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Vegetable Newsletter

ICAR-Indian Institute of Vegetable Research

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From the Director's Desk:

Vegetables are important constituents of Indian agriculture and play important role in nutritional security due to their short duration, high yield, nutritional richness, economic viability and ability to generate on-farm and off-farm employment. Vegetables form an integral part of staple diet in India where 42% population is vegetarian and vegetables are sources of daily requirement of nutrients, vitamins and minerals. Our country is blessed with diverse agro-climates with distinct seasons, making it possible to grow wide array of vegetables. However, growth of vegetable sector across our country is uneven with 1 state in the productivity range of 25-30 t/ha, 4 states in the range of 20-25 t/ha, 7 states in the range of 15-20 t/ha, 10 states in the range of 10-15 t/ha and 6 states recording less than 10 t/ha vegetable productivity. Although India ranks second in vegetable production in the global paradigm, vegetable production in our country is threatened by fragmentation of land, climate change, deteriorating natural resources and uneven growth across the country. The institute along with All India Co-ordinated Research Project on Vegetable Crops and three Krishi Vigyan Kendras (KVKs) under administrative control of IIVR are pursuing various research and extension activities aimed to address these challenges by increasing vegetable productivity per unit area and time; improving quality of the produce; and better resource management. Six mega programmes viz., Integrated gene management, seed enhancement in vegetables, productivity enhancement through better resource management, post-harvest management and value addition, prioritization of R&D needs and impact analysis of technologies developed by IIVR and integrated plant health management are tailored to counter the aforementioned bottle necks. The varieties of the institute have got a far-flung adoption among farmers and seed production of these varieties is one of the key functions of the institute. Development of varieties like Kashi Vardaan (VRO-25) in okra resistant to YVMV and OELCV and less-seeded pointed gourd is the keystone of our crop improvement research. Besides research activities, ICAR-IIVR is doing intense extension activities and has adopted 24 villages under "Mera Gaon Mera Gaurav" scheme and 6 villages under "Sansad Adarsh Gaon" scheme in 6 districts of Uttar Pradesh. Similarly 1000 tribal households in 14 villages have been adopted in Sonbhadra district under Tribal Sub Plan scheme. Round the year input distribution, training and advisory services provided by the institute in these adopted villages helps in sustainable nutritional and livelihood security of the grass root beneficiaries.

PROMISING TECHNOLOGY

Green chilli powder

Chillies are known for their characteristic flavour ranging from mild to sharp pungency. The alkaloid compounds such as capsaicin and capsaicinoids are responsible for the intensity and strong spicy pungent taste in chilli. Several beneficial properties of capsaicin are antibacterial, analgesic, antidiabetic, anticarcinogenic and lowers cholesterol level. Chillies are also rich sources of vitamin C, vitamin B complex and certain flavonoids.

Green chilli powder

The shelf-life of green chilli is only 2-3 days at room temperature. Large quantities of green chillies could be processed to green chilli powder at the time of peak production. Blanching treatment with additives to retain green colour, ascorbic acid and capsaicin content. The blanched chilli pieces are osmotically diffused in salt solution followed by cabinet drying to reduce the final moisture to <1%. The dried green chillies are ground to form powder. The green chilli powder retain about 35-38% ascorbic acid, 90-92% chlorophyll and 0.64-0.66% capsaicin. The powder remains acceptable for 7-8 months at ambient storage temperature.

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NEW CONCEPT

Microgreens: the new generation smart food

Digitalization of civilization lead to consumer much health conscious through media and are always looking for newer sources of nutritious product which not only give the nutrition, but also enhance their quality living. Microgreens are such new generation smart food with full of nutrition and flavour. Microgreens are a tiny form of young edible greens produced from various kinds of vegetables, herbs and plants, harvested as seedling stage. They have three basic parts; a central stem, two cotyledon leaves, and typically the first pair of very young true leaves which are not more than 4-14 days old depending on the species.

Palak microgreen

Plants propagated through seeds are selected for microgreens. The selection of the crop is based on seedling colour, texture, flavour and demand of the produce market. They also should have quick germination and easily growing ability. They are produced in basket or pot contains growing media. A wide range of growing media are available in India like coir, wood fiber, bark, paper fiber, peat moss, perlite, rock wool, coco-peat, vermiculite, vermicompost, sphagnum peat, etc. for production of microgreens. Before sowing of seeds, media should be completely sterilized if it is suspected for containing pathogenic organisms. Spacing of seed sowing should be optimum. After germination, seedlings are carefully watered twice daily and kept moist until harvesting. Microgreens are usually harvested at 7−14 days after germination in tropical climate and slightly longer (14 -28 days) in temperate conditions with a height of about 2.5−7.6 cm that varies from crop to crop, variety to variety and other environmental conditions. After harvest, microgreens are thoroughly hydro-cooled which extend the shelf-life. After that moisture are removed and produces are packed in plastic container. Modified atmospheric packaging is another better

choice for better shelf-life and quality.Microgreens are richer sources of various micronutrients, especially minerals and vitamins. Some bioactive compounds are present in microgreens *viz*. carotenoids, phenolics, anthocyanins, glucosinolates, thiosulphides, saponins and dietary fibers. It acts as an immunomodulation, antioxidant, cardioprotective, anticancer, anti-osteoporosis, lipid lowering and antidiabetic in human health. Besides, they can be easily produced using limited input which will be useful for the person especially in urban or peri-urban settings where land is often a limiting factor. Since, they are usually consumed raw; hence there is no loss or degradation of thermolabile micronutrients through processing.

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TILLING: a functional genomic tool for fishing out allelic variations

Today plant science research is abuzz with application of basic plant science research for crop improvements. Whole genome sequencing for important crops plants is been undertaken by various scientific agencies across the globe. Among vegetables, whole genome sequencing has been undertaken watermelon (*Cucumis lanatus*), muskmelon (*Cucumis melo*), cucumber (*Cucumis sativa)*, tomato (*Solanum lycopersicon)*, potato (*Solanum tuberosum)*, chilli (*Capsicum annum)*, brinjal (*Solanum melongena),* sugar beet (*Beta vulgaris*), carrot (*Daucus carota*) and many more crops. Once genomic information is available at hand, next query is gene finding and functional annotation of genes. Genomic information generated is being utilized by scientists for carrying out transcriptomic, genomic and proteomic studies which gives a molecular reason behind phenotypic appearance of crop plants. Reverse genetic studies are being undertaken for functional annotation of genes. Marker assisted selection and QTL mapping is done for identification of candidate lines which contain desirable genes for crop improvement. Whole genome sequence information when available for a crop plant, it provides a physical map of the genome. On this physical map of genome, it is easier to go for positioning of QTL genes by bioinfomatical tools, cloning of genes and whole genome association mapping. Whole genome association mapping is based on working out the correlation between a genetic marker and a phenotype of interest. This technique has been used in *Arabidopsis thaliana* for searching association between agronomic traits like flowering time and pathogen resistance, in wheat for mapping of plant height genes and Fusarium head blight resistance in European wheat. Recently whole genome association mapping of lettuce for 10 horticultural traits was carried out.

In case whole genome sequence information is not available for a crop plant, a technique TILLING (Targeting Induced Local Lesions in Genomes) is utilized for identifying allelic variation in crop plants and their mutated counter parts (through chemical mutagenesis). EcoTILLING is another modified version of TILLING by which natural allelic variation in crop plants and their wild relatives at a particular locus can be identified and characterized, these variations have not been identified through genetic variation. TILLING is a method of reverse genetics, it involves the following steps (a) EMS mutagenesis (b) DNA preparation and pooling (c) PCR amplification of a region of interest (d) denaturation and annealing to allow formation of heteroduplexes (e) denaturing HPLC where presence of heteroduplex in a pool is detected as an extra peak in chromatogram (f) identification of mutant individual and (g) sequencing of the mutant product. TILLING and EcoTILLING is utilized for allele mining and characterization of natural alleles present at a particular locus which in turn leads to Single nucleotide discovery and haplotyping. Practical application of TILLING for crop improvement programmes have been demonstrated in rice,

maize, wheat, barley, banana, soybean, pearl millet, tomato, peanut and castor. TILLING has been utilized for monitoring salt stress response of kinases in *Medicago truncatula* and EcoTILLING has been utilized for screening natural variants in rice plants when exposed to drought stress.

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PROMISING GENOTYPES

Kashi Vardaan (VRO-25)

A new okra variety identified through XXXII AICRP (VC) group meeting held at IGKV, Raipur from 24-27th June 2014 for Zone No. 4 (Uttar Pradesh, Bihar, Jharkhand and Punjab).It is an early, medium tall (120-125 cm) variety with short internodes along with single or double branch attached in narrow angle with main branch. It takes 42-44 days for first flowering. Flowering starts after 4.8-5.6 nodes. Each plant has 19-21 fruits of dark green colour. The length and diameter of the fruit is 10-11 cm and 1.65 cm, respectively at marketable stage. The fruits are available from 47-100 days after sowing and total yield is 150-155 q/ha. It is found resistant to yellow vein mosaic virus (YVMV) and okra enation leaf curl virus (OELCV) under field conditions

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CARI Brinjal-1: a bacterial wilt resistant brinjal variety

Brinjal (*Solanum melongena* L.) is a major vegetable crop of Andaman and Nicobar Islands and cultivated round the year. Its fruits are mainly consumed as cooked vegetable in various ways. It is low in calories and fats, contains mostly water, some protein, fibre and carbohydrates. It is also a good source of minerals and vitamins, and rich in total water soluble sugars and free reducing sugars. Brinja bacterial wilt (*Ralstonia solanacearum*) is a serious disease which cause yield loss from 20-50%. This disease has risen to alarming proportion in Bay islands and humid regions of country. Most of the commercially grown varieties are susceptible to bacterial wilt. At the same time, resistance of bacterial wilt changes over the regions and the very little success has been attained usgreenish in colour; the fruits are oblong in shape, light green in colour, medium-compact along with low seediness; and the seeds are medium in size and light yellow in colour. In addition to being highly resistant to bacterial wilt disease, an average fruit yield of 20 t/ha was obtained. It also exhibited drought tolerant ability during water stress situations and thus suitable for growing in Island conditions during dry period (October to May). In view of fragile ecosystem of Andaman and Nicobar Islands, cultivation of CARI Brinjal 1 will be extremely useful. Due to its

CARI Brinjal 1 (Resistant)

genetic resistance to bacterial wilt and other unique characteristics, it has been registered as unique

Muktta Keshi (Susceptible)

germplasm (IC 0585684, INGR1205) by NBPGR, New Delhi during 2012. Recently it has is also been recommended by Institute Variety Release Committee (IVRC), CIARI, Port Blair for commercial cultivation in Andaman and Nicobar Islands. This line could be used as donor for resistance breeding. Furthermore, the root stocks of CARI Brinjal 1 have conferred resistance to bacterial wilt disease in tomato.

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IC0598236 (UHF G-11-1): A potential genotype of great-headed garlic (*Allium ampeloprasum* var. *ampeloprasum*)

The plants of IC0598236 produce 10-12 leaves in whole life span. The leaves are foliaceous, dark green in colour, flattened and leathery measuring about 46.0 cm in length and 2.8 cm in width. The central growing portion of shoot develops into flowering stalks bearing terminal umbel at crop maturity during spring-summer. The umbels consist of tiny anthers arising from the base of ovaries turned in to micro-cloves (bulbils in the case of common garlic) by storage of food materials. Thus, the reproductive system in flowers is not conspicuous and functional. The micro-cloves have meristematic tissues differentiating in to roots and shoots. Each umbel consists of about 150-175 micro-cloves. One gram weight comprise of 28-32 micro-cloves. The viability of micro-

Plants and cloves of IC0598236 (great-headed garlic)

cloves ranges in 10-12 months in ideal storage conditions. During 2012-13 and 2013-14, great-headed garlic genotype IC0598236 exhibited significantly better potential in terms of marketable bulb yield (248.8 q/ha & 230.7 q/ha), 10 clove weight (61.3 g & 63.8 g), bulb weight (65.5 g & 71.2 g) and TSS (41.5 % & 41.0%) as compared to Agrifound Parvati cultivar of common garlic for marketable bulb yield (168.9 q/ha & 179.5 q/ha), 10 clove weight (29.8 g & 31.4 g), bulb weight (30.2 g & 27.8 g) and TSS (39.0% & 38.5%).

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VRPG-89: A unique less-seeded clone of pointed gourd

Pointed gourd (*Trichosanthes dioica* Roxb.) is also known as *parwal* in Hindi and mainly cultivated for vegetable. The fruits are also being used for confectionary preparations in eastern India where seeds are removed by giving longitudinal cut on one side and stuffing with khoa (condensed milk). Pointed gourd, generally, produced seeded fruits but production of fruits with less number of seeds is rare in pointed gourd. Less-seeded fruits have very high consumer preference as well as more suitable for sweet making, have good field stability and improve fruit quality.

VRPG-89 has been identified at IIVR, Varanasi. It is a less-seeded clone having only 4-8 seeds/ fruit as compare to seeded clone having 18-30 seeds and pulpier. The fruits are pulpy and light green in colour with longitudinal white strip. Average fruit weight, fruit length and fruit diameter ranges from 40 -45 g, 8.50-9.50 cm and 3.50-3.75 cm, respectively. The average yield varies from 11-13 kg/hill, having yield potential of 300-310 q/ha from about 2500 plant population. The fruits of this clone are the most suitable for confectionary as well as stuffing purpose.

Plants and fruits of VRPG-89

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Swarna and Shonima: seedless watermelon hybrids

As an excellent dessert fruit, watermelon holds unique position among consumers and the appeal is paramount for seedless watermelon. Crop is grown on a large scale during late rabi and early summer season and this is the crop where truck gardening is practised in its full might. After the failed attempt of Pusa Bedana in 1970's not much effort was made in India for developing and popularising of seedless watermelon cultivation. Although a number of triploid F_1 hybrids have been developed all over world particularly from Japan, USA and China, seedless watermelon fruits are still a novelty in India. Apart from more number of fruits and yield realized from the heterosis vigour, triploid fruits are characterized by high TSS and tough rind making it amenable for long distance transport. Kerala Agricultural University (KAU), Trichur, Kerala has developed a stable tetraploid line of watermelon 'KAU-CL-TETRA-1' through colchiploidy. Two triploid hybrids i.e. Shonima and Swarna have been developed using this tetraploid line through crossing with diploid males, namely CL-4 (red fleshed) and CL-5 (Yellow fleshed), respectively. Both these hybrids are now released for cultivation in Kerala. The fruits of triploid hybrids are medium in size as compared to diploid Sugar Baby and were free from seeds. Shonima, red fleshed triploid hybrid, produced fruits with high TSS (10.8 °brix) and fruits were characterized by deep red flesh without any seeds (Table). Moreover, Swarna,

Swarna (Yellow fleshed) and Shonima (red fleshed)

yellow fleshed seedless hybrid, is the first of its kind developed in India and hybrids are characterised by attractive bright yellow flesh.

Table: Characters of watermelon hybrids and parents under open condition (Mean of three seasons)

S. No.	Variety/ Hybrid	Days to harvest	Fruit weight (kg)	TSS (°Brix)	No. of fruit/ plant	Yield (kg/ plant)	No. of seeds/ fruit
1	Shonima	96	3.84	10.8	3.22	12.34	Nil
2	Swarna	98	3.43	10.3	3.15	10.27	Nil
3	Sugar Baby	92	6.50	9.2	2.20	12.36	612
4	KAU CL TETRA-1	103	2.46	10.1	3.26	8.62	84
5	CL-4	91	6.61	9.3	2.12	12.90	645
6	CL-5	89	4.12	9.0	2.25	9.21	267
	CD at 0.05%	1.5	0.7	0.2	0. 17	0.18	40.12

Both triploid hybrids are having thicker rind (1.5 cm) compared to Sugar Baby (1.0 cm) which will be an advantage in long distance transport. The triploid hybrids have excellent fruit quality compared diploids and can be promoted for cultivation under open field as well as polyhouse farming. The key benefits of triploid seedless hybrids include high quality in terms of seedlessness and high sugar content, high yields, vigorous plants, tolerance to diseases and humidity, better shipping ability, and economic return. Nevertheless, low germination, low seedling vigor and high cost of seeds of triploid hybrids are the three major obstacles for the production of seedless watermelon.

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Promising lines of brinjal (round fruit)

IVBR-15: It is a superior line, first picking can be taken between 75-80 days after transplanting and have good yield potential (3.75 kg/plant). The plants are erect, bears 15-20 shiny, light reddish-purple coloured fruits of medium size (200 g). This line is also a good combiner i.e. very much suitable for heterosis breeding, and tolerant to Fusarium wilt, Phomopsis blight and fruit and shoot borer. Hence, this line could be used as a parental line in breeding programmes. The fruits are soft, round in shape and good for *bharta* preparation relished much in the northern India.

IVBR-15

IVBR-16: It is a medium term line, first picking available for harvest between 60-65 days after transplanting. Each plant bears about 15-20 fruits along with green calyx. The fruits are light purple in colour, each fruit weigh 200-225 g and have good yield potential (4.00 kg/plant).The fruits are soft, less-seeded and very much suitable for *bharta* preparation.

Plants and fruits of IVBR-16

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IC-590813: A primitive line of King Chilli (*Capsicum chinense* Jacq.)

King chilli or Habanero chile (*Capsicum chinense* Jacq.) is a species of chilli that is native to Amazon basin. The Dutch botanist, Nikolaus Joseph von Jacquin, erroneously named the species as *chinense* in 1776 as he believed that the species origi-

nated in China. The species varies greatly in appearance and characteristics of plant growth, flowering, fruit morphology, taste and pungency, which makes very difficult to identify. IC-590813 (MZNC-1 collected from Mizoram, India) is a shade loving, unique primitive line having compact shrubby perennial plant type, approximately 80-110 cm in height, 70-90 cm in spread (frame size) with glossy-green lustrous leaves. The greenish-white flowers bears in cluster of 1-4 with upright long slender pedicel (stalk) and while the flowers bend to 45-90º. The flowers are complete, actinomorphic and pentamerous. The green sepals (calyx) are five lobed, united, persistent, devoid of calyx teeth, and clear constriction between the base of calyx and pedicel. This constriction is a peculiar trait of *Capsicum chinense* which differentiates it from other species of *Capsicum*. The greenish-white (dull) petals are five lobed and united. Stamens are 5 in number, epipetalous and alternate with petals. The fruits are upright on long slender stalk, small, almost round, pungent, buttery in taste and turn red on maturity. The line is showing profuse flowering (50-60 days after transplanting) and fruiting. The fruit weight ranges from 0.225-0.345 g (average 0.275 g) and size varied from 0.71-0.94 in diameter (mean 0.85 cm). Each plant bears 1200-1850 fruits yielding >400 g of fruits per plant under net-house conditions in 8 month cropping season. Each fruit contains approximately 13-15 seeds. The seeds are smooth, tan in colour and 1000 seeds weight is approximately 1.75 g. Like traditional King Chilli (locally known as Naga chilli), a cultivar of *Capsicum chinense*, the line IC-590813 is partial shade-loving in nature and seed viability is very poor. The line has potential breeding value for number of fruits per plant (almost 5-10 times higher than normal chilli) which could be used as a genetic resource in future breeding programmes to improve the agronomic traits, productivity and quality of common chilli (*Capsicum annuum* L.).

Plants, fruits & seeds of IC-590813

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VRCHE-4: a bathua (*Chenopodium album*) germplasm for high yield and multi-cutting

Bathua (*Chenopodium album*) is a very good source of vitamins i.e. β-carotene, folic acid, riboflavin and ascorbic acid; minerals such as Ca, Fe, P, K, Mg, Mn and Na; and health promoting phytochemicals. It is abundantly grown as weed during winter-spring season. The leaves and young shoots are extensively consumed in northern India as a leafy vegetable. The high yielding genotypes can be used as a potential leafy vegetable crop for diversification of agriculture and combating the nutritional deficiency. At IIVR, Varanasi, a high yielding genotype 'VRCHE-4' have been identified for multi-cutting purpose whose yield potential is about 320 q/ha. Moreover, total measured respective plant growth

VRCHE-4 plants

was almost 40 cm, 120 cm, 150 cm, 170 cm & 205 cm at 85 days, 100 days, 115 days, 130 days and 150 days after sowing.

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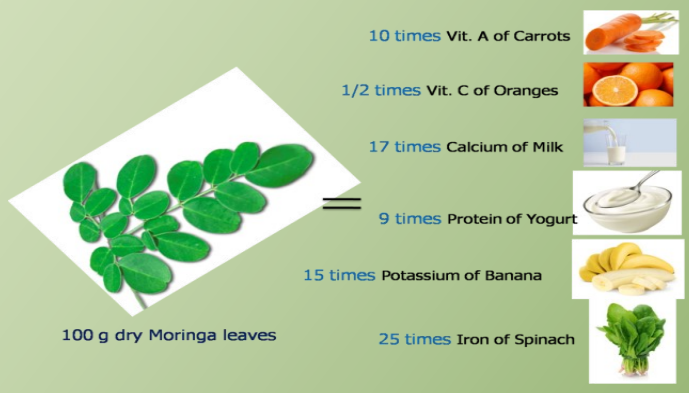
VEGETABLE FOR HEALTH

Moringa: the miracle tree on earth

The Moringa tree is one of the most incredible and versatile plants with rich horticultural potential. Its nutritional and medicinal properties have the potential to minimize malnutrition, starvation as well as prevent many diseases and maladies. Moringa is truly a miracle plant, and a divine gift for nourishing and healing of man. Moringa is the sole genus in the flowering plant family Moringaceae and have 13 species. The most common species is *Moringa oleifera* which is found in many tropical and sub-tropical regions. Moringa can be grown in even the harshest and driest of soils, where barely anything else could be grown. In fact, one of the nicknames of Moringa is "never die" due to its incredible ability to survive harsh weathers. The most incredible thing about Moringa is the amount of nutritional and medicinal chemicals and compounds found in this plant. The chart below will give a quick view of some of the notable nutrients contained in this plantSource: Fuglie (1999)

As seen in the chart above, not only does Moringa contain vitamin A, vitamin C, Ca, K and protein. Moringa also contains over 40 antioxidants, over 539 phytochemicals which is said to prevent more than 300 diseases and maladies. Moringa supplies a wide variety of nutrients in a nontoxic and easy to digest form. Moringa also contains these nutrients in combinations that are easy for the body to assimilate and digest. No wonder Moringa is considered a "miracle tree" with the ability to save lives worldwide.

- Moringa helps to fight diabetes.
- Possess many key anti-inflammatory benefits.



- Contains approximately 46 antioxidants
- Contains anti-aging compound zeatin that helps cells divide, cell enlargement and protect against oxidation.
- The seeds purify water due to presence of an active antimicrobial agent.

By virtue of these, Moringa is a gift of the nature, a pure magic natural agro-biodiversity able to save billion of thirsty people in the world with a better health and sanitation.

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CLIMATE FRIENDLY AGROPRACTICES

Grafting: an efficient technology for waterlogging tolerance in tomato

Grafting in vegetable crops, now-a-days has emerged as a promising and an alternative tool to the relatively slow conventional breeding methods aimed at increasing tolerance to abiotic stresses and soil pathogens in fruit vegetables. Scions of vegetable crops like watermelon, squash, cucumber, bitter gourd, tomato and brinjal, etc. can readily be grafted onto different rootstocks prior to being transplanted in the field or in the greenhouses. The main objective of grafting is to reduce infections by soil-borne pathogens and to enhance the tolerance to abiotic stresses

such as soil salinity, toxicity of heavy metals, drought, and waterlogging. In North Indian plains,

Newly grafted plants kept in grafting chamber for acclimatization

tomato is transplanted during South-West monsoon (July-September) where waterlogging is a serious problem for survival of plant, particularly during early establishment stage. High yielding varieties of tomato can be successfully grafted over waterlogging tolerant rootstocks of brinjal. At ICAR-IIVR, Varanasi it was observed that, when tomato plants (cv. Arka Rakshak and Arka Samrat) were grafted over brinjal rootstocks (IC-111056 or IC-354557), the grafted plants were able to tolerate waterlogging stress up to 7 days during early growth stage (one to two week after union of grating). In contrast, the non-grafted or self-grafted plants could not survive when they were exposed for more than 48 hr of waterlogging conditions. For grafting tomato onto brinjal, mostly cleft or tube grafting was practiced. Under favourable environmental conditions (RH >90%, ambient temperatures 25-30°C and low light condition), around 90% graft success was achieved. The study indicated that tomatoes can be successfully grafted over brinjal to save tomato crops from waterlogging stress in early growth stage.

Grafted and non-grafted plants exposed for 96 h of waterlogging stress

Healthy grafted tomato plant under 10 days of waterlogging stress

Grafted (L) and non-grafted plant (R) earlier exposed for waterlogging stress

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SUCCESS STORY

Backyard poultry harnesses nutritional security and additional income

Sonbhadra district of Uttar Pradesh is a water scarce and hilly area dominated by tribal population belonging to the sub-caste of Gond, Dhuria, Nayak, Ojha, Pathari, Raj Gond, Kharwar, Khairwar, Pahariya, Baiga, Pankha, Panika, Chero, Bhuniya and Bhuiya. Agriculture and forest dwelling is the main occupation of that area. But due to water scarcity, agriculture is possible only in kharif and rabi season. In agriculture lean season their livelihood becomes fragile

and they had to struggle for both ends meal.

ICAR-IIVR has adopted 1000 tribal families of 14 villages under tribal sub-plan to provide them integrated agricultural support for sustainable livelihood. Apart from seasonal vegetables, fruit plants, cereals and pulses, backyard poultry was introduced in that region as a source of income in agricultural lean season. Three breeds namely CARI-Shyama, CARI- Nirbheek and CARI-Debendra, suitable for that region were provided to 600 tribal families during September to December, 2014. Each family was provided with 15 to 20 chicks along with starter feed supplements. The initiative was successful and two success cases are being discussed here:

Case 1: Angad, age 47 years from Bhalukudar village of Padrach gram panchyat, block Chopan of Sonbhadra was provided with 20 day old chicks of CARI-Debendra (a medium-sized dual-purpose bird, produced by crossing coloured synthetic broiler line as male line and Rhode Island Red as female line). It is suitable bird for the Indian consumers due to its attractive bright plumage colour. All 20 chicks were alive and attained weight of 0.5 kg after 15 days, 1.0 kg after 30 days and 3.5 kg after 160 days. It started laying eggs after 150 days and used to lay 20 eggs per month. Due to desi nature of the eggs, Angad has fetched Rs. 8-10 per egg which is double than the market price of white colour poultry eggs. Three birds consumed by self and 12 birds sold in the market when they attained average weight of 3 kg @ Rs. 300/kg and earned Rs. 10,800. He was very happy with the performance of the birds and has kept 5 birds for further multiplication.

Case 2: Bishru, age 32 years from Bhalukudar village of Padrach gram panchyat, block Chopan of Sonbhadra was provided with 18 day old chicks of CARI-Nirbheek (a cross of Indian native breed Aseel with CARI-Red). Birds are active, large in built, pugnacious in nature with high stamina and majestic gait. They are able to save themselves from their predators due to their fighting characters and activeness and are adapted to all climatic zones of the country. One drawback of this breed is that it does not sit on the eggs for brooding. Bishru has trained the birds for sitting on eggs and developed broodiness in their behaviour. Total 15 eggs have been hatched and next generation chicks were in good health condition. He has sold 70 eggs in market @ of Rs. 10/egg. He has also sold 10 birds and earned Rs. 9,000. Bishru was also very happy with the performance of the birds.

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KVK ACTIVITIES

KVK, Kushinagar

Training programmes: Under human resource development, KVK organized 49 trainings on crop production, crop protection, horticulture, animal nutrition & management, women empowerment, child care and value addition covering 1094 practicing farmers & farm women, rural youth and extension functionaries.

Frontline demonstration (FLD): KVK conducted

FLD on oilseed, pulses, drudgery reduction, employment generation (mushroom production), nutritional garden and animal health management covering 44.9 ha area & 247 farmers and farm women and also conducted two on farm trial on crop production & nutritional security at 10 farmer's field.

Extension activities: To expedite the process of transfer of technology, KVK organized one National workshop on "Kela utpadan ki aadhunik takneek" benefitting 200 farmers; one awareness programme on "Paudha kism aur krishak adhikar sanrakshan" variety: protection & Farmer's right' benefitting 116 farmers; two conferences; nine Field Days covering 318 farmers; one Kisan Mela covering 1500 farmers; two Agricultural Exhibition covering 2000 farmers; and three Kisan Gosthi covering 1175 farmers. In addition, KVK scientists attended 2 Kisan Gosthi, 2 Kisan Mela & Exhibition where 17 lectures were delivered. KVK organized 3 Soil testing campaign covering 69 farmers. Eleven hundred farmers visited KVK, Advisory services to 400 farmers and Diagnostic services to 10 farmers were provided. One method demonstration on sowing of paddy by Drum Seeder was conducted. Two farm science club and two self-help group were formulated. One training manual, 1 Technical bulletin, 1 extension folder & 5 popular articles were published by KVK. One TV Talk and 20 news coverage were also made.

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KVK, Deoria

Training programmes: During January to June 2014-15, 51 need based training programmes were organized by the KVK on promotion of high yielding varieties in cereals, oilseeds, pulses, vegetables & fruit crops, farming system approach, entrepreneurship development, self-help groups, integrated pest management, integrated nutrients management, bee-keeping, zero energy cool chamber, value addition, drudgery reduction, resource conservation technology, etc. in which 1084 farmers & farm women had participated. One training course was organized for extension functionaries of the district in which 23 extension functionaries were participated.

FLD: Considering the agro climatic condition of the district, FLDs were conducted on oilseeds, pulses, cereals, fodder, resource conservation technologies (DSR, zero tillage sowing of wheat and sowing on raised bed), vegetables, & zero energy cool chambers at 184 farmers' fields in about 50.6 ha area.

Extension activities: For horizontal spread of scientific technology, four field day on different agriculture crops and three kisan gosthi were organized benefiting 136 farmers and farm women, and 190 farmers/ extensions personal, respectively. Apart from these, nine SHGs were formed for different income generating activities benefitting 127 women. About 209 farmers were visited the KVK to discuss their problems with KVK scientists. Additionally, KVK scientist also visited the farmers' field 101 times to diagnose their problems. Twelve news were covered in different local newspapers.

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KVK, Bhadohi

Trainings programmes: KVK organized 22 need based training programmes on various aspects of production and protection technologies of cereals, oilseeds, pulses, vegetables, fruits, soil health, livestock & fisheries involving 470 practicing farmers and farm women during January to June 2015.

FLD: About 488 FLDs were conducted in an area of 48.06 ha. In addition to these, deworming in sheep & goat was carried out in 189 animals (12 farmers) to avoid endoparasitic load and maintain proper animal health. Thirteen OFTs were also conducted at 74 farmers' field.

Extension activities: KVK planned and executed three field days (87 beneficiaries), one kisan gosthi

(108 beneficiaries), 26 field visit (170 beneficiaries), 57 scientist's visit to farmers' fields, 166 farmers visit to KVK, two agri-exhibitions benefitting about 10000 farmers. About 117 advisory services have been given to sensitize and make farmers aware about the new technological options to raise the productivity of different enterprises. The mass media coverage included three Radio talks, eight TV talks and 38 periodical-news in the various newspapers.

Rajendra Prasad
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EVENTS

National Road Safety

National Road Safety Week was observed at ICAR-IIVR during 11th to 17th January, 2015. In this occasion a banner was displayed at the entry gate of ICAR-IIVR for awareness creation of the employees as well as residents of the nearby areas. A written examination was conducted among the official drivers for testing their knowledge about road safety issues. Discussion was conducted with the official drivers how to maintain good health and personal safety related issues. Fitness of the official vehicles was checked. Efforts were made to spread the information about the Supreme Court's directive that the effort to save all accident victims should be the top priority not only of the medical professional but even of the police or any other citizen who happens to be connected with the matter or who happens to notice witness an accident.

Shubhadeep Roy and Viswanath
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Republic Day

66th Republic day was celebrated at ICAR-IIVR on 26th January 2015. All the staff of the institute participated in this occasion. Director Dr. B. Singh hoisted the national flag and delivered speech about the significance of the day. He emphasised on increasing vegetable productivity for nutritional security of India.

Celebration of Republic Day at ICAR-IIVR, Varanasi

National Farmers' Fair cum Vegetable Showcasing

National Farmers' Fair cum Vegetable showcasing was organized on 30th and 31st January 2015 at ICAR-Indian Institute of Vegetable Research in collaboration with Association for Promotion of Innovations in Vegetables (APIV) to educate the farmers regarding agricultural gamut and modern vegetable production technologies. Smt. Durgawati Devi, Gram Pradhan of Jayapur village presided over the inaugural function. Being a representative of the village adopted by Hon'ble Prime Minister under Sansad Aadarsh Gram Yojana, she welcomed all the farmers. Dr. N.K. Krishna Kumar, Deputy Director General (Horticultural Science), Indian Council of Agricultural Research, New Delhi in his inaugural address, highlighted that horticulture fetches higher income, thus more and more farmers are shifting to this sector from traditional cultivation. More than 50 stalls related to vegetables, potato, onion, garlic, seeds, fertilizer, animals, fisheries, etc. displayed by various research Institutes under the aegis of ICAR, Agricultural Universities, Government, NGOs and Private Sectors. More than five thousand farmers from different states participated in the fair. Four progressive farm-

ers, Deepak Mandal (West Bengal), Santosh Kumar (Bihar), Manjeet Singh Saluja (Chattisgarh) and Baijnath Mahto (Jharkhand) at National level and 4 farmers, Bindra Prasad, Chavi Raj Prasad, Ram Raksha Singh and Mukesh Kumar Singh at the state level have been honoured during the fair for their commendable success in vegetable cultivation.

Neeraj Singh and Shubhadeep Roy
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National Science Day

ICAR-Indian Institute of Vegetable Research, Varanasi celebrated the National Science Day on 28th February 2015 to commemorate and honour the dis-

ICAR-IIVR, Varanasi Celebrates National Science Day

covery of the Raman Effect by Indian physicist and Nobel Laureate Sir Chandrasekhara Venkata Raman on the same day in 1928. Prof. K.P. Singh, Emeritus Professor, Department of Botany, Banaras Hindu University, Varanasi graced the occasion as chief guest and delivered a science day lecture on "Environmental awareness: issues and challenges". In his address, Dr. Singh, stressed for optimization and efficient use of natural resources with special reference to water in order to save the planet. On this occasion, IIVR organized various competitions such as essay writing, debate competition and science quiz in which more than 150 students from different schools and colleges participated with great enthusiasm Dr. B. Singh, Director welcomed the gathering and briefed about the Institute's research and related activities.

Shubhadeep Roy and Neeraj Singh
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ICAR-IIVR at ICAR Zonal (North Zone) Tournament

A 35 member contingent was selected to represent ICAR-IIVR, Varanasi at the ICAR zonal (North Zone) sports tournament 2015 held at Dehradun. The selected sports contingent left Varanasi in the early morning of 16th April 2015 and reached Dehradun in the morning of 17th April. CDM meeting was held in the evening (17th April 2015) at ICAR-IISWC guest house in which Dr. Rajesh Kumar represented our institute and collected the draws of sports events. The opening ceremony was held in the forenoon of 18th April 2015 followed by the commencement of Games that continued up to forenoon of 21st April 2015. IIVR contingent participated in many sports events including individual sports like field and track events, carom and chess; and team events like football, kabaddi, volley ball, table tennis and badminton. ICAR-IIVR Varanasi bagged total 5 medals includes 2 gold, 2 silver and 1 bronze. The major achievements of the IIVR contingent were gold medals in long jump (women's) and chess (women's) by Jyoti Devi and Anuradha Kumari, respectively; silver medals in table tennis (men's) and 400m race (women's); and bronze medal in 100 m race (women's). The closing ceremony was held in the afternoon of 21st April where the medals were awarded by the chief guest (Director, FRI, Dehradun). The contingent left Dehradun at 5.00 PM on 21st April 2015 and reached Varanasi at 6.30 PM on 22nd April 2015.

RS Gujjar
ICAR-Indian Institute of Vegetable Research,
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ICAR-All India Coordinated Research Project (Vegetable Crops) Group Meeting

The XXXIII Annual Group Meeting of All India Coordinated Research Project on Vegetable Crops (AICRP-VC) was inaugurated at ICAR-Indian Institute of Vegetable Research, Varanasi on May 21, 2015 by Dr NK Krishna Kumar, Deputy Director General (Horticultural Science), ICAR, New Delhi. The DDG, in his inaugural address, highlighted the role of vegetables in nutritional security. The guest of Honour, Dr RR Hanchinal, Chairman, PPV & FRA and Dr AK Joshi, Regional Coordinator, South East Asia, CIMMYT also addressed the gathering.

Inauguration of 33rd AICRP (VC) Group Meeting by Dr NK Krishna Kumar, DDG (Hort. Science)

Plenary session of this meeting was conducted in the presence of Dr NK Krishna Kumar, DDG (Horticultural Sciences) and Dr T Jankiram, ADG (Horticultural Sciences), ICAR, New Delhi. The DDG emphasized on collaborative and multidisciplinary research to develop new varieties and hybrids in vegetable crops. He was concerned about the nutrient dilution in recently developed varieties/hybrids and urged scientists to preserve or increase the nutrient content while developing new varieties/hybrids. He highlighted the need to develop cultivars suitable for low input technology, microgreens, leaf concentrates and varieties rich in health promoting micro nutrients. He stressed upon initiation of hybrid development in new vegetables. He focused on collection, conservation, evaluation and utilization of large germplasm available in India. Further, he encouraged to preserve and utilize wild species in research programme as they are rich source of desirable genes. "There is gap in between demand and supply of good quality seeds of hybrids and it is to be fulfilled by new programmes like contract farming for seed production" he added.

Release of book by Dr NK Krishna Kumar, DDG

Dr B Singh, Director, ICAR-IIVR highlighted the need of climate smart agriculture and development of new cultivars suitable for increasing temperature and low moisture, resistance to new pests and diseases and rich in nutrients. He also highlighted the importance of public private partnership for overall vegetable research and development. The progress reports of previous year were discussed in length and technical programme of next year has been formulated. One long melon variety, one brinjal hybrid and one bacterial wilt resistant semi determinate tomato variety were identified through AICRP and recommended for released on this occasion. About 350 scientists from 24 Agricultural Universities, 10 ICAR institutes, 45 private companies and State Government officials participated in the programme.

PM Singh
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ICAR-IIVR organized National Seminar at Barhi, District Hazaribagh, Jharkhand

On the eve of foundation laying ceremony of ICAR-IARI by Hon'ble Prime Minister of India at Barhi, district Hazaribagh, Jharkhand on 28th June 2015, ICAR-IIVR in collaboration with NHB, Gurgaon successfully organized a National Seminar on Nutritional and Livelihood Security through Vegetable Cultivation on 27th June 2015. This National event was inaugurated by Hon'ble Shri Radha Mohan Singh, Union Agriculture Minister, GOI, New Delhi in the presence of Shri Randhir Kumar Singh, Minister for Agriculture, Jharkhand, Shri Suryu Rai, Minister for Parliamentary Affairs, Food, Public Distribution & Consumer Affairs, Jharkhand, Dr. S. Ayyappan, Secretary DARE & Director General (ICAR), Dr. A.K. Singh, Deputy Director General (AE, ICAR), Dr. A.K. Singh, Managing Director (NHB), and other dignitaries from public and private sectors. Chief Guest, Hon'ble Shri Radha Mohan Singh, in his inaugural address categorically emphasized on the importance of vegetable sector for livelihood security of small and marginal farmers in the country. He said in Bihar and Jharkhand number of farmers are involved in vegetable cultivation but due to lack of technical know-how the productivity is low in compare to other states therefore research institutes should come forward through KVKs to disseminate their recommended technologies among growers. During this national event, Dr. S. Ayyappan emphasized on nutritional importance of vegetables and allied crops. He appealed the growers to conserve their available resources and rare species of agriculture crops. He also focused on the importance and export value of some of the underutilized vegetables and appealed for their commercial farming. Earlier, Dr. B. Singh, Director, ICAR-IIVR while welcoming the guests on this occasion highlighted the achievements of institute along with extension activities by which it is supporting the farmers.

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