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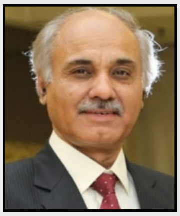
Inside this issue:

Registrar's Message



Dr. J. Kumar, Registrar

COVID-19 has struck deep into the global economic system and India isn't any exception. Agriculture remains the source of livelihood for 58% of the Indian population while 44% of the country's workforce is employed in agriculture, and hence remains a central pillar of the Indian Economy. The sector serves the food consumption needs of the whole country, while also placing among the top exporters of agricultural produce in the world. The sector has been facing its share of challenges in recent years, but few have been as severe as the domestic and international travel restrictions during Covid-19. For the record, 69% of India's populace is living in rural areas, which constitutes to extra than seven hundred million humans ——

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Editor's Desk

Dr. S. P. Singh, Editor-in-Chief

Post independence early period of the green revolution in India focused on large farms and wealthy farmers who could acclimatize with the more resource-intensive agricultural methods introduced. India holds the second-largest agricultural land in the world, with 20 agro-climatic regions. Thus, agriculture plays a vital role with 58% of rural households depending on it even though India is no longer an agrarian economy. ——

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Registrar's Message

comprising farmers, housewives, SME's, authorities servants and youth. The visible impact of COVID-19 inside the rural quarter include the rural supply-chain, put off in sowing and harvesting of crops, predicted task cuts in the agricultural region, complete shutdown of exports and prediction of a weak consumption trend post COVID-19.

Following COVID19, India has accelerated (digital) innovations such as the eNAM (electronic National Agriculture Market); a pan-India electronic trading platform for farmers. The government plans to connect all markets to the platform in financial year 2021-22. The Indian government has also recommended that states suspend some provisions of the Agricultural Produce Marketing Committees Acts to encourage direct selling by farmers of crops rather than going to rural wholesale markets ('mandis'). The government launched an app which helps farmers and traders find transport vehicles ('uberization' of farm produce transport). Online retailing accounted for less than 1 percent of total grocery sales in 2019, but has increased exponentially (although faced with the challenge of finding delivery staff).

As for food and nutrition security at such a time, government warehouses are overflowing with 77 million tons of rice and wheat. In order to avoid errors in public distribution, it is better to offer universal coverage of distribution. Nutrition programmes like Integrated Child Development service (ICDS), mid-day meals, and *Angawadis* (rural child care centers) should continue to work as essential services and provide ration and meals to recipient at home.

Unemployed informal workers need cash income support. The government has though provided Rs 500 per month to the bank accounts of 200 million women via *Jan Dhan* financial inclusion programme, this too is insufficient. There are about 40-50 million seasonal migrant workers in the country.

The central and state governments have recognized the COVID-19 challenge and responded aggressively- but this response should be just the beginning. India must be prepared to scale it up as events unfold, easing the economic impacts through even greater public programme support and policies that keep markets functioning.

One of the main barriers to boosting farm productivity is the lack of new technologies and major breakthroughs post the green revolution. While the National Agriculture Research System (NARS) played a major role in the green revolution, yet another breakthrough in research is due. A post-COVID situation offers that unique opportunity in agricultural research and development as also the prospect to repurpose the existing food and agriculture policies for a healthier population.

Research Story

Editor's Desk

Green revolution in our country left lot of grey areas like soil health, human health, crop productivity stagnation, environmental pollution are the biggest riddles to solve. The farmers are not happy with the profit and shifting from agriculture profession is another demur in coming days. Some areas like organic farming, off season cultivation, conservation agriculture, precision farming, tire system of farming, and integrated farming could be the rejoinder but these technologies are very site specific and still needed to be validated for different agro-climate and farming situations and utmost easy catch for farming community.

STATEMENT OF RESEARCH ACHIEVEMENT

Dr. Anil Kumar Sharma

Director Extension Education

Dr. A.K. Sharma is renowned nationally and internationally for his research work in soil microbiology. The overall goal of his research work has been focused on rhizosphere biology. He has introduced a novel biofertilizer technology for the first time, his work on the development of a methodology for the enhanced shelf life of bacteria, arbuscular mycorrhizal fungal propagation under *in vitro* conditions, and using the aeroponic system has contributed towards a new era of biofertilizer research in India and abroad.

He has introduced the concept of combined inoculation of arbuscular mycorrhizal fungi, *Pseudomonas fluorescens*, and *Trichoderma harzianum* strain T35. It has been used to develop the technology for protecting chili and tomato against *Fusarium* wilt. The technology has been demonstrated at farmers' fields in Nainital, Udham Singh Nagar, and Bareilly districts and is ready for commercialization. Furthermore, he has exploreda new fungal strain of *Fusarium pallidoroseum*as a biofertilizer. The process of its mass multiplication has been patented. The fungus is non-specific means it can promote the growth of different crops including cereals, pulses, flowers, and vegetables. It has gotphosphorus solubilization activity and therefore, can give higher nutrient concentration in plants under marginal soils. The mass production protocol has been achieved and technology is ready for commercialization.

Fusarium pallidoroseum

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Additionally, technology has been generated and commercializedusing arbuscular mycorrhizal (AM) fungi and two strains of pseudomonads, where it could increase the yield of wheat from 10-14% as demonstrated at different places in UP, Uttarakhand, Haryana, MP, Rajasthan, and Punjab, the major wheat-growing areas. The technology has been licensed to Nagarjuna Fertilizers and PCIL, Pune.

Arbuscular mycorrhizal

The licensing has been done worth of Rs. 2.00 crores to both the companies. The first-time demonstration for *in situ* detection of bacterial strain has been done and also both the pseudomonads strains have been fully sequenced. He has recently developed AM fungus technology for mass production under axenic conditions which got transferred to Insecticide India Limited, New Delhi in 2019.

Use of Jatropha deoiled cake is the problem and preparation of compost out the Jatropha deoiled cake with the amendments of the organic materials has shown disease suppression of different soil-borne diseases. A unique molecular marker has been developed to detect such type of compost and is ready for commercialization.

He has worked on enhancing the shelf life of *Trichoderma harzianum*strain 35 showing good biocontrol activity at the farmers' fields using knocking out gene technology. It has been shown by other workers in the case of *Saccharomyces cerevisiae* that *Phil* gene is involved in the regulation of heat stress in the yeast. This hypothesis was followed in *Trichoderma harzianum* by his group where it was found that there are two transcripts, one is functional and the other is non-functional since it has got four introns. While doing RT PCR, it is found that the non-functional transcript is expressed. After verifying the knockout of *PIL* gene, T35 isolate has been mutated using gamma radiation and a strain working at 55¤ has been achieved.

He has extended his research area on fungal fermentation for organic extracellular pigment production and utilization as a natural dye for silk and woolen fabric. He has identified the culture, chemical composition of the extracellular pigments, optimized the culture conditions both physical and medium composition for maximum extracellular pigments production, toxicity test against rat model, microalgae, carried out antioxidant properties, the stability of pigments, storage stability. This pigment has also showed the potential in liver functioning.

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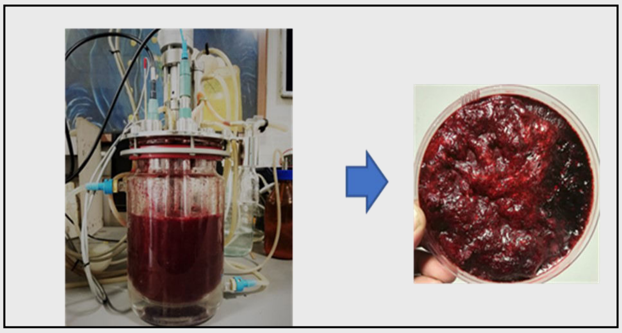
Also, his group developed dyeing parameters for silk and woolen fabric acquired a pleasant shade, and exhibited very good to excellent washing, and rubbing fastness.



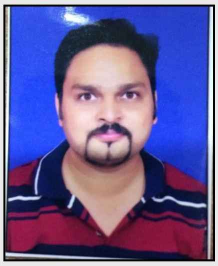
TalaromycespurpureogenusFextracellular pigment

Since 2015, he further added new dimension to his research area on microalgae for the production of value-added products. He has submitted a patent with Application No.201711031649 A where the *Desmodesmussubspicatus* GB6 culture in axenic heterotrophic mode with different sugars results in a different concentration of EPA, omega 6 to 3 ration 1:1, protein (39.78%), Carbohydrate (30%), contain lutein carotenoids, shows antioxidants properties. Besides, he hasmicroalgae *Parachlorellakessleri* GB1 with maximum biomass productivity 1.3 g/L/d cultured under axenic heterotrophic cultivation conditions, with high antioxidant properties like ABTS, PM, ferrous chelating activity (EC_{50}0.960mg/mL), DPPH scavenging activity (EC_{50} 0.073 mg/mL).*P. kessleri* can be used as functional food additives like capsules, tablets, flour, as an alternative protein.

He has completed 7 international projects with prestigious institutions in countries like Switzerland, Finland, Germany, Philippines, and Australia and 1 international project with Denmark is ongoing and 14 projects under national funding from agencies like ICAR, DST, DBT & DRDO. He has published > 120 research papers, articles in national and international peer-reviewed journals, and 8 books. He has one patent granted andt wo under process. He has been appointed as a member of the expert committee in DBT, also the series editor for the Rhizosphere Biology series from Springer Verlag. He has been invited to deliver lectures in many international scientific institutes & universities and has chaired and spoken at various national & international forums. He has transferred two technologies to commercial manufacturers of biofertilizers in 2012 and 2019.

Research Story

MICROGREENS- A millennial super food of urban farming



Dr. Amit Kesarwani

Assistant Professor, Department of Agronomy

Have you ever tasted fresh green wheat leaves at tender stage in the morning diet?? Wheatgrass is one of the types of microgreens which has been harvested in 10-14 days stage while growing in your apartments or any locations. It's a perfect food supplement to grow in limited space and don't need much care. Microgreens are well familiar in western world with other nicknames too such as **microherbs**, or **vegetable confetti**. They are different from sprouts where seeds are not considerate but baby plants after first true leaf emergence has been harvested for salad garnishing, juice and as a part of sweet and savory dishes. They have high aromatic flavour, concentrated nutrients, loaded with vitamins, antioxidants and phytonutrients which are exceptionally beneficial than matured green leaves. On a larger scale it can even make a profitable business similar to commercial crops, which is extensively popular in premium hotels, supermarkets, various stores, and in many up-market dishes. There is huge list of plant families where plant producing seeds can be used as microgreens ranging from leek, onion, amaranth, carrot, fennel, celery, cauliflower, cabbage, broccoli, cucumber, squash, melons, spinach, lettuce and many more. In cereals oats, wheat, barley, rice as well as legumes such as beans, lentils and chick pea are also sometimes hit the list.

Microgreens require less warm and humid conditions where it can even germinate without any fertilizer application. But a little dose of nutrient supplements through water soluble fertilizers quick fold the production. It can regenerate after each cut; however, the nutrient content would be compromised, where every cut will be the end of seedling life on nutritional ground. So, every two weeks we can re-grow them in similar manner. For only two leaves harvest, a potting mix of cocopeat in ample sunlight will be sufficient. In an indoor system, it can be grown in hydroponic unit where kitchen tray with the coconut coir supporting the roots, and nutrient film technique can be used in the regulated nutrient rich solution. Other mediums also help to grow microgreens from hemp mats, clay pebbles, rock wool and vermiculite.

Research Story

One of the most convenient techniques at home is using hydroponic growing pads (plastic trays) or paper towels which kept moist on daily basis for ample humidity and moisture while keeping the seeds sheltered from excessive light. After 4-8 days the seed will sprout and cotyledon stage (two to three leaves) can be seen in 10-14 days which considered as the best stage to harvest microgreens.

The urban city life is vacuumed with tiny spaces now and the microgreens found the perfect spot to grow indoor and in cubic trays with little investment. The market reach is culinary industry where it's blooming in an exceptional manner with smart industry thinking. Our Uttarakhand enriched with a versatile plant kingdom that gives ample fortune to try this technique as microgreens growers and be AATM-NIRBHAR.

Shoots of alfalfa, Chinese cabbage, garlic, kale, lentils and radish in potting compost. Pic credit: ALAMY

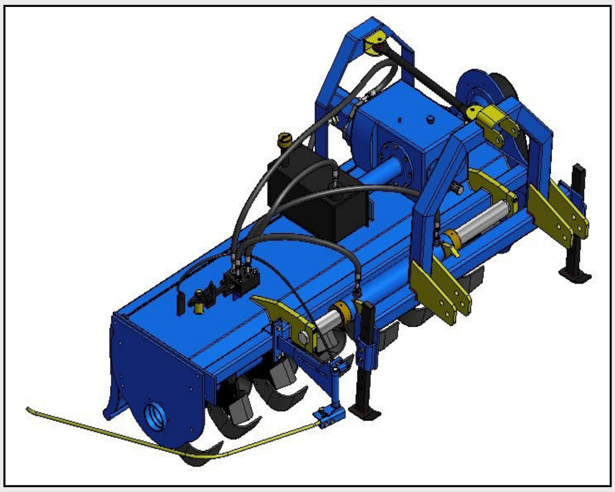
Research Story

OFFSET ROTAVATOR FOR ORCHARDS

Dr. R.N. Pateriya,
Professor

Offset Rotavator is an implement that is generally used for intercultural operations in the orchards. The ordinary rotavator at the back of the tractors cannot be used in the orchards because of the hindrance that is created by the narrow spaces between the trees. The Offset Rotavator proves to be useful for the intercultural operations in the orchards since it can offset from the centre line of the tractor and can reach out to the area under the tree without damaging the trees. The most important feature of this type of rotary tillage tool is the side shift system which works when the sensing rod of the Offset Rotavator senses the tree and the shifting mechanism shifts inwards. The side shift rotary tiller is used mainly for intercultural operation in the orchards and in row crops which requires an implement with side shift ability.

The field experiment was carried out in the sandy clay loam soil at Horticultural Research Center, Pattherchatta, Govind Ballabh Pant University of Agriculture and Technology Pantnagar-263145 U.S. Nagar, Uttarakhand during the period of 2012- 2018.



Steady view of the developed Offset Rotavator.

Working of the developed Offset Rotavator in pears orchard

Research Story

The study was undertaken to examine the influence of λ – ratio and depth of cut on different parameters of Offset Rotavator. The experiments for evaluating the performance of the modified Offset Rotavator were carried out in three different orchard fields of Mango, Pears and Sapota. The different dependent parameters determined during the study were draft, fuel consumption, mean mass diameter, field efficiency, residue incorporation, plant injury, area uncovered near the girth and the cost of operation of the modified Offset Rotavator.

Based upon the experimental results, the following conclusions can drawn –

1. The modified sensing mechanism work satisfactorily as the plant injury were reduced by 6.76, 5.25 and 5.77 % for Mango, Pears and Sapota orchards. It was found that at a particular value of λ-ratio as the depth of cut increases, the draft required by the implement increased and for same depth of cut if we increase λ-ratio the increased draft was reported. The effect of λ-ratio and depth of cut were found to be significant on the draft.
2. It is observed that at a particular value of λ-ratio as the depth of cut was increased, the fuel consumption was increased. If the depth of cut is kept constant and λ-ratio was increased the fuel consumption was reported at reduced level. The effect of λ-ratio and depth of cut were found to be significant on fuel consumption statistically.
3. From the experiments it can be concluded that for a constant λ-ratio and varying depth of cut, as the depth of cut was increased the percentage of residue incorporation was also increased and on keeping depth of cut constant and increasing λ-ratio the residue incorporation is increased. The statistical result shows that λ-ratio and depth of cut has significant effect on the residue incorporation.
4. It is concluded that as the λ-ratio increases, the actual field capacity decreases. The λ-ratio has insignificant effect on the actual field capacity. It is observed from the results that as the value of girth increases for a tree, the area uncovered near the tree was decreased. The effect of girth value was found to have significant effect on area uncovered near the tree.

Research Story

Aerobic Rice: A New Technology to Enhanced Resource-Use Efficiency

Dr. V. P. Singh, Professor Agronomy

The rice-wheat system is a predominant cropping system of the Indo-Gangetic Plains (IGP), where rice is traditionally grown by transplanting 20-25 days old seedlings into puddled fields. Results of several studies have indicated that nearly 30% of the total water used (1,400-1,800 mm) in rice culture is consumed mainly in puddling and transplanting operations, which resulted breaking of capillary pores, destroys soil aggregates and results in formation of hard pan, creating problems for the establishment and growth of succeeding crops. As a matter of fact, the global reduction in the availability of water for agriculture purpose is one of the greatest threats to rice producers. Hence, direct seeded rice (DSR) can be a mitigation strategy to meet up the increasing water demand of the rice crop. Due to climate change *i.e.* research reports have revealed that for each 1˚C rise in temperature water requirement of rice crop increases by 2-3%. The profit margins are decreasing in transplant puddled rice (TPR) mainly because of high labour cost and water requirement. Increasing water scarcity, water loving nature of rice cultivation and increasing labour wages switching over from TPR to DSR for rice cultivation which can increase water productivity. There are large areas, where rice is grown under upland aerobic conditions. Aerobic rice system (ARS)/ Direct seeded rice (DSR) is a new rice production technology in which rice is grown under nonpuddled, nonflooded, and nonsaturated s conditions of soil.

IRRI Scientist Visits DSR at NEBCRC

IRRI Scientist Visits DSR—FLD

Research Story

Director Research visited DSR field (40 Hectare) at NEBCRC with associated scientists

Alternative technology rice establishment through direct dry seeding under irrigated ecosystem in the Indo-Gangetic Plains began at the G. B. Pant University of Agriculture and Technology, Pantnagar with technical collaboration from the International Rice Research Institute (IRRI) Philippines, the Natural Resources Institutes (NRI) UK and the University of Liverpool UK with financial support from the Department for International development (UK) for the period of 10 years (2000-2010).

The research was confined to GBPUAT experiment Station at Pantnagar in collaboration with progressive farmers Uttrakhand and Uttar Pradesh. In subsequent years, work on alternative methods and weed management was extended to eastern part of Indo-Gangetic Plains NDAUT, Faizabad RAU and Patna. Further, developed technology disseminated through NGOs Ram Krishna Mission, Pradhan (West Bengal) and NEFROD (Lucknow). At these sites, on-farm trials over several seasons at various locations have demonstration in large area adoption on direct seeded rice successfully achieved comparable yield and resulted DSR is a suitable alternative of transplanted rice. Many farmers have expressed considerable and system is being adopted among lead farmers. Technology is cost effective, save labour and water and increase farmers profit.

Research Story

Why shift TPR- DSR?

1. **Rising interest in conservation agriculture:** Conservation agriculture (CA) involves zero till (ZT) or reduced till (RT) sown and an additional crop intensification.
2. **Best fit in cropping system:** Besides the savings in labor and water, economic benefits its early mature of as compared to TPR that's fits well in different cropping systems.
3. **Economics:** A major reason for farmers' interest in DSR is the rising cost of cultivation, and decreasing profits with conventional system.

Less methane emission

Enhanced nutrient use efficiency and integrated weed management can produce comparable yields to that of transplanted rice (TPR) encouraging many farmers to switch over TPR by DSR.

Production Technology

1. **Soil type:** Direct seeding should be done on medium to heavy textured soils.
2. **Planting time:** The best seeding time for DSR is a first fortnight of June. This would facilitate the timely establishment of the rice crop before rains and reduce seedling mortality brought about by submergence, making efficient use of rainwater and timely planting of a succeeding crop of after the rice harvest.
3. **Laser land leveling:** Surface covers, seed and labor costs, soil moisture regimes, and the intensity of weed infestation determine planting techniques and associated practices enable good germination and seedling emergence. Laser land leveling enables farmers to apply water uniformly, thus facilitating a uniform crop stand and maturity through improved nutrient-water interactions.
4. **Seed rate and seeding depth:** A seed rate of 30-35kg/ha should sown at a depth of 3-5 cm with maintaining optimum spacing 20-25cm within row to row after pre sowing irrigation.
5. **Seed drill:** Among various seed drills used for direct seeding (viz., conventional seed cum fertilizer drill, Pant zero till ferti seedrill, Inverted T-tyne zero-till seed-cum-fertilizer drill and rice planter) with inclined plate metering mechanism are most suitable for DSR. These types of machines help in maintaining row to row and seed to seed spacing with little breakage.
6. **Nutrient management**: A general recommendation is to apply a full dose of P and K (60 kg P_2O_5 and 40-60 kg K_2O/ha) basally.
7. For N @I20-150 kg/ha an it is suggested that 50% of the recommended dose of N can be applied at sowing using a seed-cum-fertilizer drill, another dose should be split 2-3 time between tilling to panicle initiation stage.

Research Story

Iron chlorosis particularly in sandy soil and deficient in zinc under micaceous soil is very common hence would need its application in DSR field.

7. **Weed management:** Weed management mitigation in aerobic rice is the prime challenge for the farmers. These days many new herbicides are available in the market which can be used judiciously. Pendimethalin@1000g/ha as Pre Emergence (just after seeding) followed by penoxsulam @25g/ha or bispyribac sodium@20g/ha at 15-20 days after sowing (DAS) else there is not much infestation of complex weed flora one can go for application of 2, 4-D @ 500 g/ha or (MSM+CME)@20 g/ha at 30DAS. If there is infestation of *Leptochloa chinensis* weed with other complex population of weeds in the field, ready mix application of penoxsulam 1.02 % + cyhalofop-butyl 5.1 % w/w OD @120-135g/ha at the 2-3 leaf stage of weeds or at the crop age of 20-25 DAS can be applied. If there is problem of Cyperus sps then one can apply 2, 4-D @ 500 g/ha or (MSM+CME)@20 g/ha at 30DAS. Metamifop10%EC @100g/ha can be used against *Leptochloa chinensis* infestation at 15-20 DAS.

8. In heavy textured soils, DSR crop is commonly established by farmers with pre-sowing irrigation. First post-sowing irrigation can be delayed from 7-15 days with subsequent irrigations at an interval of 5-10 days. Water stress must be avoided during critical stages of seedling emergence, active tillering, panicle initiation and flowering stage.

Pre-requisites for aerobic rice:

Laser leveling: Precise leveling is pre-requisite for DSR and should be done at least first fortnight of May.

Stale Seed Bed: After laser leveling, the field should be irrigated which stimulates weed and previous rice crop seed to germination, that can be destroyed by shallow tillage operation or glyphosate 1500-2000 g/ha or paraquat 24SL @ 1250 ml/ha application at field preparation before rice seeding.

Integrated weed management: Integration of preventive, physical, mechanical, cropping and cultural measures along with low doses of herbicides is imperative to make weed management effective, economical and eco-friendly.

Brown mannuring

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Research Story

Systematic weed monitoring programme: Effective weed control is pivotal for DSR. Cultural methods of weed control like stale seed bed technique, use of surface mulch, cover crops (viz., *Sesbania rostrata*, *Phaseolus radiatus* and *Vigna unguiculata*) used as brown manuring can help to reduce weed pressure. Cover crop of *Sesbania* can be knocked downed with application of 2-4D@500g/ha at 20-25 DAS.

Advantages from DSR:

1. Labour required for nursery raising, uprooting and transplanting of seedlings are saved to the extent of about 40%.
2. Sowing can be done in stipulated time frame because of easier and faster planting.
3. Early crop maturity by 7-10 days which allows timely planting of subsequent crops.
4. More efficient water use and higher water stress tolerance.
5. More profitability especially under assured irrigation facilities.
6. Better soil physical conditions.
7. Less methane emission: direct seeding (DSR) < Transplanted rice (TPR).
8. Saving of water (up to 60%) as nursery raising, puddling, seepage and percolation are eliminated.
9. Fertilizer use efficiency is increased because of placement/ application of fertilizers in the root zone.
10. Energy saving (up to 60% of diesel) because of elimination of field preparation for nursery raising, puddling and reduced water application for irrigation.
11. System productivity is enhanced
12. Cost of cultivation is reduced by about Rs. 5000-6000 ha

PMSS-1: A Mango germplasm for *Off season*

Dr. A. K. Singh, Department of Horticulture

In north India the fruits of different mango verities mature from June to July and become available to the consumers upto mid August. The team of scientists led by Dr. A. K. Singh, Department of Horticulture, GBPUA&T, Pantnagar has developed one new germplasm/variety of mango at HRC, Patharchtta, which matures in first fortnight of September and the fruits may be available upto last week of September. The new developed variety/accession of mango namely **PMSS-1**(Pant Mango Seedling Selection-1) has been identified as a chance seedling and it is of intermediate tree growth habit.

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Research Story

It has yellow colour fruits having average fruit weight of about 250 g, fruit surface is smooth, flesh is attractive golden yellow colour and also has good blend of sugar & acid.

The fruit possesses the TSS from 17.5 to 18.8 ^{0}B, acidity from 0.22 to 0.28 %, ascorbic acid from 35.0 to 40.0 mg/100 flesh and total carotenoides of about 4.25 mg/100 g flesh. It has shelf life of about 8-10 days at room temperature.

Dr. A.S. Nain, Director Research, GBPUAT, Pantnagar has visited and witnessed the bearing plants and newly established mother block of promising germplasm of mango (PMSS-1) at HRC, Patharchtta on 7th September 2020 and at the same time the bearing plants were also shown to the media personnel for its wider publicity. Dr. Nain has told that such type of germplasm will be helpful to increase the farmer's income by fetching more prices in the market due to its availability during the off season. Dr. A. K. Singh, Joint Director, HRC and Programme Coordinator, AICRP on fruits informed that the trial entitled "Augmentation and evaluation of germplasm in mango" with the objectives to strengthen NAGS in germplasm collection, conservation & characterization and evaluation for the specific traits (i.e. off season bearing, shelf life, peel colour, pulp texture and anthracnose) is being operational under AICRP on fruits at HRC, Patharchatta. It was also informed that under said project 22 primary germplasms/accessions of mango have been identified from different districts of Uttarakhand. Among the identified mango accessions, the nine namely PMSS-1, 7, 8, 9, 10, 11, 14, 17 and 18 are being characterized after its establishment in gene block at HRC and the grafts of these nine accessions have been also deposited to National Active Germplasm Site (NAGS) at CISH, Lucknow. Now to get the IC (Indigenous Collection) number a proposal with passport data of the germplasm will be sent to the NBPGR, New Delhi.

Organic farming

Dr. D.K. Singh
Professor, Department of Agronomy

Quality organic produce with good productivity requires good soil health. Balanced nutrition is required to maintain fertility status of soil in addition to better growth and development of plant. Nutrient level and its availability in soil play major role in development of crop and it is directly related to its productivity under organic production system.

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Research Story

Therefore, in order to get satisfactory yield from crop in organic mode, the availability of essential nutrients in soil must be in sufficient amount and at right time.

In organic farming, soil is considered as living medium. Soil has numerous microorganisms, which are complimentary to each other and it also play major role in availability of essential nutrients in addition to crop growth. Essential nutrients are fulfilled through various nutrient management practices which are a very important aspect of organic production system. In order to keep soil fertile (physically, chemically and biologically), the bio-fertilizers and other organic manures are used in addition to green manures. Available resources used in organic farming for nutrient management are as under:

1. Green manure.
2. Farm yard manure (FYM), poultry manure, cow urine etc.
3. Crop residues and weeds
4. Compost (vermin-compost, enriched compost, effective microorganism compost etc.)
5. Various types of cakes (neem cake, mustard cake, etc.)
6. Biofertilizers, rockphosphate, lime etc.
7. Crop rotation, inclusion of legumes in cropping systems, intercropping etc.
8. Waste from different agriculture based industries.

In organic farming, the use of crop cycle principles is very effective to make available the crop nutrients mainly nitrogen and increase fertility status of soil. For this, cereal crops should be taken followed by pulses and pulses followed by cereal in the system. The use of pulses in crop cycle increases the environmental nitrogen fixation and which will be available for the next crop and also reduces the consumption of organic manures. In the initial years of organic farming, rice- wheat cropping system should not be included in crop cycle because it reduces the productivity of wheat.

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Research Story

Therefore, after rice, pulses like lentil, chickpea, vegetable pea etc. should be used. If organic farming methods are adopted properly, self resistance of pest and disease resistance in plants develops itself.

Agronomic practices: Various agronomic activities can also be a process of management of extremely effective low-cost and environmentally safe pest management practices. Agronomic practices changes the environment of crop and also changes the stage of disease and pests attack. These processes break the relationship between pest- diseases and plants, thus making the life cycle of insects- disease different.

Selection of appropriate seed and variety: The main basis of good crop is healthy seed; farmers always take risks in the selection of seeds and often use non-certified seeds. Most of the diseases are seed borne or soil borne. If the variety of particular crop is selected accordingly to the local environmental condition then the risk of crop damage is very less.

Organic Certification: To get the premium price of organic produce, organic production certification is an important aspect. It is to communicate, inspect/ evaluate etc. by the authorized way to insure compliance with standards from production processes. Organic certification is the process certification in which various stages of organic production like production, processing, storage and packaging etc. are being certified. Certification letter is issued only after ensuring compliance with the standards. Presently, the Government of India has authorized 28 organic certification agencies which is doing organic certification work in the country.

Key stages of Organic certification

1. Application by the Producer to the certification agency on the prescribed format.
2. Reviewing the application form received by the certification agency and seeking other information if required.
3. On receipt of full information, registering the producer, estimating the estimated duty and determining the date / time of inspection.

Contd—

Research Story

4. To supervise / audit all production processes by the inspectors as per the standards and submit the inspection report to the agency office.
5. Evaluation of inspection data by the agency and submission of certification decision to the production agent.
6. Issuance of certificate by certification agency only after compliance with standards.

Ridge furrow reversal (RIFUR) sowing of spring season maize, boosts water and nutrient use efficiency

Dr. Subhash Chandra, Professor Agronomy

Cultivation of maize during spring season (February to June) is becoming popular in Northern belt of the country. Unlike rainy season (main season of maize cultivation) wherein drainage of excess water is essential, maize requires 8-10 irrigations during spring season to produce potential yield, because this is almost rainless season. During this season, the initial phase of the crop faces low temperature, but April onward the temperatures spikes and hot winds also starts. As a result, the daily evaporation rate touches 10-12 mm per day. Due to high evaporative demands the water requirement of maize also increases. To cope up this demand RIFUR (ridge furrow reversal) method of maize raising has been found quite promising as compared to flat sowing and ridge sowing, the two most popular methods of maize sowing.

In RIFUR method, after land preparation surface is converted into ridge and furrows using ridge maker machine. The furrow to furrow spacing is kept at 60 cm. The maize seeds are sown in the furrows at a spacing of 20 cm and covered with soil and then firmly compacted to ensure proper seed soil contact. At the time of sowing, the soil moisture content (60-70% of field capacity) is required to support germination. First irrigation is provided 14-18 days after sowing, upon proper crop establishment. Subsequently, irrigations are provided as per recommendations (IW:CPE 1.20) maintaining an irrigation depth of 5.0 cm.

Main attributes of the RIFUR practice: At 35-40 DAS, the first top dressing of urea is done. After urea application, the ridges are dismantled with the help of spade and soil is placed along the crop rows (earthing). This way, the ridges gets converted into furrows and furrows into ridges. Since soil covers the urea, so its efficiency gets increased.

Contd—

Research Story

Also, the lodging problem is reduced as the plant stem is supported by the soil. The roots remain in the moist soil zone as these are covered with soil upto ridge height.

Yield and water productivity of the RIFUR; comparative performance against ridge and flat sowing

Practice	Grain yield (t/ha)	Water productivity (kg grain /m^3 water)
Year 2019		
Ridge sowing	6.15	1.23
RIFUR sowing	7.88	1.58
Year 2020		
Flat sowing	6.34	1.27
RIFUR sowing	8.61	1.72

Maize on ridges

Maize with RIFUR practice

Maize in Flat sowing

Maize with RIFUR practice

Pantvarsity in News

अब सितंबर अंत तक ले सकेंगे आम का स्वाद

संवाद न्यूज एजेंसी

पंतनगर। आम के शौकीनों के लिए एक अच्छी खबर है। एक तरफ आम का सीजन समाप्त हो चुका है, वहीं पंतनगर के वैज्ञानिकों ने आम की देर से पकने वाली प्रजाति पीएमएसएस-1 विकसित की है। यह प्रजाति देर से पकने के साथ ही गुणों से भी भरपूर है।

जीबी पंत कृषि एवं प्रौद्योगिकी विश्वविद्यालय के उद्यान अनुसंधान केंद्र में आम के प्रमुख वैज्ञानिक व संयुक्त निदेशक डॉ. एके सिंह ने बताया कि यह प्रजाति सितंबर में पककर तैयार होती है। सितंबर अंत तक खाई जा सकती है। उत्तरी भारत में आम की फसल मई से अगस्त के बीच तक समाप्त हो जाती है। चौसा और फजली आम की प्रजाति अगस्त के अंत तक बाजार में उपलब्ध रहती है।

इस प्रजाति को परिसर के नगला स्थित एक माली के घर में उगे एक स्थानीय आम के अंकुर के रूप में पहचाना गया था। इसके बाद पूरे उत्तराखंड से 22 जर्मप्लाज्मा एकत्र किए गए जिसमें से नौ जर्मप्लाज्मा को चिन्हित कर विकसित किया गया। इन नौ जर्मप्लाज्मा को नेशनल एक्टिव जर्मप्लाज्मा साइट लखनऊ में जमा करा दिया गया है।

संस्था ने इसके लिए विवि को एक प्रमाण-पत्र भी दिया है। इससे इस प्रजाति को विकसित करने में आसानी होगी। विवि के निदेशक शोध डॉ. अजीत सिंह नैन ने वैज्ञानिकों को इस सफलता पर शुभकामनाएं दीं और कहा कि विवि द्वारा विकसित इस प्रजाति से किसानों की आय में शत-प्रतिशत वृद्धि होगी। वहां सहायक निदेशक डॉ. प्रतिभा, सह प्राध्यापक डॉ. शैलेश त्रिपाठी, डॉ. स्मिता कुमारी, वीके सिंह, रजनीश पांडे आदि थे।

गुणों से भरपूर है आम की पीएमएसएस-1 प्रजाति

संयुक्त निदेशक डॉ. एके सिंह ने बताया कि आम की देर से पकने वाली प्रजाति पीएमएसएस-1 आम की लंगड़ा प्रजाति से मिलता-जुलता है। इसके फल का वजन 230-250 ग्राम तक होता है। इस प्रजाति का आम पतले छिलके वाला सुनहरा पीला रंग का होता है व फलों की सतह चिकनी होती है। इसमें टीएसएस 17.5 से 18.5 ब्रिक्स, अम्लता की मात्रा 0.22 से 0.28 प्रतिशत, जबकि शुगर की मात्रा 12.20 से 13.00 प्रतिशत, एस्कार्बिक एसिड 35-40 मिलीग्राम/100ग्राम, कुल कैरोटीनॉइड तथा चीनी व एसिड का अच्छा मिश्रण होता है। इसकी गुणवत्ता बरकरार रहने के लिए 10-12 दिन का समय निर्धारित किया गया है।

पंतनगर में आम की पीएमएसएस-1 प्रजाति का अवलोकन करते निदेशक शोध और अन्य वैज्ञानिक।

यूएस नगर खाद्यान्न में अव्वल, पहाड़ों पर फलोत्पादन की अपार संभावना

इन फसलों का है दबदबा

पहाड़ों पर अधिक सीजन सब्जियों और फल उत्पादन की संभावनाएं

उत्तराखंड में कृषि उत्पादकता में क्रमवार जिले

पर्वतीय कृषि को सरसब्ज कर सकती है जैविक खेती

मृदा को स्वस्थ रखना जरूरी, प्रमाणीकरण से मिलेगा उपज का सही मूल्य

जैविक खेती में लाभप्रद है स्वस्थ बीजों का चयन

जैविक कृषि से पौधों में रोग प्रतिरोधक क्षमता खुद हो जाती है विकसित

उत्पादों के सही मूल्य के लिए जैविक प्रमाणीकरण भी जरूरी

डॉ. डीके सिंह

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पंत विवि ने ईजाद की आम की प्रजाति, विवि को हासिल हुई बड़ी कामयाबी, आम के शौकीनों के लिए अच्छी खबर, फल के हो सकेंगे कई उपयोग

सितंबर में भी बाजार में दिखेगा फलों का राजा आम, ले सकेंगे स्वाद

नई प्रजाति की खासियत

				
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