in the 6th week to determine various blood parameters in different treatment groups. Six birds from each replicate were sacrificed to study the various carcass characteristics. At the end of the 6th week, a metabolism trial was conducted to study the various nutrient metabolisms.

The body weight at 6th week was 2085.24±18.40g, 2026.73±19.47g and 1990.16±37.42g in ME-2700, ME-2900 and ME-3100, respectively. The differences in body weight between the groups were not significant. At 3rd weeks of age significantly ($p \leq 0.05$) lower feed intake was observed in the ME-3100 group than ME-2700 and ME-2900 group. However, at the 6th weeks of age, the feed intake in the ME-2900 group was significantly ($p \leq 0.05$) lower than the ME-2700 group, but the differences in intake was not statistically significant from the ME-3100 group. Significantly ($p \leq 0.05$) lower FCR was observed in ME-2900 (2.67±0.05) than ME-2700 (3.05±0.13) and ME-3100 (3.02±0.08) group. No significant differences between the groups with respect to carcass characteristics and different blood parameters like total protein, albumin, globulin, urea, creatinine, total cholesterol and triglycerides were observed. Similar DM, OM and CF digestibility was observed between the groups. No significant differences with respect to Nitrogen and EE metabolizability between the groups were observed. From this experiment, it was concluded that the diet containing 2900 kcal ME/ kg diet was optimum for growth and nutrient utilization for White Pekin ducks during the starter stage.

S.K. Sahoo et al.

EVENTS ORGANISED

Word Water Day 2021 celebrated at ICAR-DPR, Hyderabad

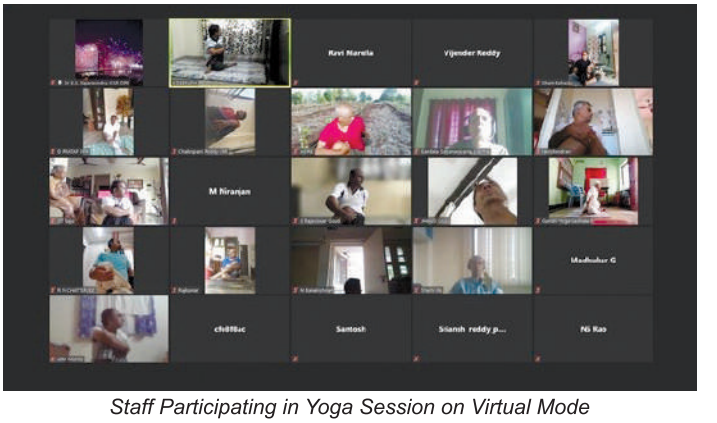
ICAR-Directorate of Poultry Research, Hyderabad celebrated "World Water Day- 2021" on 22nd March 2021 at the Directorate. The Chief Guest Dr. V. Ravinder Reddy, Vice-Chancellor, P.V. Narasimha Rao Telangana Veterinary University (PVNRTVU), Hyderabad inaugurated the function and highlighted the importance of water in the poultry sector while addressing the dignitaries and members of AP (Hyderabad) Chapter of the Indian Poultry Science Association (IPSA). There was a seminar on "Efficient use of Water in Poultry Production" by Dr. M.R. Reddy, Principal Scientist. He highlighted the quantum and quality of water required in the agricultural sector in general and the poultry sector in particular. There was an essay competition for students and staff of the Directorate and winners were given an award by the Director. In the end, the Chairman of the programme, Dr. R.N. Chatterjee highlighted the United Nations Sustainable Development Goal (SDGs) and use of water for mankind. He also emphasized the conservation of water in daily use. Dr. Vijay Kumar coordinated the programme.

World Water Day Celebrations

Director, DPR with Chief Guest and other Dignitaries on World Water Day Celebrations

ICAR-DPR celebrated 7th International Day of Yoga-2021

The Director and staff of the Directorate actively participated in the online Yoga session organized by ICAR-National Academy of Agricultural Research Management, Hyderabad commemorating the 7th International Day of Yoga on 21st June 2021. Wide publicity about the celebration of 7th International Day of Yoga 2021 was given in the Directorate's website, Facebook and Twitter handles. The online Yoga session was conducted by Dr. A. Debnath, the AMA of the Directorate. The participants practiced some important pranayamas and asanas. The Director and the staff of the Directorate practiced the asanas from their residences on virtual mode.



Staff Participating in Yoga Session on Virtual Mode

TRANSFER OF TECHNOLOGY

Development Action Plan for Scheduled Caste

Three on-field training cum input distribution programmes were organized in Telangana (2) and Andhra Pradesh (1) during the period on backyard poultry farming and to improve livelihoods and nutritional security of SC families under DAPSC programme. A total of 200 night shelters and training kits were distributed among the beneficiaries.

On-field training and inputs distribution to SC families in Andhra Pradesh

ICAR-DPR in association with the Department of Animal Husbandry, Andhra Pradesh organised an on-field training cum input distribution programme at Mulpur, Amruthalur Mandal, Guntur District, Andhra Pradesh on 24th March 2021. Initially, the participants were given training on the scientific rearing of backyard poultry farming. After the training, 100 temporary night shelters were distributed to SC families to start backyard poultry farming and for proper safeguarding of birds during the night from predator attacks and cold climate. Dr. M. Shanmugam, and Dr. K.S. Rajaravindra from ICAR-DPR coordinated the programme. Dr. B. Nagi Reddy, AD, Dr. Munaiah and Dr. P. Mounika from AP State Animal Husbandry Department, and local Panchayat members also participated in the programme. About 150 SC farmers were present during the programme.

Input Distribution Programme to SC Families in Andhra Pradesh

On-field training and input distribution to SC families in Telangana

In Telangana, an on-field training cum input distribution programme was organised at Bopparam and Nakkalapally villages of Kottapalle Mandal, Mancherial district on 27th March 2021. As part of the programme, 40 night shelters were distributed to SC families in Bopparam village and 60 in Nakkalapally village. Scientific practices on rearing chicken under the backyard farming system were also explained to the beneficiaries. Dr. A. Kannan, and Dr. S.P. Yadav from

Night Shelter Distribution to SC Families at Bopparam Village and Nakkalapally Village in Mancherial District, Telangana

ICAR-DPR coordinated the programme. Dr. T. Srinivas from AH Department, Telangana and local Panchayat members actively participated and helped in the smooth conduct of the programme.

Farmers Awareness campaign on Balanced use of fertilizers

Fifteen farmers from Bavoji Tanda, Ranga Reddy district, Telangana were imparted training on compost and vermicompost preparation from poultry litter and other waste material such as saw dust, dry leaves etc., on 18th June 2021.

Dr. Mahapatra Demonstrating to the Participants

Trainings conducted/skill development imparted

Sl. No.	Name of Training	Duration	Coordinator	Number of Participants
1	Certified Livestock Advisor Programme on Poultry (Module II) in collaboration with MANAGE Hyderabad (Virtual mode)	4-18 March 2021	Dr. K.S. Rajaravindra Sr. Scientist Dr. Vijay Kumar Sr. Scientist	15 (field Veterinarians)
2	Refresher Training Programme on Poultry Management for Established Agripreneurs in collaboration with MANAGE, Hyderabad (Virtual mode)	24-26 March 2021	Dr. Vijay Kumar Sr. Scientist	20

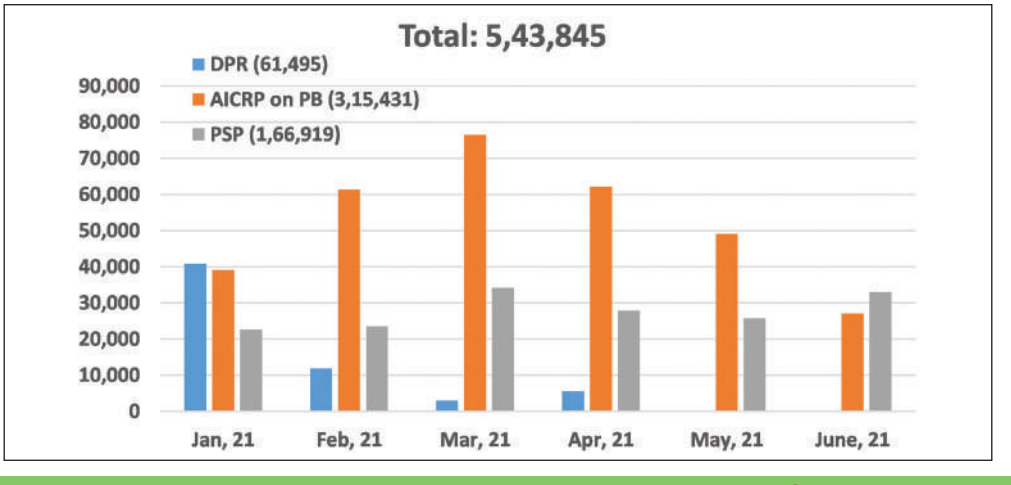
Contract Service Project Initiated

An MoU was signed with Sree Ramadootha Poultry Research Farms Pvt Ltd., Hyderabad for providing poultry disease diagnostic and health services on payment basis under contract service mode of ICAR professional services functions.

AKMU

- Institute webpage (http://www.pdonpoultry.org) was frequently updated and had about 4.89 lakh hits during the period Jan to June 2021 with an average of 2,675 visits per day. Payment Gateway link has been maintained in DPR webpage.
- **ICAR-DPR Mobile App:** An Android App in English was maintained, which provides information about institute, chicken germplasm, AICRP on Poultry Breeding, Poultry Seed Project, germplasm availability, etc. About 417 users downloaded the App during the period Jan to June 2021. A total of 3012 users download the mobile app since launching. Average rating given by 23 users was 4.5 out of 5.
- A film on the profile of DPR "DPR Marching ahead" in English, Hindi and Telugu and few Informative and awareness videos are also available in the ICAR-DPR Poultry YouTube channel. https://www.youtube.com/channel/UCDL2gnmjtzabrxX39waOITA. A total of 60,857 views were recorded during Jan to June 2021.
- Facebook page https://www.facebook.com/ICAR.DPR.Hyderabad and Twitter handle https://twitter.com/IcarPoultry were maintained for effective dissemination of information to farmers and poultry entrepreneurs.

Germplasm Supply during January to June 2021



HUMAN RESOURCE DEVELOPMENT

Sl. No.	Name of the Training	Official(s)	Date	Organized by
1	Generic Online Training in Cyber Security	Dr. L.L.L. Prince Pr. Scientist	21 January 2021	ISEA, Ministry of Electronics and Information Technology
2	Online Training Program on Laboratory Assessor Course (LEVEL 1) (Accreditation Criteria ISO/IEC 17025:2017),	Dr. T.K. Bhattacharya, National Fellow Dr. M. Shanmugam, Sr. Scientist Dr. K.S. Rajaravindra, Sr. Scientist	10-12 March 2021	National Accreditation Board for Testing and Calibration Laboratories (NABL), Gurugram

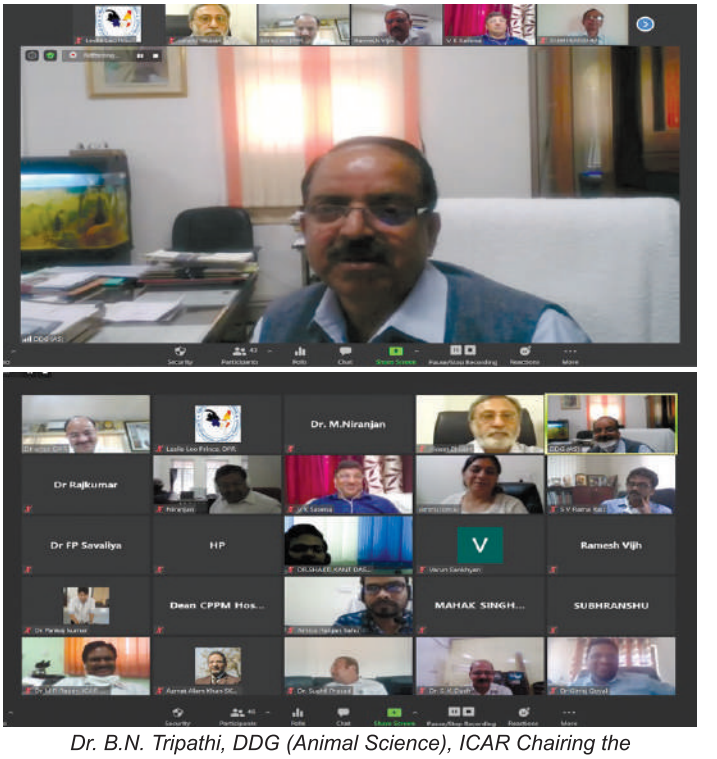
MEETINGS CONDUCTED

Annual Review Meeting of AICRP on Poultry Breeding and Poultry Seed Project organized

Annual Review Meeting of All India Coordinated Research Project (AICRP) on Poultry Breeding and Poultry Seed Project (PSP) was held on 7th April 2021 through online mode.

Dr. B.N. Tripathi, Deputy Director General (Animal Science) chaired the meeting. He appreciated the contribution of AICRP on Poultry Breeding in the development of the poultry sector in India over the last 50 years. He emphasized to further increase the contribution of backyard poultry to total poultry production. He also stressed the need to concentrate on climate-resilient poultry and the health management of backyard poultry. Dr. V.K. Saxena, ADG (AP&B), ICAR, New Delhi appreciated the good work carried out under AICRP on Poultry Breeding. He emphasized the need for conservation of indigenous chicken breeds and large scale dissemination of superior backyard poultry. Dr. Vineet Bhasin, Principal Scientist, AS Division, ICAR suggested working on chicken variety suitable for high altitude regions.

Dr. R.N. Chatterjee, Director, ICAR-DPR appraised the genesis of the project and its salient achievements made during the last 50 years. He also presented the action taken report and the action plan for the next five years. Annual Progress made during 2019-20 for the 12 AICRP and 12 PSP Centres was reviewed and suitable suggestions were offered for improvement of the scheme. Dr. R.K. Vijh, Director, NBAGR participated in the review meeting. Earlier, Dr. S.V. Rama Rao, Pr. Scientist welcomed the dignitaries and participants. Centre in-charges of 12 AICRP-PB and 12 Poultry Seed Project centres covering different states of the country and scientists from ICAR-DPR, Hyderabad participated in the review meeting.



Dr. B.N. Tripathi, DDG (Animal Science), ICAR Chairing the AICRP/PSP Review Meeting and Addressing the Participants

Dr. R.N. Chatterjee, Director Presenting the Coordinator's Report

Participation in Symposia/ Conferences/ Seminars/ Workshops

Sl. No.	Event	Scientist	Date	Venue/Organized by
1	Virtual International Conference on Promising genetic and genomic technologies - Frontier in selection and animal improvement	Dr. L.L.L. Prince, Pr. Scientist	27-28 January 2021	TANUVAS & KVASU
2	XVIII Annual Convention and National Webinar of Society for Conservation of Domestic Animal Biodiversity	Dr. M. Shanmugam, Sr. Scientist	11-12 February 2021	SOCDAB, ICAR-NBAGR, Karnal
3	Strategy Workshop (online) on "Potential of Transgenic Poultry for Biopharming"	Dr. L.L.L. Prince, Pr. Scientist	15 March 2021	National Academy of Agricultural Sciences (NAAS)
4	2nd International Webinar on Veterinary and Livestock	Dr. N. Anand Laxmi, Pr. Scientist	19 March 2021	Conference Mind
5	Knowledge Day 2021, Online Technical Webinar	Dr. M.V.L.N. Raju, Pr. Scientist	16 April 2021	IPEMA, Poultry India, Hyderabad
6	Online International workshop on Scientific writing	Dr. L.L.L. Prince, Pr. Scientist Dr. K.S. Rajaravindra, Sr. Scientist	23-24 June 2021	IDP-NAHEP, ICAR-NDRI, Karnal
7	Webinar Series on 3D Bioprinting	Dr. N. Anand Laxmi, Pr. Scientist	23 June 2021	Altem Technologies Biotecnika Information Labs Pvt. Ltd., Bengaluru
8	Webinar on Sustainable Poultry Farming	Dr. N. Anand Laxmi, Pr. Scientist	24 June 2021	Misset International

To

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ICAR-Directorate of Poultry Research
Rajendranagar, Hyderabad - 500 030, Telangana, India
Ph.: +91 (40) 2401 5651/ 7000/ 5652/ 8687 Fax: +91 (40) 2401 7002
email: pdpoult@nic.in website: www.pdonpoultry.org
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