



# Pearl Millet News

ICAR - All India Coordinated Research Project on Pearl Millet  
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## From Coordinator's Desk.....

Pearl millet [*Pennisetum glaucum* (L.) R. Br.] is the 6<sup>th</sup> major cereal crop globally followed by maize, rice, wheat, barley and sorghum. It stands as a crucial climate-resilient crop, offering sustenance, fodder and nutritional stability in some of the most arid and impoverished regions worldwide, especially across sub-Saharan Africa (SSA) and Asia, with a particular focus on India. It is being cultivated over 30 million ha worldwide, with the major crop area in Africa (>18 million ha) and Asia (>10 million ha). It is also used in industries such as - alcohol and fuel, starch and processed food sectors. Being a climate-resilient crop, it is very important in mitigating the adverse effects of climate change facilitating income and food security among farming communities of arid regions. It is the fourth most widely cultivated food crop after rice, wheat and maize in India. It can grow rapidly and needs fewer inputs and has high photosynthetic efficiency, good and balanced nutritional profile, tolerant to adverse climatic conditions and biotic stresses. It is mainly grown under the most adverse agro-climatic conditions where other staple cereal crop like rice and wheat are not able to survive. It can very well grow in the harshest conditions including low soil fertility, high soil pH, high soil  $Al^{3+}$  saturation, low soil moisture, high temperature, high soil salinity and scanty rainfall. As per the fourth advance estimates during 2021-22, pearl millet area in India was 6.70 million ha with an average production of 9.62 million tons and 1436 kg/ha productivity (Directorate of Millets development, Jaipur). The major pearl millet growing states are Rajasthan, Maharashtra, Uttar Pradesh, Gujarat and Haryana contributing to 90% of total production in the country. Rajasthan contributes nearly 45% followed by Uttar Pradesh (19%), Haryana (9%), Gujarat (9%), Maharashtra (6%) and Tamil Nadu (2%). Most of pearl millet in India is grown in rainy (kharif) season (June/July-September/October). Pearl millet is also cultivated during summer season (February-May) in parts of Gujarat, Rajasthan and Uttar Pradesh; and during the post-rainy (rabi) season (November-February) at a small scale in Maharashtra and Gujarat.



Pearl millet is more nutritious than commonly consumed staple crops such as wheat, rice, maize and sorghum. The grain is rich in carbohydrates, proteins, fats, fibres, resistant starch, vitamins, antioxidants, essential micronutrients such as iron and zinc and has a more balanced essential amino acid profile than maize or sorghum. Lipids are dominated with omega-3 and omega-6 fatty acids (polyunsaturated fatty acids) that contribute to good health of heart and brain. Pearl millet is not expensive like pearl but it's definitely has pearl like quality which is beneficial to the body. 100 grams of bajra contains- energy 360 calories, moisture 12 g, protein 12 g, fat 5 g, mineral 2 g, fiber 1 g, carbohydrate 67 g, Calcium 42 mg, phosphorus 242 mg, and iron 8 mg. It offers gluten-free grains with high and better protein in terms of quality and quantity making it ideal for people with gluten allergy. It is the only cereal which retains alkaline nature even after cooking with a low glycemic index thus making it a diabetic friendly food. It acts as a probiotic food for microflora in our inner ecosystem and hydrates our colon to keep us from being constipated. Its consumption has been associated with protection against certain types of cancer and cardiovascular diseases. It has high proportions of slowly digestible starch (SDS) and resistant starch (RS) which contribute to low glycemic index (GI) and is much sought after in the recent times of transforming diets, food habits and the food industry. Hence, pearl millet is gaining lot of popularity among health conscious people all over the world. It can play a vital role in overcoming malnutrition to ensure food and nutritional security. Due to its excellent nutritional properties, pearl millet is designated as nutri-cereal (Gazette of India, No. 133 dtd 13th April, 2018) for production, consumption, trade and was included in Public Distribution System (PDS). Further, recently India's prime minister has given it the name of 'Shree Anna' for its superior quality over all other grains and declared IIMR, Hyderabad as “Global Centre of Excellence for Millets”. In addition, to include millets into the mainstream and exploit its nutritionally superior qualities and promote its cultivation Govt. of India has declared Year 2018 as the “Year of Millets” and after declaration of FAO Committee on Agriculture (COAG) forum Year 2023 is being celebrated as “International Year of Millets”.

Apart from the conductance of mandated coordinated multi location trials and evaluation of test entries, ICAR- AICRP on Pearl millet is committed to

pearl millet improvement through research, technology generation and transfer. Till date, a total of 190 hybrids and 65 varieties were identified and released for cultivation in different agro ecological zones of the country through AICRP on Pearl millet. A number of production and protection technologies specific to different agro-ecological regions which will prove useful in enhancing the productivity of improved cultivars to commercial farming scales and increase the profitability of pearl millet growers were developed through this system. ICAR-AICRP on Pearl millet is actively collaborating as technology and knowledge partner in several new research initiatives like Niche area of excellence (NAE) programme from ICAR on “Development of Biochemical and Physical Processing Technology to Arrest Oxidation of Lipids/Flavones to Enhance the Shelf-Life of Pearl Millet Flour”; ICAR-BMGF project on “Application of Next-Generation Breeding, Genotyping, and Digitalization Approaches for Improving the Genetic Gain in Indian Staple Crops” etc. During 2021-22, high iron/zinc pearl millet hybrids and varieties were used in 45% of the front line demonstrations for technology transfer.

Along with yield improvement, focus on the nutritional improvement was also given in Pearl millet. Pearl millet is the first crop in the world to introduce bench mark levels for Fe (42 ppm) and Zn (32 ppm) in cultivar promotion and release since 2018 ensuring nutritional security in the country falling in line with the vision of nutritionally secure India. Since then, twenty eight hybrids/varieties were developed as micronutrient rich pearl millet cultivars. Development of high yielding, dual purpose disease resistant cultivars for low rainfall areas i.e. A1 zone is also given priority for increasing pearl millet productivity at national level. Along with development of sound extension support for popularization of these technologies and products; spread of pearl millet cultivation in nontraditional areas and pearl millet hybrid seed production in North - Western part of the country is the need of the hour. Addressing these changes will certainly add to the national efforts of doubling the farmer's income.

### **57<sup>th</sup> Annual Group Meeting of ICAR-AICRP on Pearl millet**

The 57<sup>th</sup> Annual Group Meeting of ICAR-AICRP on Pearl millet was held online via Zoom on 2<sup>nd</sup>-3<sup>rd</sup> March,



2022. Dr. Trilochan Mohapatra, Secretary, DARE & DG, ICAR was the chief guest and addressed the plenary session through online mode. Dr. Mohapatra appreciated the efforts and achievements of the AICRP during last year in the pandemic situation. He stressed upon requirement of public-private partnership, natural farming, development of hybrids/varieties for A<sup>1</sup> zone, organoleptic properties of local landraces like Jafrabadi etc. He further suggested doing some special efforts/activities in order to create awareness among people to consume nutri-cereal. He also emphasized to put more efforts in context of the Year 2023 declared as "International Year of Millets". Dr. T. R. Sharma, DDG (Crop Science), ICAR, New Delhi chaired the session while Dr. R.K. Singh, ADG (FFC), ICAR, New Delhi and Dr. Vilas A Tonapi, Director, ICAR- Indian Institute of Millets Research, Hyderabad co-chaired the session. Around 150 participants including PAMC Chairman, Dr. P. Raghava Reddy and members Dr. M.L. Lodha (Biochemistry), Dr. R.K. Pannu (Agronomy), Prof. H.

Shekhar Shetty (Plant Pathology) and Dr. D.C. Uprety (Plant Physiology), Directors from various ICAR institutes and scientists from public sector, private sector and ICRISAT attended the meeting. Dr. T.R. Sharma, DDG (CS), ICAR, New Delhi appreciated the achievements made by AICRP. He suggested that pre-breeding and molecular breeding work should be taken up and lead by IARI, IIMR and ICRISAT. Dr. R.K. Singh, ADG (CC & FFC), ICAR, New Delhi stressed upon to broaden the genetic base and include good germplasm to improve the breeding programme and focus on basic strategic research. Dr. C. Tara Satyavathi, Project Coordinator, ICAR-AICRP on Pearl millet, Jodhpur welcomed all the guests and participants and presented research highlights of various pearl millet experiments conducted during 2021-22. She also briefed about the product profile developed for each zone and trait specific germplasm identified and pre-breeding work initiated at various centers.





## New Releases and Notification of Hybrids and Varieties of Pearl Millet During 2022-23

- Five pearl millet hybrids were notified and released for cultivation in various agro-ecologies of the country during 2022-23:

Hybrid	Notification number	Notification date	Area of adaptation
86M80 (MH 2439)	S.O. 4065 (E)	31.08.2022	Rajasthan, Gujarat, Haryana, Madhya Pradesh and Delhi
BLPMH-109	S.O. 4065 (E)	31.08.2022	Summer growing areas of Gujarat, Rajasthan, UP Maharashtra and Tamil Nadu
SVPMH-101 (MSH 361)	S.O. 4065 (E)	31.08.2022	Summer growing areas of Gujarat, Rajasthan, UP Maharashtra and Tamil Nadu
MPMH 35 (MH 2474) (Maru Sampada)	S.O. 4065 (E)	31.08.2022	Western Rajasthan, drier parts of Gujarat and Haryana
86M94 (MH 2480)	S.O. 4065 (E)	31.08.2022	Rajasthan, Gujarat, Haryana, Madhya Pradesh and Delhi

## MoUs for Promotions of the Released Pearl Millet Hybrids

- The Pearl Millet Research Station, JAU, Jamnagar made non-exclusive MoU with Surya Seed Farm, Gandhinagar for seed production, marketing and commercialization of foundation/certified seed of biofortified hybrids GHB 1129 and GHB 1231 and it was approved in the 59<sup>th</sup> meeting of Board of Management on 3<sup>rd</sup> December, 2022 vide item no. 59.12.
- A MoU was signed between JAU, Jamnagar and Reshma Chemicals Private Limited, Vijaywada for non-exclusive license of production, marketing of foundation/certified seed of GHB 538 (EDV:DM) (Maru Sona) and it is approved in the 59<sup>th</sup> meeting of Board of Management on 3<sup>rd</sup> December 2022 vide item no. 59.13.
- A MoU was signed between Agriculture University, Jodhpur, PC Unit, ICAR-AICRP on Pearl millet and M/s Sampoorana Seeds for non-exclusive license of production, marketing of foundation/certified seed of pearl millet hybrid MPMH 35.
- A MoU was signed between Mahatma Phule Krishi Vidyapeeth, Rahuri and Asode Seeds Private Limited Company, Jalgaon for production and selling foundation/certified seed of Phule Aadishakti Bajra hybrid.
- MoU was made with Maharashtra State Seeds Corporation Ltd. (MSSC Ltd.) (Public seed sector) for popularization and seed production of pearl millet variety ABPC 4-3, AHB-1200 Fe and AHB- 1269.
- MoUs was signed between ICRISAT and VNMKV, Parbhani for the project “Genetically enhanced micronutrient dense Pearl Millet for improved human nutrition under Harvest Plus # 5310.”



## Trainings/Workshops/Seminars/Conferences Organized

- PC Unit, ICAR-AICRP on Pearl millet, Jodhpur organized a training-cum-awareness programme on PPV & FR Act and DUS testing in pearl millet on 22<sup>nd</sup> September, 2022. The programme was attended by the farmers of Barmer, Jodhpur and Jaisalmer district and scientific staff of Agriculture University, Jodhpur.



- PC Unit, ICAR-AICRP on Pearl millet, Jodhpur in collaboration with Agriculture University, Jodhpur organized an International conference on “Development and promotion of millets and seed spices for livelihood security” during 24-26<sup>th</sup> February, 2023 at Agriculture University, Jodhpur.
- ICAR-AICRP on Pearl millet, JAU, Jamnagar organized two special trainings on “Varietal characterization and seed production technology in pearl millet” on 15<sup>th</sup> October, 2022 and 23<sup>rd</sup> December, 2022 and 72 trainees were benefitted through these trainings.



- CCS HAU, Hisar organized 9 trainings on value addition and various technologies of pearl millet were displayed and public was educated to increase intake of pearl millet based products. Around 3000 trainees/farmers were benefitted through these trainings.



- ICAR-AICRP on Pearl Millet, ARS, ANGRAU, Ananthapuram conducted 2 local training programmes & FLD seed distribution including a training on “Package of practice of pearl millet and implementation of pearl millet TSP” at Ananthapuramu district on 11<sup>th</sup> July, 2022 and at Vepacherla diguva thanda, Ananthapuramu on 20<sup>th</sup> July, 2022.

- RARI, Durgapura, Jaipur organized “National seminar cum exhibition on promotion value addition and export of millet and millet produce” on 7-8<sup>th</sup> May, 2022.
- ICAR-AICRP on Pearl Millet, NARP, Aurangabad conducted 17 training programs during the year 2022-23 on various topics including trainings on “Package of practice, varietal improvement-based cropping system, pest and disease management of pearl millet.



## Field Days/Kisan Mela

- PC Unit, ICAR-AICRP on Pearl millet, Jodhpur participated and demonstrated technologies related to Pearl millet in the exhibition in one day Kisan Mela at Padru, Barmer organized by KVK, Gudamalani on 19<sup>th</sup> March, 2022.



- PC Unit, ICAR-AICRP on pearl millet, Jodhpur participated in mallinath pasu mela at tilwara, barmer during 1<sup>st</sup>-3<sup>rd</sup> April, 2022 and demonstrated various pearl millet hybrids/varieties and technology to the farmers with benchmark levels of iron and zinc.



- ICAR-AICRP on Pearl Millet, Jodhpur demonstrated various pearl millet hybrids/varieties and technology to the Agriculture University officials, farmers and state government officials from Agriculture department, Rajasthan on 7<sup>th</sup> September, 2022.



- ICAR-AICRP on Pearl Millet, Jodhpur demonstrated various pearl millet hybrids/varieties and technology to the final year students and scientific staff of C.T. College of Agriculture, S.K. Nagar and C.O.A., Tharad (SDAU) on 7<sup>th</sup> October, 2022.



- ICAR-AICRP on Pearl Millet, Jodhpur demonstrated Pearl millet hybrids/varieties/local landraces to farmers and government officials from District-Barwani, Madhya Pradesh under RKVY-Millet Mission on 4<sup>th</sup> November, 2022.



- ICAR-AICRP on Pearl millet, JAU, Jamnagar participated and installed exhibition stall in the Kisan Mela Agri-world Expo-2022 organized by spark media ink, Ahmedabad at Rajkot (Gujarat) during 16-18<sup>th</sup> September, 2022 and benefited 1.10 lakh farmers of Gujarat State.





- ICAR-IARI, New Delhi demonstrated Pearl millet hybrids/varieties to farmers and government officials during Pusa Krishi Vigyan Mela held at IARI, New Delhi during 9-11<sup>th</sup> March, 2022. Shri Kailash Choudhary Ji, Honorable Union Minister of State for Agriculture and Farmers Welfare visited stall of IARI, New Delhi.



- PAU, Ludhiana organized Kisan Mela on 23<sup>rd</sup> September, 2022 where farmers were demonstrated about Package and Practices of Pearl Millet cultivation and value addition.



- ICAR-AICRP on Pearl millet, Vijayapur conducted a Field day on Pearl Millet at Kalgurki village, tq. Basavan Bagevadi, Dist. Vijayapur under Frontline Demonstration programme on 10<sup>th</sup> October, 2022.



- ICAR- AICRP on Pearl millet, Vijayapur demonstrated recent pearl millet varieties and improved agronomic practices during the Kisan mela at University of Agricultural Sciences, Dharwad during 22<sup>nd</sup> -25<sup>th</sup> September, 2022.



- ICAR-AICRP on Pearl millet, CCS HAU, Hisar participated in university level farm melas during 13-14<sup>th</sup> March, 2022 and 13-14<sup>th</sup> September, 2022. More than 150,000 farmers participated in these events and thousands of farmers were apprised of varietal, production technologies and plant protection aspects of pearl millet crop.



- ICAR-AICRP on Pearl Millet, Bajra Research Scheme, Dhule organized a Field day and Farmers rallies at Village-Ghotane, Tal-Sakri, Dist-Dhule on 29<sup>th</sup> September, 2022.



- ICAR-AICRP on Pearl Millet, Bajra Research Scheme, Dhule organized a field day under TSP at Village-Pratappur, Tal-Navapur, Dist-Nandurbar on 13<sup>th</sup> July, 2022 and distributed the Spray pump and Phule Aadishakti Seed to the Farmers.



- ICAR-AICRP on Pearl Millet, Bajra Research Scheme, Dhule organized 'ek divas baliraja sathi programme' at Village-Kodale, Tal-Navapur, Dist-Nandurbar (Maharashtra) on 1<sup>st</sup> October, 2022.



- ICAR-AICRP on Pearl Millet, NARP, Aurangabad conducted 3 field days on Pearl millet at Khandala, Tq Vaijapur, Dist. Aurangabad on 16<sup>th</sup> September, 2022; at Waluj & Gurudhanor, Tq. Gangapur, Dist. Aurangabad on 12<sup>th</sup> October, 2022 and at Lakhegaon and Kherda village Tq. Pithan, Dist. Aurangabad on 29<sup>th</sup> November, 2022.



- ICAR-AICRP on Pearl Millet, NARP, Aurangabad participated and demonstrated farmers package of practices, crop management, varietal profile of pearl millet during 5 Kisan Melas at Krishi Vigyan Kendra, Badnapur and Krishi Vigyan Kendra, Kharpudi on 26<sup>th</sup> April, 2022; at VNMKV, Parbhani on 18<sup>th</sup> May, 2022; at Krishi Vigyan Kendra, Gandheli on 31<sup>st</sup> May, 2022; at Krishi Vigyan Kendra, Aurangabad on 1<sup>st</sup> July, 2022 and at Manor, Tq. Vaijapur, Dist. Aurangabad on 16<sup>th</sup> November, 2022.
- ICAR-AICRP on Pearl Millet, ARS, ANGRAU, Ananthapuramu organized a field day on Seeds of millets at ANGRAU-ARS, Ananthapuramu on 10<sup>th</sup> October, 2022.



## Appointments/Retirements

- Dr. I. Johnson, Assistant Professor (Pathology) joined AICRP on Pearl millet, Coimbatore w.e.f. 23<sup>rd</sup> June, 2022 and promoted under CAS from 10<sup>th</sup> October, 2022 as Associate Professor (Pathology).
- Dr. V. Vasuki, Assistant Professor (Agronomy) joined AICRP on Pearl millet, Coimbatore w.e.f. 5<sup>th</sup> July, 2022 and promoted under CAS from 10<sup>th</sup> October, 2022 as Associate Professor (Agronomy).
- Dr. D. G. Hingole was appointed as Pearl Millet Pathologist at AICRP on Pearl millet, NARP, Aurangabad w.e.f. 1<sup>st</sup> July, 2022.
- Dr. C. B. Patil was appointed as Pearl Millet Agronomist at AICRP on Pearl millet, NARP, Aurangabad w.e.f. 1<sup>st</sup> July, 2022.
- Mrs. Shital Shrikant Kamble appointed as Senior Technical Assistant at AICRP on Pearl millet, NARP, Aurangabad w.e.f. 1<sup>st</sup> July, 2022.
- Dr. L.D. Sharma, Principal Scientist (Plant Breeding), RARI, Durgapura superannuated on 31<sup>st</sup> May, 2023.



## Trainings/Workshops/Seminars/Conferences Attended by Pearl Millet Researchers

- Dr. C. Tara Satyavathi, PC delivered a talk on pearl millet for food and nutritional security on 15<sup>th</sup> March, 2022 at ANGRAU, Lam, Andhra Pradesh.
- Dr. C. Tara Satyavathi, PC delivered a talk on “Pearl millet: A crop for food, nutritional security and health” in “Public awareness event about millets on World Health Day” on 7<sup>th</sup> April, 2022 at Centre for Culture studies, New Delhi.
- Dr. C. Tara Satyavathi, PC delivered a talk on “Biofortification in pearl millet and various milestones” at RARS, Durgapura in a joint event organized by India Millet Initiative and SKNAU, Jobner on 7<sup>th</sup> May, 2022.
- Dr. C. Tara Satyavathi, PC delivered an invited talk on “Genomics in pearl millet Improvement -Status and Prospects” in International Conference on “Agricultural Sciences and Technology-Challenges and Prospects (AST-2022)” organized jointly by RLBCAU, Jhansi and ICAR-CAFRI, ICAR- IGFRI, Jhansi, Bundelkhand University, Jhansi and Central Ayurveda Research Institute, Jhansi during 6-8<sup>th</sup> May, 2022.
- Dr. C. Tara Satyavathi, PC delivered an invited talk on “Genetic improvement in Pearl millet with special reference to dual purpose and forage trait types” at the 52<sup>nd</sup> AGM of ICAR-AICRP on Forage crops on 14<sup>th</sup> June, 2022 at SKUAST, Srinagar.
- Dr. C. Tara Satyavathi, PC delivered an invited talk on “Potential of millets-nutritional value, as nutraceuticals and functional foods” to Delhi University students on 17<sup>th</sup> August, 2022.
- Dr. C Tara Satyavathi, Project Coordinator (Pearl millet) and Dr. Vikas Khandelwal, Sr. Scientist (GPB), ICAR-AICRP on Pearl Millet, Jodhpur, Dr. SP Singh, Dr Nirupma Singh, Dr. Chandan Kapoor, ICAR-IARI, New delhi participated in the symposium on “Tending Mendel's garden for a perpetual and bountiful harvest: A symposium commemorating the birth bicentenary of Gregor Johann Mendel (MENDELSYM)” organized by ICAR-IARI on 19<sup>th</sup>-21<sup>st</sup> July, 2022.
- Dr. Supriya and Dr. RC Meena attended online national workshop on “Genome editing” organized by Glostem Pvt Ltd. during 27<sup>th</sup> June- 3<sup>rd</sup> July, 2022.
- Dr. Supriya attended 7<sup>th</sup> International conference on “Global research initiatives for sustainable agriculture and allied sciences (GRISAAS-2022)” organized by Astha Foundation, Meerut in collaboration with CSAUAT Kanpur; BAU Ranchi; ICAR-CIFE Mumbai; SKRAU Bikaner; RLBCAU Jhansi; AFU Chitwan Nepal; NPU Palamu; RG (PG) College Shamli & SSDAT, Meerut during 21<sup>st</sup> -23<sup>rd</sup> November, 2022.
- Dr. Supriya attended 21 days ICAR-sponsored winter school on “Development, Evaluation and biosafety assessment of genome edited crops: hands-on training” held during 20<sup>th</sup> January to 9<sup>th</sup> February, 2023 at ICAR-IIRR, Hyderabad.
- Dr. Vikas Khnadelewal, Dr. Moolaram, Dr. RC Meena, Dr. Manoj Kumar, Dr. Supriya and Dr. JP Bishnoi attended International conference on “Development and promotion of millets and seed spices for livelihood security” held during 24-26<sup>th</sup> February, 2023 at Agriculture University, Jodhpur.
- Dr. SP Singh gave a talk on “Juwar Bajra kee khedi se adhik aay hetu vaigyanik vidhian in the training “kkarif faslon kee utpadakta badhane hetu do divasiy prashikshan kaarykrm” organized by CATAT on 25<sup>th</sup> August, 2022.
- Dr. SP Singh delivered a lecture on “Biofortification: An approach to make nutri-cereals more nutritive” in Department of Botany, SGBT Khalsa College, University of Delhi on 7<sup>th</sup> September, 2022.
- Dr. SP Singh attended Pearl Millet Scientist's Field Day Program at ICRISAT during 3-4<sup>th</sup> October, 2022.
- Dr SP Singh delivered a lecture on “Millets: our national treasure” to the students of Amity Institute of Organic Agriculture, Amity University Uttar Pradesh, Noida (UP) on 19<sup>th</sup> October, 2022 on occasion of World Food Day.
- Dr. G. M. Parmar, Assoc. Res. Sci. and Dr. R. J. Chaudhari, Asstt. Res. Scientist, PMRS, JAU, Jamnagar attended State level seminar on "Prakrutik Krushi ma pak saraxan" organized by Plant Protection Association of Gujarat, Anand Chapter, Platinum Jubilee-B.A. College of Agriculture, AAU, Anand, Gujarat Organic Agricultural University, Anand and Centre for Agricultural Market Intelligence, NAHEP-Cast, AAU, Anand on 5<sup>th</sup> April, 2022 through virtual mode.

- Dr. K. D. Mungra, Res. Sci. (Pearl Millet), Dr. S. K. Parmar, Asstt. Res. Scientist, PMRS, JAU, Jamnagar attended webinar on "Plant improvement to increase crop drought resilience" organized by ICAR-Indian Institute of Millets Research, Hyderabad held on 8<sup>th</sup> April, 2022.
- Prof. R.P. Juneja, Asstt. Res. Scientist, PMRS, JAU, Jamnagar participated in IP awareness/training program under "National intellectual property awareness mission" on 21<sup>st</sup> April, 2022 organized by Intellectual Property Office, India.
- Prof. R. P. Juneja, Asstt. Res. Scientist, PMRS, JAU, Jamnagar participated in two days webinar on "Emerging agricultural marketing trends and challenges" during 29-30<sup>th</sup> April, 2022 organized by Centre for Agricultural Market Intelligence, NAHEP, AAU, Anand in collaboration with Department of Agricultural Economics, B.A. College of Agriculture, AAU, Anand, Gujarat.
- Dr. K.D. Mungra, Res. Sci. (Pearl Millet), Dr. G. M. Parmar, Assoc. Res. Sci, Dr. R. P. Juneja, Asstt. Res. Scientist, Dr. H. N. Bhuva, Asstt. Res. Scientist, Dr. S. K. Parmar, Asstt. Res. Scientist, Dr. R. J. Chaudhri, Asstt. Res. Sci. (Pl. Pathology) participated in National Seminar cum webinar on "Climate change concerns: challenges for agriculture sector and food and nutrition security" organized by ICAR-Indian Institute of Millets Research (IIMR), Hyderabad and Karnataka Agri-Professionals Association (KAPA), Hyderabad during 14-15<sup>th</sup> May, 2022.
- Prof. R. P. Juneja, JAU, Jamnagar attended IDP-NAHEP sponsored National Webinar: Maharana Pratap Memorial Lecture-2022 on "Innovations in crop improvement for national food security" on 4<sup>th</sup> June, 2022 organized by Directorate of Students' Welfare, Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan).
- Prof. R. P. Juneja, JAU, Jamnagar attended the webinar on "Quit India Movement to Food Secured India" organized by Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan on 8<sup>th</sup> August, 2022.
- Dr. S. K. Parmar, Asstt. Res. Scientist, PMRS, JAU, Jamnagar attended National Symposium on "Emerging innovations in plant molecules for achieving food and nutritional security" organized by Department of Plant Molecular Biology and Biotechnology, ACHF, NAU, Navsari and Division of Biochemistry, ICAR-IARI, New Delhi in association with Society for Plant Biochemistry and Biotechnology, IARI, Pusa Campus, New Delhi which was held at NAU during 22<sup>nd</sup> -23<sup>rd</sup> September, 2022.
- Dr. L.D. Sharma Professor & Incharge, Pearl millet, RARI, Durgapura delivered lecture on "Biofortification in pearl millet" during conference on biofortification at Hotel Royal Orchid, Durgapura, Tonk Road, Jaipur organized by Federation of Indian Chambers of Commerce and Industry on 22<sup>nd</sup> July, 2022.
- Dr. L.D. Sharma Professor & Incharge, Pearl millet, RARI, Durgapura chaired a session during Rajasthan Industry meet on "Millets power house of nutrition" on 23<sup>rd</sup> December, 2022 at NIAM Jaipur organized by PHD Chamber of Commerce and Industry.
- Dr. S.B. Pawar attended the online training program on importance of crop diversity organized by Director of Extension Education, VNMKV, Parbhani on 2<sup>nd</sup> February, 2022
- Dr. A.B. Bagade attended 21 days online training programme on "A futuristic approach towards smart agriculture & sustainable urban farming" during 30<sup>th</sup> April, 2022 to 20<sup>th</sup> May, 2022 organized by Agro Environmental Education and Farmers Welfare Society, Punjab & Just Agriculture.
- Dr. C.B. Patil attended online training programme on "Digital assessment and evaluation on methodology" during 1<sup>st</sup> -30<sup>th</sup> September, 2022 organized by NAARM, Hyderabad.
- Dr. A.B. Bagade attended 5 days training programme on "The future of farming technology & agripreneurship development" during 10-14<sup>th</sup> November, 2022 online Agro Environmental Education and Farmers Welfare Society, Punjab & Just Agriculture.
- Dr. Ruchika Bhardwaj delivered talk on "Millet production in India" for popularization of millets in PAU live program organized by Communication Centre on 16<sup>th</sup> June, 2022.
- Dr. Ruchika Bhardwaj, Millets Breeder, PAU, Ludhiana attended the "National symposium on transforming the green revolution hub of India: Innovations in crop breeding, resource management and policy" organized by Punjab Agricultural University, Ludhiana held on 17-18<sup>th</sup> August, 2022.
- Dr. Ruchika Bhardwaj delivered a special lecture on "Cultivation and Importance of Millets" in Research and Extension Specialist Workshop for Rabi crops at



Punjab Agricultural University, Ludhiana on 23<sup>rd</sup> August, 2022.

- Dr. Ruchika Bhardwaj, Millets Breeder, PAU, Ludhiana attended the “National symposium on millets-2022” jointly organized by MGSIPA, Punjab and PGIMER, Chandigarh on 2<sup>nd</sup> September, 2022 at Chandigarh.
- Dr. Ruchika Bhardwaj participated and delivered lecture as expert on millets in a meeting on “Scope of millet cultivation and processing in Punjab” organized by NABARAD at Chandigarh on 20<sup>th</sup> September, 2022.
- Dr. Ruchika Bhardwaj delivered a lecture on “Importance of millets” at farmers training camp being organized by ATMA at grain market Kotkapura on 1<sup>st</sup> October, 2022.
- Dr. Ruchika Bhardwaj attended pearl millet scientist's field day held on 3<sup>rd</sup>-4<sup>th</sup> October, 2022 at ICRISAT, Patancheru, Hyderabad.
- Dr. Ruchika Bhardwaj delivered a lecture on “Cultivation of millets” during the meeting on millets at Kheti Bhawan, SAS Nagar under the chairmanship of Director of Agriculture, Punjab on 9<sup>th</sup> November, 2022.
- Dr. Sadhana Babar and Dr. Kumari Basamma attended National seminar on “Sustainable food production systems for self reliant and climate resilient agriculture” held at University of Agricultural Sciences, Dharwad during 16-18<sup>th</sup> June, 2022.
- Dr. Vinod Kumar, Asstt. Plant pathologist attended and successfully completed the 21 days refresher course on extension management conducted by

AAREM, DHRM, CCSHAU, Hisar from 4-24<sup>th</sup> May, 2022.

- Dr. I. Johnson, Associate Professor (Pathology) has attended 7<sup>th</sup> National conference on Biological control on “75 years of biological control of pests and diseases in agriculture: challenges and the way forward” Jointly organized by Society for Biocontrol Advancement, Bengaluru, India & ICAR-National Bureau of Agricultural Insect Resources, Bengaluru, India at Hotel Ramada by Wyndham, Yelahanka, Bengaluru between 15- 17<sup>th</sup> December, 2022.
- Dr. V. Vasuki, Associate Professor (Agronomy) attended 7<sup>th</sup> National conference on “Agricultural Scientific Tamil (Theme: Tamil can do- Agriculture/Veterinary/Fishery) from 2<sup>nd</sup>-3<sup>rd</sup> September, 2022 organized by TANUVAS and Agricultural Scientific Tamil Society, New Delhi.
- Dr. I. Johnson, Associate Professor (Pathology) attended workshop on “Surveillance and development of weather based forecasting models for crop pests” organized by Director (CPPS), TNAU, Coimbatore on 20<sup>th</sup> September, 2022.
- Dr. V. Vasuki, Associate Professor (Agronomy) attended workshop on “Writeshop 3.0- manuscript writing and publication from 24-26<sup>th</sup> November, 2022 organised at MASU, TNAU, Coimbatore.
- Dr. K.K. Barhate attended field day of pearl millet at ICRISAT, Hyderabad on 3<sup>rd</sup>-4<sup>th</sup> October, 2022 and selected 170 breeding germplasm lines.

## Awards and Nominations

- PC Unit, ICAR-AICRP on Pearl millet, Jodhpur got second prize during Kisan Mela organized at Padru, Barmer on 19<sup>th</sup> March, 2022.
- ICAR-AICRP on Pearl millet, RARI, Jaipur (SKNAU) got Certificate of Appreciation for significant performance in Zone A during 57<sup>th</sup> AGM of ICAR-AICRP on Pearl millet on 3<sup>rd</sup> March, 2022.
- VNMKV- NARP, Aurangabad received Best ICAR- AICRP on Pearl Millet Centre for 2021-22 at Mandor, Jodhpur on 3<sup>rd</sup> March, 2022 during 57<sup>th</sup> AGM for significant contribution in Pearl Millet improvement in Zone B from ICAR- AICRP on Pearl Millet
- Dr. L.D. Sharma, Professor (Plant Breeding) was awarded Appreciation Certificate by Director, RARI, Jaipur on the occasion of 73<sup>rd</sup> Republic Day on 26<sup>th</sup> January, 2022 for his outstanding contribution during the year 2021.

- Dr. Ruchika Bhardwaj, Millets Breeder, Punjab Agricultural University, Ludhiana was awarded certificate of appreciation for excellent work in the discipline of Plant Breeding for the year 2021-2022 by ICAR-AICRP on Pearl Millet on 3<sup>rd</sup> March, 2022 during the 57<sup>th</sup> Annual Group Meet.
- ICAR-IARI, New Delhi was awarded best poster (MS 1066) for abstract on “Development and validation of CMS specific SCAR marker to ensure the purity of A line against B line admixture in pearl millet” by A. Akash, M.B. Arun Kumar, S.K. Jain, S.P. Singh, C Tara Satyavathi and R.J. Sherry during symposium tending Mendel's garden for a perpetual and bountiful harvest commemorating birth bicentenary of Gregor Johann Mendel at ICAR-Indian Agricultural Research Institute, New Delhi on 19<sup>th</sup> -21<sup>st</sup> July, 2022.
- ICAR-IARI, New Delhi was awarded best poster (MS 1172) was awarded for abstract on “Identification and validation of genes conferring foliar blast resistance in pearl millet using genome wide association mapping strategy” by S. Mukesh Sankar, S.P. Singh, R. Srivastava, G. Prakash, S.L. Soumya, M.B. Arun Kumar, C. Kapoor, F. Hossain, A.R. Rao, A. Mithra, T. Singhal, M. Mallik, T. Satyavathi and J. Aravind presented during symposium tending Mendel's garden for a perpetual and bountiful harvest commemorating birth icentenary of Gregor Johann Mendel at ICAR-Indian Agricultural Research Institute, New Delhi on 19<sup>th</sup> -21<sup>st</sup> July, 2022.
- CCS HAU, Hisar was awarded Certificate of Best performing ICAR-AICRP on Pearl millet Centre (2021-22) during 57<sup>th</sup> Annual Group Meeting of ICAR-AICRP on Pearl millet on 2<sup>nd</sup> -3<sup>rd</sup> March, 2022 held online.
- Dr Vinod Kumar Malik, CCS HAU, Hisar got Best Oral Presentation Award during IPS 8<sup>th</sup> International Conference-2022 held at SKNAU, Jobner-Jaipur, Rajasthan, India during 23<sup>rd</sup> -26<sup>th</sup> March, 2022.
- Dr. Sanjay K. Parmar, Assistant Research Scientist, Department of Plant Breeding, Pearl Millet Research Station, JAU, Jamnagar received “Springer young scientist award” for oral

presentation on “Pearl millet hybrid GHB 1129: Gujarat's first effort to combat malnutrition through crop biofortification” during National Symposium on “Emerging Innovations in Plant Molecules for Achieving Food and Nutritional Security” organized by Department of Plant Molecular Biology and Biotechnology, ACHF, NAU, Navsari and Division of Biochemistry, ICAR-IARI, New Delhi in association with Society for Plant Biochemistry and Biotechnology, IARI, Pusa Campus, New Delhi during 22<sup>nd</sup> -23<sup>rd</sup> September, 2022.



- Dr. K.Iyanar, Professor (PBG), Department of Millets, TNAU has recived “TNAU best researcher award”during 52<sup>nd</sup> Foundation day organized at TNAU, Coimbatore on 1<sup>st</sup> July, 2022.



- Dr. I. Johnson, Associate Professor (Pathology), Department of Millets, TNAU received an “Excellence in teaching award” on the occasion of 6th International Conference on "Current issues in agricultural, biological & applied sciences for sustainable development (CIABASSD-2022) organized by Department & Directorate of Extension Education, UBKV, West Bengal, ICAR (NAHEP) Kalimpong Science Centre, West Bengal, AEDS, Rampur and The Himalayan Scientific Society for Fundamental and Applied Research, West Bengal at Kalimpong Science



Centre, Deolo, Kalimpong, West Bengal during 11-13<sup>th</sup> June, 2022.

- Dr. I. Johnson, Associate Professor (Pathology), Department of Millets, TNAU received “Best poster presentation award” in the 7<sup>th</sup> National Conference on biological control: “75 years of biological control of pests and diseases in agriculture: Challenges and the way forward” jointly organized by NBAIR, Bengaluru and Society for Biocontrol Advancement, Bengaluru, India from 15-17<sup>th</sup> December, 2022.



- Dr. I. Johnson, Associate Professor (Pathology), Department of Millets, TNAU received “Eminent Scientist award” in Plant Pathology during 5<sup>th</sup> National conference on “Doubling the farmers income for sustainable & harmonious agriculture (DISHA-2022) organized by KNIPSS, Sultanpur, UP in association with Green Agri Professional Society, Dhanbad, Jharkhand and PKVSS during 11-12<sup>th</sup> June, 2022.
- Dr. RC Meena, Dr. Supriya and Sh. Arjun Singh Nathawat got certificate of Appreciation on Foundation day of Agriculture University, Jodhpur on 14<sup>th</sup> September, 2022.



- Dr. CVCM Reddy, Senior Scientist from ANGRAU-

ARS, Ananthapuramu received Meritorious Scientist Award on 15<sup>th</sup> October, 2022 from Hon'ble Vice Chancellor, ANGRAU, Guntur, Andhra Pradesh.

## Visits

- Dr. Himanshu Pathak, Secretary, Department of Agricultural Research and Education & Director General, ICAR, New Delhi visited pearl millet breeding program at IARI, New Delhi on 17<sup>th</sup> September, 2022.



- Dr. T. Mohapatra, Chairman, PPVFRA, New Delhi and Ex- DG, ICAR, New Delhi visited PC Unit, ICAR-AICRP on Pearl Millet, Jodhpur on 1<sup>st</sup> October, 2022.



- Dr. BR Choudhary, Vice Chancellor, AU, Jodhpur, QRT Chairman, members and scientists from different ICAR-AICRP centers of sesame visited PC Unit, ICAR-AICRP on Pearl Millet, Jodhpur on 12<sup>th</sup> October, 2022.



- Minister of Agriculture, Livestock and Irrigation of Republic of the Union of Myanmar visited pearl millet field of IARI, New Dehi on 20<sup>th</sup> September, 2022.



- Dr. C.D. Deokar, Associate Dean, College of Agriculture, Dhule visited ICAR-AICRP on Pearl millet, Dhule on 24<sup>th</sup> September, 2022.



- Shri. Vijugouda Patil. Hon'ble Chairman of Karnataka State Seed and Organic Certification Agency visited the Pearl millet exhibition stall during Kisan mela at Regional Agricultural Research Station, Vijayapur on 1<sup>st</sup> January, 2023.



- Dr. A.S. Dhawan, Hon. Vice Chancellor, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani visited NARP, Aurangabad, on 15<sup>th</sup> February, 2022.
- Dr. D. P. Waskar, Director of Research, VNMKV, Parbhani visited NARP, Aurangabad on 30<sup>th</sup> May, 2022.
- Dr. C. Tara Satyavathi, Project Coordinator, Pearl Millet, Jodhpur, Rajasthan visited NARP, Aurangabad on 8<sup>th</sup> July, 2022 and inspected seed godown and seed processing plant constructed under enhancing breeder seed production and also Trichoderma and Trichocard laboratory.



- Dr. Indra Mani, Vice Chancellor, Vasantao Naik Marathwada Krishi Vidyapeeth, Parbhani visited NARP, Aurangabad on 9<sup>th</sup> August, 2022 and 21<sup>st</sup> September, 2022.





- Internal Monitoring of ICAR-AICRP on Pearl millet by Dr. K.K.Barhate, Dr. C.S. Thakare, Shri. R.Suryawanshi, Dr. V.Y Pawar and Dr. A. S Mahale on 24<sup>th</sup> September, 2022.



- Vice Chairman of A.P. Agriculture Mission, Govt of AP visited ARS, Ananthapuramu to know about millets.



## Research Papers

- Mondal D, Awana M, Aggarwal S, Das D, Thomas B, Singh SP, Satyavathi CT, Sundaram RM, Anand A, Singh A, Sachdev A, Praveen S, Krishnan V (2022) Microstructure, matrix interactions and molecular structure are the key determinants of inherent glycemic potential in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *Food Hydrocolloids* 127:107481 <https://doi.org/10.1016/j.foodhyd.2022.107481> (NAAS Rating-17.50)
- Tomar M, Bhardwaj R, Verma R, Singh SP, Dahuja A, Krishnan V, Kansal R, Yadav VK, Praveen S, Sachdev A (2022) Interactome of millet-based food matrices: A review. *Food Chemistry* 385: 132636 <https://doi.org/10.1016/j.foodchem.2022.132636> (NAAS Rating-15.23)
- Vinutha T, Kumar D, Bansal N, Krishnan V, Goswami S, Kumar RR, Kundu A, Poondia V, Rudra SG, Muthusamy V, Prashat GR, Venkatesh P, Kumari S, Jaiswal P, Singh A, Sachdev A, Singh SP, Satyavathi CT, Ramesh SV, Praveen S (2022) Thermal treatments reduce rancidity and modulate structural and digestive properties of starch in pearl millet flour. *International Journal of Biological Macromolecules* 195:207-216. <https://doi.org/10.1016/j.ijbiomac.2021.12.011> (NAAS Rating-14.03)
- Chakraborty A, Viswanath A, Malipatil R, Semalaiyappan J, Shah P, Ronanki S, Rathore A, Singh SP, Govindaraj M, Tonapi VA, Nepolean T (2022) Identification of candidate genes regulating drought tolerance in pearl millet. *International Journal of Molecular Sciences* 23(13):6907 <https://doi.org/10.3390/ijms23136907> (NAAS Rating-12.21)
- Singhal T, Satyavathi CT, Singh SP, Mallik M, Sankar MM, Bharadwaj C (2022) Mapping and identification of quantitative trait loci controlling test weight and seed yield of pearl millet in multi agro-climatic zones of India. *Field Crops Research* 288:108701 <https://doi.org/10.1016/j.fcr.2022.108701> (NAAS Rating: 11.15)
- Satyavathi CT, Tomar RS, Ambawat S, Kheni J, Padhiyar SM, Desai H, Bhatt SB, Shitap MS, Meena RC, Singhal T, Sankar SM, Singh SP, Khandelwal V (2022) Stage specific comparative transcriptomic analysis to reveal gene networks regulating iron and zinc content in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *Scientific Reports* 12:276 <https://doi.org/10.1038/s41598-021-04388-0> (NAAS Rating-11.00)
- Maibam A, Lone SA, Ningombam S, Gaikwad K, Amitha Mithra SV, Singh MP, Singh SP, Dalal M, Padaria JC (2022) Transcriptome analysis of [*Pennisetum glaucum* (L.) R. Br] provides insight into heat stress responses. *Frontiers in Genetics* 13:884106 doi: 10.3389/fgene.2022.884106 (NAAS Rating-10.77)
- Malik. VK, Sangwan P, Singh M, Punia R, Yadav DV, Kumari P, Pahuja SK (2022) First report of *Klebsiella aerogenes* inciting stem rot of pearl millet in Haryana, India. *Plant Disease* 106 (2): 754 (NAAS Rating- 10.61)
- Kumar RR, Singh SP, Rai GK, Krishnan V, Berwal MK, Goswami S, Vinutha T, Mishra, GP, Satyavathi CT, Singh B, Praveen S (2022) Iron and zinc at a cross-road: A trade-off between micronutrients and

- anti-nutritional factors in pearl millet flour for enhancing the bioavailability. *Journal of Food Composition and Analysis* 111:104591 <https://doi.org/10.1016/j.jfca.2022.104591> (NAAS Rating-10.52)
- Ali A, Kumar RR, Vinutha T, Singh T, Singh SP, Satyavathi CT, Praveen S, Goswami S (2022) Grain phenolics: critical role in quality, storage stability and effects of processing in major grain crops-a concise review. *European Food Research and Technology* <https://doi.org/10.1007/s00217-022-04026-7> (NAAS Rating-9.50)
  - Murria S, Gupta N, Kaur N, Bhardwaj R, Sharma AB (2022) Impact of sclerospora graminicola infection on physiological mechanisms and hormonal regulation of floral reversion in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *Physiological and Molecular Plant Pathology* 118 (101806):1-10 (NAAS Rating- 8.74)
  - Singhal T, Satyavathi CT, Singh SP, Mallik M, Anuradha N, Sankar SM, Bharadwaj C, Singh N (2022) Achieving nutritional security in India through iron and zinc biofortification in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *Physiological and Molecular Plant Pathology* 2576 <https://doi.org/10.1007/s12298-022-01144-0> (NAAS Rating: 8.74)
  - Sharma R, Bhandari M, Sharma S, Bhardwaj R (2022) Compositional, structural and functional characteristics of millets as modified by bio processing techniques: A review. *Journal of Food Processing and Preservation* <https://doi.org/10.1111/jfpp.16885> (NAAS Rating- 8.61)
  - Kapoor C, Singh SP, Sankar SM, Singh N (2022) Enhancing drought tolerance in pearl millet [*Pennisetum glaucum* L.] integrating traditional and omics approaches. *Euphytica* 218:104 <https://doi.org/10.1007/s10681-022-03045-5> (NAAS Rating: 8.19)
  - Kumar RR, Singh N, Singh S, Vinutha T, Krishnan V, Goswami S, Kumar B, Jat SL, Yogeesh LN, Singh SP, Mishra GP, Satyavathi CT, Sachdev A, Praveen S (2022) Nutritional supremacy of pearl- and foxtail millets: assessing the nutrient density, protein stability and shelf-life of flours in millets and cereals for developing nutri-stable foods. *Journal of Plant Biochemistry and Biotechnology* <https://doi.org/10.1007/s13562-021-00761-2> (NAAS Rating-7.53)
  - Sanjana Reddy P, C Tara Satyavati, Vikas Khandelwal, HT Patil, R Narasimhulu, HH Bhadarge, K Iyanar, AM Talwar, K Sravanthi, BK Athoni (2022) GGE biplot analysis for identification of ideal cultivars and testing locations of pearl millet [*Pennisetum glaucum* (L.) R.Br.]. *Indian Journal of Genetics and Plant breeding* 82(2):167-176 (NAAS Rating-7.34)
  - Chandra S, Singh SP, Satyavathi CT, Sankar SM, Singh AM, Bhat JS (2022) Genetics of fertility restoration for the A1 cytoplasmic genic male sterility-system in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *Indian Journal of Genetics and Plant Breeding* 82(1):65-72:doi: 10.31742/IJGPB.82.1.9 (NAAS Rating-7.34)
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  - Parihar P, Pandya RK, Singh P, Tiwari S, Tripathi MK, Tripathi N and Satyavathi CT (2022) Elucidation of molecular variability among (*Pyricularia grisea*) isolates causing blast disease in pearl millet. *Range Management & Agroforestry* (In Press) (NAAS Rating- 6.58)
  - Shekhawat K, Sharma N, Kumawat S, Kumar A, Gupta PC, Sharma AK (2022) Studies on Gene effects of pearl millet hybrids in arid conditions. *Agricultural Mechanization in Asia, Africa and Latin America* 53(02): 6331-6338 (NAAS Rating-6.29)
  - Salam SA, Parthiban VK, Paranidharan V, Johnson I, Karthikeyan M, Kavitha C. *Alcaligenes faecalis* strain SASBG203: A novel biocontrol agent against *Colletotrichum orbiculare*. *Annals of Phytomedicine* 11(1): 714-723 (NAAS Rating-5.95)
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- and biofortified traits in pearl millet [*Pennisetum glaucum* (L.) R. Br.]. *The Pharma Innovation Journal* 11(5):1144-5 (NAAS Rating-5.23)
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  - Kambale PS, Barhate KK, Andhale GR (2022) Correlation and path analysis for zinc, iron and yield contributing characters in Pearl Millet genotypes. *The Pharma Innovation J.* 11(6):596-600 (NAAS Rating- 5.23)
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  - Sharma S, Sharma LD, Singh S, Gupta S, Singh P (2022) Influence of organic nutrients and biostimulants on growth and productivity of pearl millet under semi-arid conditions of Rajasthan. *Indian Journal of Agricultural Research.* 18805 /IJAR.A-5933 (NAAS Rating-5.20)
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  - Saini MR, Dalal MS, Langaya S, Pal A, Vart D, Kiran, Kaushik D, Kamboj A (2022) Exploring the causal effects and association among various morphological and biochemical traits for enhancing bioavailability of Fe-Zn micronutrients in pearl millet. *Forage Research* 48(2):278-283 (NAAS Rating- 4.84)
  - Athoni BK, Biradar BD, Patil SS, Patil PV, Guggari AK (2022) Combining ability analysis for grain yield and yield components using diverse lines in pearl millet [*Pennisetum glaucum* (L) R.Br.]. *Journal of Farm Sciences* 35(1):14-19 (NAAS Rating - 4.58)
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