

Proceedings

4th International Conference on Advancement of Science and Technology for Environment, Society and People (ICASTESP-IV) (17-18 May 2024)

Organised by



**Society for Technology,
Environment, Science & People,
Kozhikode, India**



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**Proceedings
of the
4th International Conference**

On

**Advancement of Science and Technology for Environment,
Society and People (ICASTESP-IV)**

Kozhikode, Kerala, India

(17-18 May 2024)

Editor

Devi Dayal

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Society for Technology, Environment, Science & People, Kozhikode, India

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‘CRR 752-3-1-B’ an Introgression of DTY QTL in Popular Upland Rice Variety ‘Anjali’

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ABSTRACT: Rice (*Oryza sativa* L.) being the most important staple food in the throughout the world, can be grown in different ecologies. Rainfed ecologies of South and Southeast Asia, covers considerable (around 1/3) area under rice cultivation in the world, which are adversely affected by abiotic stresses specially drought and flood. In India, drought is a major factor of lowering yield of rice in rainfed areas. Drought during the cropping season particularly at the reproductive stage, is the most devastating stage which affects grain yield. The reproductive stage drought stress (RSDS) reduces grains per panicle, enhances grain sterility, reduces grain weight, results a substantial reduction in grain yield. Several large effect QTLs for grain yield under drought (DTY QTLs) viz. qDTY1.1, qDTY2.1, qDTY2.2, qDTY3.1, qDTY3.2, qDTY9.1 and qDTY12.1 have been identified by International Rice Research Institute and partner institutions. Introgression of DTY QTLs into popular rice varieties has been an effective approach to stabilize yield under drought conditions. In the present study, strategy of marker assisted backcross breeding (MABB) has been carried out with an aim to develop the drought tolerant lines of popular upland rice variety ‘Anjali’.

‘Anjali’ is a popular upland rice variety suitable for direct seeded condition (DSR), released and notified by the Central Variety Release Committee in 2002 for the rainfed drought-prone upland areas in Bihar, Jharkhand, Odisha, Assam and Tripura states of Eastern and North-eastern India. It is early maturing (90-95 days) and cultivated under DSR conditions with a yield level of 3.0 to 3.5 t/ha. To improve the drought tolerance of Anjali, DTY QTLs (qDTY12.1 and qDTY3.1) were introgressed exploiting donors IR84984-83-15-481-B and IR81896-B-B-195, respectively. As a result, total 10 Near Isogenic Lines (NILs) were selected on the basis of their phenotypic selection for yield under drought conditions. Two improved NILs, CRR 809-11-1-9-B and CRR 752-3-1-B were nominated for multilocation trials in Advance Variety Trial 1-Near Isogenic Line-Drought (AVT1 NIL-DRT) under All India Coordinated Rice Improvement Project (AICRIP) in kharif, 2021 and 2022 under Rain-Out Shelter with the recurrent parent ‘Anjali’ and tolerant checks ‘Vandana’ and ‘Sahbhagi Dhan’ (National Check) and a sensitive check. The NIL ‘CRR 809-11-1-9-B’ with introgressed DTY QTLs (qDTY12.1 and qDTY3.1) was released and notified by the Central Variety Release Committee as

variety named 'CR Dhan 808' for direct seeded rainfed drought prone areas of states, Bihar and Jharkhand.

The NIL 'CRR 752-3-1-B' with introgressed DTY QTL (qDTY3.1) showed 39.43%, 16.50% and 42.40% yield superiority over recurrent parent 'Anjali', tolerant check variety 'Vandana' and sensitive check variety 'IR 64' respectively under drought condition. Drought tolerance score as per standard evaluation system (SES) of 'CRR 752-3-1-B' along with checks at the test locations under AICRIP indicated that it was having lesser score for drought tolerance, leaf rolling and leaf drying than recurrent parent 'Anjali', and sensitive check variety 'IR 64'. The NIL 'CRR 752-3-1-B' agro-morphologically resembles the recurrent parent 'Anjali' and possesses light green foliage, long heavy and well exerted panicles, short bold grain with straw colour at maturity with semi erect flag leaf at flowering and grain filling. The height of the plant ranges from 100-110 cm with 50 % flowering in 73 days after sowing and 193-221 panicles/m². Grain quality characters of 'CRR 752-3-1 B' includes 80.5%, 70% and 53.5 %, Hulling, Milling and Head Rice Recovery respectively, with Short Bold grain, very occasionally chalkiness and 20 % Amylose content. This line 'CRR 752-3-1 B' can be a potential donor for the development of climate resilient varieties with tolerance to this important abiotic stress. Further, it has been developed in the elite background, so by using this line as donor, the traits of interest can be easily transferred without the risk of linkage drag of undesirable traits.

Keywords: DTY QTLs, RSDS, MABB, Rainfed Upland, DSR

An efficient optimized method for callus induction, shoot regeneration and root initiation in potato cultivars Kufri Sangam

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ABSTRACT: Potato (*Solanum tuberosum* L.) is a perennial food crop that contributes to the global food and nutritional security. In this study an *in vitro* callus and shoot induction protocol for potato cultivar Kufri Sangam was developed and evaluated the frequency of callus and shoot regeneration. This study showed that supplementing the Murashige and Skoog's medium with BAP (0.5 mg/l) and NAA (5 mg/l) resulted in 100% callus. The optimal condition for inducing shoot regeneration was basal MS medium supplemented with TDZ (2 mg/litre) and gibberellic acid (0.25 mg/l). The best MS medium composition for shoot proliferation was

found to be the one that was supplemented with zeatin riboside (1 mg/l), NAA (0.5 mg/l) and GA3 (5 mg/l) with 60 % shoot regeneration efficiency. 6 mg/l of AgNO₃ showed good effect on direct shoot regeneration. Effect of varying IAA (auxin) concentration on root induction showed best results when MS medium was supplemented with 0.10 mg/l IAA, as it took only 7–12 days for root regeneration. Although the regeneration system was influenced by the potato cultivar Kufri Sangam genotype, it is still effective for similar genotypes studied. Potato cultivar Kufri Sangam explants can attain high induction rates and proliferation coefficients using this novel system.

Keywords: Potato, callus, zeatin riboside, TDZ, auxin, IAA.

Reactor based studies on natural colourants

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ABSTRACT: Fungi produce pigments which have the potential for various industrial applications. The objective of this study was to produce natural colorants from fungi in a sustainable way and when compared to the production of synthetic colorants. The isolation process involved identifying fungal samples, followed by their cultivation in suitable media. The growth of fungi was monitored, and the resulting cultures were subjected to microscopic analysis to characterize their morphological features. Shake flask cultivations were carried out in a controlled environment for optimal growth of the fungus followed by microscopic examination. Further scale up studies were carried out in a laboratory bioreactor with a working volume of 1.3 liters to compare the biomass growth and pigment production. With controlled pH, the biomass generation in the bioreactor was 48% higher than that in the shake flask culture. Pigment formation was visible in both shake flask and bioreactor cultivations, but the influencing factors were the reactor conditions and semi batch operation of the bioreactor.

Keywords: Natural colorants, Pigments, Bioreactor, Fungi, ioreactor

Influence of weather factors on light trap catches of yellow stem borer, *Scirpophaga incertulas* (Walker) in rice

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ABSTRACT: Rice (*Oryza sativa* L.) is the most important and staple food crop for more than two thirds of the population in India. It occupies largest area among gall food crops in India and is cultivated in an area of 43.78 million hectares with 118.43 million tonnes of production and 2705 kg/ha of productivity. The Yellow Stem Borer (YSB), *Scirpophaga Incertulas* is distributed widely, covering almost all the Asian countries. YSB usually comprised more than 90 % of the borer populations and damage the rice crop from seedling to maturity causing either dead heart at tillering stage or produces white ears at harvest stage, which can lead to complete failure of the crop. Assessment of yellow stem borer population was done by light trapping, 200-watt electric light source was used for the trapping of insects. Light trap was installed in ARS farm long ago, 6 m above the ground level with collection pan below the light source. The trap was operated from 18.00 to 6.00 hours. The light trap catches of yellow stem borer have been recorded daily throughout the year. These observations were compiled and averaged to weekly. Peak yellow stem borer catches (1510 moths) were recorded during 38th std week. Correlation analysis of light trap catches of yellow stem borer with weather data revealed that Stem borer had significant positive correlation with maximum temperature ($r=0.382$) and had significant negative correlation with evening relative humidity ($r=0.403$), and negatively correlated with minimum temperature ($r=0.190$), morning relative humidity ($r=0.070$), sunshine hours ($r=0.034$) and rainfall ($r=0.072$).

Seasonal Incidence of Rice Leaf Mite, *Oligonychus oryzae* Hirst (Acari: Tetranychidae)

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ABSTRACT: Rice, *Oryza sativa* L., is a staple food crop in India, which is attacked by many insect pests out of which leaf mite, *Oligonychus oryzae* Hirst (Acari: Tetranychidae) attack heavily during summer season (Early kharif) causing yellowing of leaves. Meteorological factors play an important role in seasonal abundance, distribution and population build up of insect pests it is difficult to find direct cause and effect relationship between any single factor and pest activity because the impact of meteorological factor on pests is usually compounded. Considering the severity of leaf mite on rice during summer the present investigation was conducted at Agricultural Research Station, Nellore, and Andhra Pradesh during Early kharif season (April – August) of 2023. The varieties NLR 40024 and TN1 was selected for the study and normal agronomic practices were followed during the crop growth under unprotected conditions. The observation on leaf mite incidence were made at weekly intervals throughout the crop season, total number of leaves and damaged leaves were counted and per cent damage or per cent incidence was calculated. The meteorological data were collected from Agro-meteorological observatory, Department of Agronomy at Agricultural Research Station, Nellore. The study revealed that the incidence of mite found to build up from second fortnight of June and this trend continued up to last week of July. The peak incidence was associated with rise in temperatures. Correlation coefficient studies indicated that the temperature and relative humidity have significant effect on the rice leaf mite incidence. The leaf mite incidence was positively correlated to temperatures and negatively correlated to the relative humidity. There is no significant correlation with rainfall.

Effect of various organic sources of nutrients on soil fertility, yield and nutrient uptake by rainfed cotton in vertisols

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ABSTRACT: A field experiment was initiated during 2019-20 and the present study was conducted during 2022-23 on the research field of AICRP for Dryland Agriculture, Dr.Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra to assess the effect of various organic sources of nutrients on soil fertility, yield and nutrient uptake by rainfed cotton in Vertisols. The various organic sources used were FYM, vermicompost and gliricidia green leaves. The nine treatments consisting of various combinations of organic sources of nutrients along with three replications were evaluated in randomized block design. The soil of the experimental site was low in available nitrogen, medium in available phosphorus and high in available potassium. The results indicated that integrated application of 50% N through FYM/ vermicompost + 50% N through gliricidia resulted in improvement in soil fertility, seed cotton yield and nutrient uptake (N, P and K) by rainfed cotton in Vertisols under semi-arid conditions. Therefore, this study confirms a number of previously published claims that long-term trials are required to fully comprehend the positive impacts of organic supplies or organic farming. Hence, it is concluded that the integrated application of 50% N through FYM/ vermicompost + 50% N through gliricidia beneficial for improvement in soil fertility and nutrient uptake (N, P and K) with higher productivity of cotton in Vertisols under rainfed conditions.

Keywords: organic sources, soil fertility, nutrient uptake, productivity, vertisols

Boosting soil health and cauliflower (*Brassica oleracea* var. *botrytis* L.) production using fertilizers and natural farming formulations

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ABSTRACT: During the Rabi season, a meticulous study was conducted at the Vegetable Research Farm of Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during *Rabi*, 2021-22 & 2022-23 to investigate the impact of varying levels of inorganic fertilizers and natural farming formulations specifically, jeevamrit and ghanjeevamrit, on nutrient uptake, soil characteristics, microbial count and economics of cauliflower cv. PSBK-1. The experimental treatments included two levels of inorganic fertilizers (80% and 60% RDN) and three levels of natural farming formulations, namely jeevamrit (5%, 10% and 15%) and ghanjeevamrit (90%, 100% and 110%), along with a positive control (100% RDN; N:P:K at 125:76:72 kg ha⁻¹). The study employed a Randomized Block Design with three replications. The pooled analysis revealed that application of 80% RDN in combination with soil drenching of jeevamrit at 15% at 21-day intervals outperformed all other treatments. This combination yielded the highest net returns and elevated nutrient assimilation. The experimental findings indicated that jeevamrit at 15% proved effective in enhancing soil microbial count and the uptake of nutrients by the plants.

Keywords: Jeevamrit, Microbial count, Actinomycetes, Nutrient uptake, Economics.

Genetic improvement and biotechnology trends

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ABSTRACT: Biotechnological approaches are being used widely in modern plant breeding for genetic improvement of crops for targeted traits and yield. The conventional breeding methods are mostly based on hybridization and selection of advance breeding lines. Advance biotechnological methods are rapidly being employed for achieving improved varieties in less span of time with desirable traits. These methods include plant tissue culture, molecular breeding, and transgenic methods. Plant tissue culture is helpful in getting somaclonal variants, embryo rescue, and for mass propagation of plants through micropropagation, while molecular breeding is being applied for marker assisted selection, varietal characterization, foreground and background selection and transgenics approaches are being used to transfer gene from different background in genome of crop plants. High throughput genotyping, next generation sequencing and genome editing are some of the recent biotechnological tools being applied for successful crop improvement programme.

Nano technology for increasing productivity in agriculture & allied sciences

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ABSTRACT: Nanobiotechnology provides novel set of tools to manipulate and enhance crop production using nanoparticles, nanofibres, nanoemulsions, and nanocapsules. Nanomaterials provide a platform to deliver agrochemicals and various macromolecules needed for plant growth enhancement and resistance to stresses. Smart delivery of agrochemicals increases the yield by optimizing water and nutrient conditions. Another added advantage is controlled release and site-directed delivery of agrochemicals. Further enhancement in quality and

quantity in agriculture can be achieved by nanoparticle-mediated gene transformation and delivery of macromolecules that induces gene expression in plants. Various types of nanomaterials have been tested so far and the results have been promising in terms of productivity and quality enhancement.

Health benefits of MCTs - medium-chain triglycerides in Milk

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ABSTRACT: MCTs (medium-chain triglycerides) are a type of fat that are found naturally in certain foods, particularly in coconut milk and different dairy based milks like camel, cow, goat, sheep etc. Among different types of milk, coconut milk is notably rich in MCTs. Medium-chain triglycerides (MCTs) have garnered increasing attention for their potential health benefits. Derived primarily from coconut oil, MCTs are readily absorbed and metabolized by the body, offering a unique source of energy. This abstract examines the multifaceted health advantages associated with MCT consumption. Research suggests that MCTs may aid in weight management by promoting satiety and enhancing calorie expenditure. Moreover, they exhibit antimicrobial properties, contributing to gastrointestinal health and potentially combating harmful pathogens. Emerging evidence also suggests a role for MCTs in cognitive function, with studies indicating potential benefits for individuals with neurodegenerative conditions. Additionally, MCTs have been investigated for their impact on metabolic health, showing promise in improving lipid profiles and insulin sensitivity. Furthermore, their rapid absorption makes them a valuable energy source, particularly for individuals following ketogenic diets. Despite these promising findings, further research is warranted to elucidate the full spectrum of MCT benefits and optimal dosages for various health outcomes. In conclusion, MCTs represent a promising dietary component with diverse health-promoting effects, offering potential applications in weight management, gastrointestinal health, cognitive function, and metabolic well-being.

HPLC and its applications in dairy industry

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ABSTRACT: High performance liquid chromatography (HPLC) is a column chromatography which is an improved form of conventional liquid column chromatography. HPLC mainly utilizes a column that holds packing material (stationary phase), a pump that moves the mobile phase through the column, and a detector that shows the retention times of the molecules. Retention time varies depending on the interactions between the stationary phase, the molecules being analyzed and the solvent used. The sample to be analyzed is introduced in small volume to the stream of mobile phase and is retarded by specific chemical or physical interactions with the stationary phase. The amount of retardation depends on the nature of the analyte and composition of both stationary and mobile phase. The time at which a specific analyte elutes (comes out of the end of the column) is called the retention time. No two analytes have same retention time; hence they get separated and detected separately at the exit of column. Depending on the nature, chemical structure, and molecular weight of the analytes, it is possible to select the type of HPLC. In this sense, different kinds of HPLC have emerged to allow qualitative and quantitative information regarding individual components such as normal phase, reverse phase, adsorption, ion-exchange, size-exclusion etc. Particularly in dairy industry, HPLC can be used for identification, separation, quantification, monitoring, and purification of almost every type of analytes like dairy additives, contaminants, residues, proteins, vitamins, sugars etc. Due to its high precision, accuracy, efficiency, repeatability, and reproducibility, different HPLC methods are adopted by organizations like ISO, IDF and FSSAI for the analysis of different types of dairy products.

Effect of abiotic stress on biochemical properties and antioxidant defense mechanism in *Gymnocladus assamicus* ex P.C. Kanjilal - a critically endangered and endemic plant of the Eastern Himalaya

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ABSTRACT: The genus *Gymnocladus* is a primitive genus of the family leguminosae. In India, the species *Gymnocladus assamicus* is reportedly a critically endangered species in Northeast India. The Eastern Himalayan region of Northeast India is a global biodiversity hotspot, home to relict species found nowhere else in the world. However, the region's biodiversity has been threatened by anthropogenic activities such as over-harvesting, habitat degradation and agricultural extension. Therefore, an integrated approach for effective management at local and international level is required. The present investigation includes a study on the biochemical and antioxidant activities of *G. assamicus* to five different individual abiotic stresses including heat, submergence, cold, drought and low pH and two combined stresses viz. heat and drought, cold and drought. Biochemical parameters like hydrogen peroxide, malonedialdehyde, phenol, flavonoid, alkaloid, tannin and saponin content and antioxidant parameters like glutathione, ascorbate, proline and 1,1-diphenyl-1-2-picrylhydrazyl (DPPH) content and enzymatic antioxidant parameters like superoxide dismutase (SOD), glutathione peroxidase (GPX), glutathione reductase (GR), catalase (CAT) and ascorbate peroxidase (APX) were recorded which revealed increasing value in the stress conditions. The key parameters mostly affected by stress were found in principal component analysis (PCA) and pearson's correlation coefficient analysis. By conducting these analyses, researchers can assess the phytochemical content, antioxidant properties and enzymatic activities present in *G. assamicus*, providing valuable insights into their bioactive compounds and health-promoting effects.

Keywords: abiotic stress, biochemical, antioxidant, principal component analysis, pearson's correlation.

Correlation studies among morphological, physiological and yield components with kernel yield over seasons in maize (*Zea mays* L.)

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ABSTRACT: Knowledge of the interrelationships of kernel yield and its morphological, physiological and yield components is very helpful to improve the efficiency of breeding programs. This study is conducted to determine the nature of relationships of kernel yield and its morphological, physiological and yield contributing components and to identify those components with significant effects on kernel yield over seasons. Forty five single cross hybrids made from 10 inbred lines of maize through diallel mating design were evaluated for three seasons *viz.*, *rabi*, *summer* and *kharif* from 2016-17 to 2017-18. Kernel yield had consistent significant and positive associations with SPAD meter readings, specific leaf area, cob length, cob girth, number of kernel rows cob⁻¹, number of kernels row⁻¹, 100 kernel weight and harvest index in *rabi*, *summer* and *kharif* seasons. Similar trend of positive and significant association of kernel yield with all the above characters was recorded at genotype level. Days to 50% tasseling, days to 50% silking, days to maturity and specific leaf weight showed consistent negative and significant correlations with kernel yield both at phenotypic genotypic level. The associations of anthesis-silking interval with kernel yield were consistently negative and non-significant in all the three seasons at phenotypic level. Plant height showed either negative and significant or negative but non-significant association with kernel yield across seasons. The characters *viz.*, SPAD meter readings, specific leaf area, cob length, cob girth, number of kernel rows cob⁻¹, number of kernels row⁻¹, 100 kernel weight and harvest index might be given due importance, while formulating selection indices as these characters had showed consistent positive and significant associations with kernel yield.

Keywords: Maize, Association Analysis, Kernel Yield, Yield Components

Spatial distribution of silicon in the *Saccharum spontaneum* and *Erianthus arundinaceus* energy canes and their relationship with sugarcane borer pests

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ABSTRACT: A total of eight energy canes comprising Type I (>15% juice brix & >20% cane fibre) and Type II (<15% juice brix and >25% cane fibre) categories were used for this study. Among the eight energy canes, four energy canes from *Saccharum spontaneum* (SBIEC 11003, SBIEC 13010, SBIEC 11002, and SBIEC 14003) and the another four energy canes from *Erianthus arundinaceus* (SBIEC 14006, SBIEC 11004, SBIEC 11001 and SBIEC 14001) were chosen based on the fibre content and biomass yield attributes. Profiling of silicon was done at the preferential feeding sites of sugarcane tissue borer on the type 1 *S. spontaneum* and type 2 *E. arundinaceus* energy canes. Silicon content was higher among the plant parts in the order of leaf > leaf sheath > rind > midrib invariably in all the *S. spontaneum* energy canes. The same pattern was observed in *E. arundinaceus* energy canes, with the exception that the rind sections had a lower silicon content. In the two groups, silicon content was significantly highest in *E. arundinaceus* energy canes than in *S. spontaneum* energy canes. Furthermore, silica content in all the parts was highest in the energy canes SBI EC 13010 followed by SBI EC 11002 under *S. spontaneum* category and SBI EC 14006 and SBI EC 14001 under *E. arundinaceus* category. Subsequently, extracted silicon from *S. spontaneum* and *E. arundinaceus* were correlated to early shoot borer (ESB) and internode borer (INB) infestations. In the correlation studies, *E. arundinaceus* silicon content were negatively correlated with both borer pests as compared to the silicon content of *S. spontaneum*.

Keywords: *Saccharum spontaneum*, *Erianthus arundinaceus*, early shoot borer, internode borer, silicon, energy canes.

Mechanism of resistance operating in the *Erianthus arundinaceus* against sugarcane shoot borer *Chilo infuscatellus* (Crambidae: Lepidoptera)

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ABSTRACT: *Erianthus arundinaceus* is one of eight species under the genus *Erianthus* extensively used for the development intergeneric hybrids in the presentday sugarcane breeding Programme. It possesses valuable agronomic traits including high biomass production, vigour, ratoonability, tolerance to drought and waterlogging as well as resistance to pests and diseases. Understanding the mechanism of resistance involved in the sugarcane crop is essential for mounting suitable breeding strategies against sugarcane pests. A total of eight field screened *Erianthus arundinaceus* genotypes against sugarcane shoot borer, *Chilo infuscatellus* was further screened under laboratory conditions along with a ruling variety Co 86032 for their confirmation of resistance and susceptibility. A significant reduction of *C. infuscatellus* larval and pupal survival; larval and female pupal weight; adult longevity; fecundity rate (eggs/female) and extended larval and pupal duration was recorded in the genotypes IJ 76 370, IJ 76 364 and IK 76 78, respectively. Biochemical parameters viz., total phenols, poly phenol oxidase and proteinase inhibitors and total proteins were highest in the genotypes IJ 76 370 and IJ 76 364 which indicates the presence of antibiosis mechanism of resistance against *C. infuscatellus*. The total soluble sugars were significantly lower in all genotypes. The genotypes IJ 76 364 and IK 76 84 fed – *C. infuscatellus* showed lowest larval total carbohydrate and protein content, respectively. *E. arundianceus* is a repository of resistance source against sugarcane pests mainly the borers. In conclusion, the study identified two elite *E. arundinaceus* IJ 76 370 and IJ 76 364, that could be used as new genetic stocks for the possible utilization in the future resistant breeding programme against sugarcane shoot borer.

Keywords: Antibiosis, *Chilo infuscatellus* biology, *Erianthus arundinaceus*, resistance, Screening

Milk protein based pickering emulsion for stabilization of lutein

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ABSTRACT: Lutein can be used in food products as a nutraceutical due to its potentially health benefits. However, its incorporation into foods is limited due to low water solubility, chemical instability, and poor oral bioavailability. Milk proteins when heated tend to aggregate through hydrophobic and covalent interactions, demonstrating the great potential of stabilizing emulsions via a Pickering mechanism. In this study, casein (CS) and whey proteins (WP) were combined with polysaccharides (sodium alginate [SA], gum Arabic, [GA], pectin, [PC]) to form composite gels (WP+GA, WP+SA, CS+GA, CS+SA) and used to stabilize o/w emulsion containing lutein (in oil phase). The protein-polysaccharide gels at various ratios (v/v) were optimized based on rheological properties, particle size, zeta potential and interfacial contact angles (WP+GA[1:1], WP+SA[9:1], CS+GA[2:3], CS+PC[2:1]) which were further used in o/w emulsions. Particle size increases due to addition of polysaccharide. Negative zeta potential indicates effective coating of polysaccharide on to the surface of protein gel. WP+GA[1:1], WP+SA[9:1], CS+GA[2:3], and CS+PC[2:1] showed contact angle of 90°. The emulsifying conditions were optimized based on emulsifying, capacity, emulsion activity, emulsion stability indices, lutein encapsulation efficiency, physical, chemical, light stabilities (WP+GA[1:1], CS+GA[2:3]). Emulsifying activity of CS based coating matrix is better than WP based coating matrix. Emulsion stability is however better in case of Pickering emulsion prepared from WP based gel than CS based gel. WP-GA and CS-GA can encapsulate lutein up to 1% with efficiency of 95% and 92% respectively. Lutein encapsulated with protein-GA coating matrices have better stability (in terms of lutein retention) and light stability.

Keywords: Lutein, whey protein, casein, emulsion, polysaccharide

Apical rooted cutting technology vs. conventional potato cultivation: a comparative economic study in Hassan district of Karnataka

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ABSTRACT: The area under potato cultivation in Karnataka has reduced drastically due to the outbreak of diseases, poor access and poor seed quality and high seed price. Apical Rooted Cuttings (ARC), a vegetative propagation technique, facilitates rapid multiplication, producing numerous high-quality seedlings and affordable seed potatoes for small farmers. A study in Hassan district, with a substantial number of ARC potato growers, examines the economic aspects of potato cultivation using ARC technology compared to conventional method. With the objective of analyzing cost and returns of ARC technology and Conventional method of potato cultivation. The cost of cultivation of potato in conventional method was higher (Rs. 78,822/acre) compared to ARC method (Rs. 67,322/acre). The lower cost of cultivation in ARC method was mainly attributed to reduction in seed material cost. The average yield of potato was marginally higher (69 q/acre) in ARC method compared to conventional method (67q/acre) of potato cultivation. The higher yield in ARC method was mainly attributed to high yielding varieties of seedlings than seed tubers. The net returns realized in ARC method (Rs. 48,325) of potato cultivation was higher compared to conventional method (Rs. 30,963) of potato cultivation mainly due to reduction in seed material cost and slight increase of yield in ARC method. Returns per rupee of expenditure in ARC and conventional method were Rs. 1.56 and Rs. 1.31, respectively. The adoption of ARC technology by sampled respondents saved seed costs by 14% and increased net income by 29.6% compared to the conventional potato cultivation method. Hence, awareness has to be created for popularization of ARC across all the stakeholders through conduct of field days, technology demonstrations for adoption and its dissemination.

Keywords: ARC Technology, Potato seed, ARC seedlings, Cost & Returns and Conventional potato production.

External and internal qualities of egg in layer chicken as influenced by dietary inclusion of perilla and flaxseed

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ABSTRACT: The experiment was conducted done for 6 weeks duration in laying hens of 30-week-old and there were 20 birds in each treatment. There were five number of different treatments, T1 – Control (Corn soya-based layer diet), T2- Corn soya-based layer diet with perilla @ 50 g/kg in diet, T3- T3- Corn soya-based layer diet with perilla @100 g/kg in diet and T4- Corn soya-based layer diet with flaxseed @ 50g/kg in diet and T5- Corn soya-based layer diet with flaxseed @ 100g/kg in diet. The results revealed that Birds in T3 and T5 group receiving 10% Perilla and 10 % of Flaxseed had given significantly better egg weight at III, V- and VI-week feeding period when compared with other groups in laying hen. The highest egg weight of 58g in T5 group (with 10% flaxseed). Higher values of egg shape index (76) was found in T3 and T5 group while there was no effect on specific gravity of the egg. No significant difference was found on shell weight % and shell thickness of the egg of laying hen in any of the treatment group though there is slight improvement in both the parameters in T3 group. Yolk index of T3 (with 10% Perilla) and T5 (with 10% Flaxseed) groups at III and VI weeks feeding had higher values of 46.2 to 46.96. Significantly better albumen index was observed in T3 and T5 group at III week and VI week feeding period. No change in the Haugh unit at III week feeding value while better Haugh unit was observed in T3 and T5 group at III and VI weeks feeding. Hence dietary inclusion of perilla and flaxseed at the rate of 5% and 10% inclusion levels in the layer diet have improved the external and internal egg qualities in layer chicken

Keywords: Dietary inclusion, peril, flaxseed, egg external qualities, internal qualities, layer chicken

Improvement of lodging resistance through breeding approaches in direct seeded rice (*Oryza sativa* L.)

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ABSTRACT: The use of semi-dwarf plants facilitates high grain yield since these varieties possess high levels of lodging resistance and thus could support the high grain weight. Although this approach has been successful in increasing grain yield, it is desirable to further improve grain production and also to breed for high biomass. Breeding for lodging resistance in rice involves selecting and developing varieties with traits that contribute to stronger, sturdier plants less prone to lodging through the identification and prioritization traits associated with lodging resistance in direct seeded rice, such as shorter stature, thicker stems, stronger root systems, and enhanced stem architecture. These traits help in supporting the weight of the grain and withstand environmental stresses commonly encountered in direct seeding systems. Exploitation of diverse genetic resources, including wild rice species and traditional landraces adapted to direct seeding conditions helps in identification of novel alleles and genomic regions associated with lodging and allows breeders to target and introgress relevant QTLs into elite breeding lines by conducting QTL mapping studies. Further the use of marker assisted back crossing and multi trait selection breeding techniques for precise transfer of lodging resistance genes into elite breeding lines along with selection of breeding lines by considering other important agronomic traits for direct seeded rice, such as early vigor, weed competitiveness, and drought tolerance. In addition to these exploitations, culm strength and culm diameter are the important traits for lodging resistance in direct seeded rice by facilitating the crop to withstand wind-induced forces, preventing bending or breakage. The genomic area that is stable and consistent inside the id1001973-id1006772 marker interval may be a significant source of alleles that improve rice's resistance to lodging. (Yadav et al, 2017). Future marker-assisted breeding initiatives might make use of the polymorphic SNP markers found in these QTL locations. To fully comprehend the mechanism of lodging resistance, functional validation of the candidate gene SCM2 and genes for GA production with precursors of several metabolic pathways linked to culm QTLs (qCS6.2, qCS1.1, and qCD1.1) would be an important next step.

Importance of colored rice genotypes in plant breeding

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ABSTRACT: Rice is the second most important cereal crop in the world. Among the rice growing countries in the world, India has the second largest area under rice crop (about 45 million ha) and ranks second in production next to China. In Asia, traditionally, rice with varied colours such as red, purple, brown yellow and green have been grown. Traditional rice varieties maintained and cultivated by farmers are likely sources of germplasm for breeding new rice varieties. They possess traits potentially adaptable to a wide range of abiotic and biotic stresses. Characterization of these germplasms is essential in rice breeding and provides valued information on developing new rice cultivars. Two loci have been identified using classical genetic analysis for red pericarp coloration, Rc (brown pericarp and seed coat) and Rd (red pericarp and seed coat). When present together these loci produce red seed colour whereas Rd in the absence of Rc provides brown seeds whereas Rc alone has no phenotype (Kato and Lshikawa, 1921). A mutation in the Rc gene that changed the red seed of wild rice into the white seeds of modern rice is shared by a large majority of rice varieties, regardless of subspecies (Megan et al., 2007). Evaluation of the germplasms should be conducted to assess their potential as donor parents for the breeding of new varieties with improved responses to various abiotic and biotic stresses. Broadening of the genetic base through utilization of diverse germplasms in breeding for new rice varieties may be able to break the yield barrier that rice breeders are currently trying to address. (Rabara et al, 2014). To conclude that, colored rice varieties play an important role in breeding programs by offering nutritional benefits, meeting market demand, enhancing crop diversity and resilience, creating value-added products, preserving cultural heritage, promoting sustainability and providing valuable genetic resources for crop improvement and further including them in breeding initiatives helps create more nutrient-denser, resilient, and varied rice varieties that meet consumer demands.

Assessment of mortality due to caprine pneumonia in Jamunapari, Barbari, and Jakhrana breeds under semi-intensive farming system

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ABSTRACT: Pneumonia affects goats and sheep of all ages and is one of the most common respiratory problems in small ruminants throughout the world, including India. It is responsible for a very high morbidity and mortality in lambs and kids, leading to severe economic losses to goat farmers. The current investigation was done to assess mortality due to pneumonia in goats with respect to breed, age, sex, and season. Postmortem data on pneumonia with respect to the goats of the Jamunapari, Barbari, and Jakhrana breeds was compiled from January 1, 2005, to December 31, 2023 (19 years' duration). During the period, out of total post-mortem cases, the overall proportionate mortality due to pneumonia was observed at 27.74%, and in male goats, it was found to be higher as compared to female goats. No significant difference in proportionate mortality was observed in the Jamunapari, Barbari, and Jakhrana breeds. The proportionate mortality was found to be highest in the winter (53.05%), followed by the summer (29.03%) and rainy seasons (17.91%). Likewise, the proportionate mortality was noticed in mainly kids (22.22%) compared to the adult goats (5.44%), and the younger kids (0–6 months) were more affected as compared to the older ones (6–12 months). Thus, the investigation concludes that the maximum mortality due to caprine pneumonia was seen in the younger kids and in the winter season.

NLR 3217: A Short duration, Photo-insensitive Climate Resilient rice culture

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ABSTRACT: Rice is the major staple food crop and versatile in nature. In India rice crop occupies an area of about 43.79 million ha, with a production of 116.42 million tons and an average productivity of 2659 kg/ha. Andhra Pradesh, a major rice growing state in India where rice crop is cultivated in an area of about 2.21million ha with a production of 8.25 million tons and productivity of 3733 kg/ha. In the entire Andhra Pradesh rice crop can be grown in the kharif season but in the southern zone of Andhra Pradesh where rice can be grown in the early kharif and rabi seasons. The early kharif season is characterized by quite high temperatures, high velocity hot winds, and the variety should mature in a shorter time. In view of this, Agricultural Research Station, Nellore has developed NLR 3217, a short duration (120-125 days), medium slender grain, blast tolerant, non-lodging rice culture. It is a cross derivative of NLR 34449 x NLR 33358. It has dwarf stature of 80cm height, profuse tillering capacity, medium green foliage, medium droopy panicles with highly acceptable plant characters along with high grain yield, pest and disease tolerance ability. It is a photo-insensitive rice culture and can be grown though out the year. It possesses moderate resistant score for leaf blast and recorded a susceptibility index score of 4.0 for leaf blast disease among 19 locations tested across India under AICRIP testing during 2023. The genotyping data revealed that it possess Pi54 gene to confer resistance. Whereas, the susceptible check variety HR 12 recorded 6.5 score and resistant check Tetep scored about 4.2. It recorded an average yield of 6410 kg/ha over the check of 5799 kg/ha in different trials conducted for a period of 9 years. It produces good quality cooked rice besides high milling and head rice recovery (>60%). It produces medium slender white rice with intermediate amylose, soft gel consistency and moderate gelatinization temperature.

Exploring the plastic degradation capacity of superworms (*Zophobas morio*): a comparative analysis across various plastics and examination of proximate composition changes

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ABSTRACT: Plastic waste poses a significant global challenge, wreaking havoc on the environment and jeopardizing human and animal well-being. Microplastics discharge harmful substances, causing tissue damage, while ocean plastics pose threats to marine creatures through ingestion and entanglement. Recent discoveries indicate that specific types of insect larvae possess the ability to ingest and decompose plastics, offering hopeful pathways for biodegradation. One such approach involves leveraging organisms like *Zophobas morio*, commonly known as superworms, a species of darkling beetle larvae renowned for their capacity to metabolize plastics. This research investigates the performance of superworms exclusively fed with polystyrene (PS) and polyethylene (PE) foam plastics for a duration of 35 days, with cabbage serving as a control. Daily monitoring tracks parameters such as weight gain, mortality rates, and survival rates. The study also examined the duration taken to consume each plastic type and any indications of distress exhibited by the superworms. Statistical analysis reveals a higher rate of PS consumption compared to PE. While superworms fed with PE exhibit greater weight gain than those fed with PS, the length gain is more pronounced in PS-fed superworms. Nutritional profiling of all experimental setups is conducted at the end of the trial period. Interestingly, superworms fed with cabbage demonstrate the most favorable nutritional composition when compared to those fed with plastics. Evidence of plastic presence is detected in both PS and PE frass samples. These findings underscore the significance of superworms in plastic breakdown and their potential role in waste management, particularly in addressing the challenge of plastic pollution.

Keywords: Circular economy, Plastics, Zero-waste, Insect meal

ABOUT THE EDITOR

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Dr. Devi Dayal is former Head, ICAR- Central Arid Zone Research Institute, Regional Station, Gujarat. **He** started Agricultural Research Service in January 1984 and has worked in different capacities in technology development and dissemination related to groundnut and other dryland crops for about 36 years in different institutes such as Directorate of Groundnut Research, Junagadh. He was instrumental in developing paired row planting pattern and in-situ moisture conservation technologies for groundnut and other dryland crops. During his career, he mobilised external funding from different agencies such as PPV&FRA, NATP, NAIP and NASF for various research activities and handled collaborative projects with international CGIAR institutions like ICRISAT, Hyderabad & ICARDA, Jordan. He conducted many national seminars in the capacity of organising secretary. He has edited 15 books and published more than 100 research papers in journals of national and international repute. He has also contributed to several book chapters to books and proceedings of the symposia apart from many technical bulletins and training manuals. He has received many awards including Fellow 2015 by the Indian Society of Oil Seeds Research and Gold Medal and Distinguished Plant Scientist Award-2013 by the Academy of Plant Sciences. He serves as member of Editorial Board for Indian Journal of Oil Seeds Research and Advances in Plant Sciences. He acts as external examiner for post-graduate and doctoral students for several universities Junagadh Agricultural University, Junagadh and MPKV, Rahuri, TNAU, Coimbatore and Osmania University, Hyderabad.

ABOUT THE BOOK

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