Vegetable Newsletter

ICAR-Indian Institute of Vegetable Research

VOLUME 3, No. 1 JANUARY-JUNE 2016

RESEARCH UPDATE

From the Director's Desk

Vegetables as the main sources of daily required nutrients, vitamins and minerals are the integral part of Indian diet where about 42% population is vegetarian. Our country is blessed with diverse agro-climatic conditions with distinct seasons, making it possible to grow wide array of vegetables almost round the year in one or other parts of country. Presently, India is producing >171 MT of vegetables from 9.8 Mha acreage with the productivity of 17.8 t/ha and ranks second in the world. However, vegetable production in our country is threatened by fragmentation of land, climate change, deteriorating natural resources, pest incidences etc resulted in uneven productivity across the country. The productivity of vegetables in various states across our country is very potholed i.e. 2 states in the productivity range of 25-30 t/ha, 5 states in the range of 20-25 t/ha, 10 states in the range of 15-20 t/ha, 11 states in the range of 10-15 t/ha and 6 states have less than 10 t/ha productivity. The institute along with All India Coordinated Research Project on Vegetable Crops (AICRP-VC) and three Krishi Vigyan Kendras (KVKs) are pursuing various research and development activities aimed to increase the vegetable productivity per unit area and time; to improve the quality of the produce; and to manage the resources efficiently. To achieve these, ICAR-IIVR tailored six mega programmes such as 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. The R&D activities are also strengthened by 27 externally funded projects being executed in the institute. Various novel value added products such as green chilli powder, moringa soup, bottle gourd kheer mix, etc. have been developed to fulfil the need of consumer. Furthermore, there has been a paradigm shift towards initiation of research and development activities on >20 lesser-known underutilized vegetable crops to broaden and diversify the vegetable basket of India.

(Bijendra Singh)

NEW CONCEPT

Reverse breeding: A novel breeding technique

Reverse breeding can be defined as a breeding technique in which the sequence of events required for the production of a F_1 hybrid variety is fundamentally overturned. It is a novel breeding approach which based on engineered meiosis and designed to directly produce parental lines for any heterozygous plant. The intended goal of the reverse breeding technique is to create absolutely complementing homozygous parental lines through an inhibition of meiotic crossovers and the subsequent fixation of non-recombinant chromosomes in homozygous doubled haploid lines. In conventional plant breeding, to extract the advantage of heterosis, the selection is applied to two homozygous parental lines on their capability to produce the best hybrid upon crossing. Reverse breeding puts this century old practices up–side- down by starting with the selection of a superior F_1 hybrid and followed by the recovery of the parental lines. It can be considered as potential tool in the kitty of a plant breeder, as it allow for much more efficient and targeted hybrid development in crop plants. This breeding strategy generates homozygous parental lines from any heterozygous plant and is based on the abolition of crossover formation in the heterozygote and the production of doubled haploid plants from the gametes free of crossovers. Selecting and crossing two lines with complementary sets of chromosomes allow the production of the hybrid on a large extent. This technique also allows the production of so-called substitution lines that are, for example, heterozygous for only one chromosome and facilitating the assortment of the best alleles carried by the chromosome.

Reverse breeding comprises two important steps i.e. the suppression of crossover recombination in a selected plant followed by the regeneration of doubled haploids from spores containing non-recombinant chromosomes. This process is pursued through down regulation of meiotic recombination combined with double haploid technology. Gene targets for down regulation of meiotic recombination are a.o.SPO11 and DMC1 for which RNAi vectors have been constructed and which are currently used in plant transformation. In this respect, there are no changes foreseen in the genome of the selected non-GM offspring. Inadvertent effects could include the silencing of other homologous sequences in the genome as a result of the presence of the RNAi construct. This would not persuade genomic changes, but could influence the expression intensities. Another unintended effect of this technique could be an incomplete suppression of meiosis. This technique was anticipated in 2009 but yet to exploit commercially for genetic improvement. It has already been adopted at research scale by plant breeders. For crops where an extensive collection of germplasm is still lacking, it can accelerate the development of varieties. In these crops, superior heterozygous plants can be disseminated without prior knowledge of their genetic constitution. Breeding on single chromosome level is possible in this technique. Using marker assisted breeding, the desired chromosome substitution can be detected with relative ease. In vegetable crops, this technique can be a useful means for the genetic improvement of pea, sugar beet, cucumber, onion, broccoli, cauliflower, cabbage, watermelon, brinjal, tomato, etc. Reverse breeding is a very young technique and thus research is still essential to overcome technical problems and to harness its potential completely.

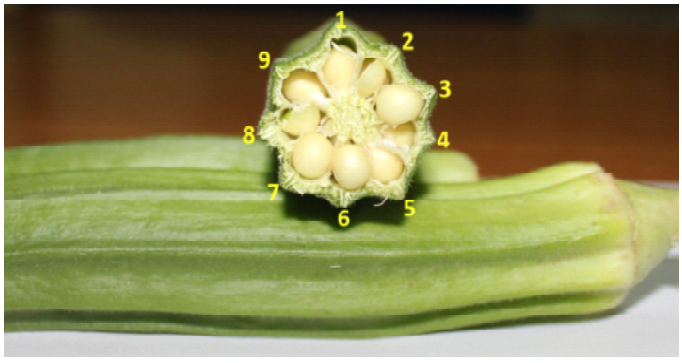
Pradip Karmakar, BK Singh and PM Singh

ICAR-Indian Institute of Vegetable Research, Varanasi-221305, UP

PROMISING GENOTYPES

IC-117090: Nine ridges okra accession

While screening 1225 okra accessions of okra for various agro-morphological characters during *kharif*-2015 and summer-2016 at ICAR-IIVR, Varanasi; an accession 'IC-117090' having nine ridges on its fruithas been identified. However, some of its fruits were also found having even 11 ridges. Besides, three accessions, IC-117088, IC-117245 and IC-117333 were identified having seven ridged fruits. Further, all these accessions were again grown during summer-2016 at ICAR-IIVR, farm for its further validation, evaluation and characterization. As observed earlier, during summer-2016 also, the accession IC-117090 showed stable expression of nine ridges on its fruit, while other three accessions (IC-117088, IC-117245 and IC-117333) showed seven ridges. The characterization details of various okra genotypes having 5 to 9 ridges during *kharif*-2015 and summer-2016 are given in the Table. When tested for the viral disease resistance, all these genotypes were found to have only moderate tolerance to both yellow vein mosaic



IC-117090: Nine ridges okra genotype

virus (YVMV) and okra enation leaf curl virus (OELCV) diseases.

Okra consumers across the world have a wide choice from smooth-pods to ridged-pods. A number of germplasm lines were known to possess varying number of ridges on its fruits, but mostly cultivated okra genotypes having five ridges. Kashi Satdhari (IIVR-10) is a seven ridged variety which was developed by ICAR-IIVR, Varanasi and got notified during the year 2006. Interestingly, the variety Kashi Satdhari was named so, based on the number of ridges it possesses. Therefore, there are all possibilities of developing a high yielding line having viral disease resistance and nine-ridges using this accession as a parent, which may be released as nine-ridged variety. At ICAR-IIVR, we are using IC-117090 genotype in various combinations in our breeding programme so as to achieve the goal of getting a genotype having nine-ridges along with high yields and viral disease resistance.

Table: Characterization details of various okra genotypes having 5-9 ridges

Variety/ Genotype	No. of ridges	Avg. pod weight (g)	No. of pods/ plant	100 seed weight (g)
Kashi Satdhari	7	13-14	10-15	5.0-5.5
IC-117245	7	12-14	10-16	6.0-6.5
IC-117790	9	12-14	9-15	5.5-6.0
IC-117088	7	13-14	8-15	5.0-5.5
IC-117333	7	11-13	8-14	5.0-5.5
Pusa Makhmali	5	10-11	15-25	5.5-6.0
Parbhani Kranti	5	11-14	15-20	5.5-6.0
Kashi Kranti	5	11-15	16-25	5.5-6.0
Pusa Sawani	5	8-12	12-18	6.0-6.5

Tania Seth, JK Ranjan, B Singh and Gyan P Mishra

ICAR-Indian Institute of Vegetable Research, Varanasi-221305, UP

VRBSEM-3: High yielding line of bush-type lablab bean

This is a bush-type genotype, crop attains 50% flowering in about 54 days after sowing and ready for first picking in 65 days after sowing. The inflorescence is raceme of many white-coloured flowers. A plant bears an average 250 number of green and straight tender pods per plant weighing about 700 g. Each pod's length and width is 13.5 cm and 1.8 cm, respectively, and contains 4.1-5.0 black coloured seeds. The nutritional and antioxidant properties of edible pods were estimated, 93.6 mg/g of total soluble protein, 1.08 mg/g of total phenol content, 0.734 mg/g of total chlorophyll content, 0.212 mg/g of total carotenoids, 2.99 µg/g of proline content, 16.29 µmol/g hydrogen peroxide, and catalase activity 1.29 µmol H_2O_2 reduced/min/mg protein.

VRBSEM-3

Nagendra Rai

ICAR-Indian Institute of Vegetable Research, Varanasi-221305, UP

Bacterial wilt tolerant tomato

Tomato is one of the most important vegetable crops grown worldwide. In North Eastern Hill region of India, it is grown mostly during the November-April as rainfed crop on raised bed i.e. locally known as Bun after harvesting of the rice. There are several limiting factors in the production of the crops viz. moisture stress (deficit during winter and excess during the March-April at flowering and fruiting stage), bacterial wilt, early and late blight. Among the biotic stresses, bacterial wilt and late blight are more severe in crop production. The ICAR Research Complex for NEH Region, Umiam, Meghalaya has developed two varieties of tomato tolerant to bacterial wilt.

Megha Tomato-2 (IC0597242): An indeterminate, high yielding and bacterial wilt tolerant cultivar of tomato developed by pedigree breeding using parental lines EC-1773 × Shakti (LE-79). The fruits are oblong in shape, weighing 55-75g, rich in lycopene (8.46mg/ 100 g), TSS (4.8-5.6 °B), acidity (0.4-0.6%) and ascorbic acid (18.23-25.20mg/ 100 g) content. The fruits are also having longer shelf-life (15-18days) due to thick pericarp (5-6mm) and are suitable for long distance markets. This variety is tolerant to bacterial wilt, disease incidence ranged from 5.5-11.0% under field conditions, and also tolerant to moisture stress makes suitable for the rainfed cultivation. The yield potential ranged from 40-45 t/ha. In Group Meeting of AICRP on Vegetable Crops held at Pantnagar during 2012, Megha Tomato-2 has been recommended for the registration as bacterial wilt resistant line.

Megha Tomato-2 (IC-597242)

Megha Tomato-3 (IC0597243): This is high yielding, indeterminate in growth habit, and tolerant to low temperature and bacterial wilt cultivar developed by pedigree breeding using parental lines Pusa Sheetal × Lima. The fruits are round in shape and weight ranged from 55-75g. Variety is rich in lycopene (8.40 mg/ 100 g), TSS (4.6-5.5 °B), acidity (0.5-0.7%) and ascorbic acid content (16.8-24.6 mg/ 100 g). The shelf-life of fruits is 12-15 days. It is tolerant to bacterial wilt, disease incidence ranged from 7.0-13.0%. The yield ranged from 40-45 t/ha. Under the farmers' fields (Lairbang and Nongrim Nongladaw, Meghalaya) the variety has reported yield of 40.5 t/ha. This variety has been released by Meghalaya State Variety Release Committee in 2010.

Megha Tomato-3 (IC- 59723)

Veerendra Kumar Verma, Anjani Kumar Jha and SV Ngachan

ICAR Research Complex for NEH Region, Umiam-793103, Meghalaya

VRRAD-143: A tropical red radish for better quality and high yield

It is a unique genotype of coloured tropical radish having iciclical/ obtriangular root shape. The roots are attractive, red in colour (root exterior) along with white root interior due to presence of anthocyanins, especially pelargonidine. Usually, coloured rooted varieties are temperate type having globular/ stumpy/ spindle shaped roots, but these have fewer acceptances in Indian subcontinent due to predominant preference for iciclical root shape. VRRAD-143 has been developed through phenotypic recurrent selection at ICAR-IIVR, Varanasi, UP. The leaf shape (leaf division-incision) is typically lyrate and green in colour. It is ready to harvest after 42-50 days of sowing. The roots are long measuring 23-26 cm in length, 2.6-3.0 cm in diameter, 150-160 g in weight and has good root yield potential 38-42 t/ha. It is good source of antioxidants such as anthocyanin, phenolics, flavonoids and ascorbic acid, and possesses 20-80% more of these phytonutrients than white rooted cultivars. The uses of coloured radish in the salads or as garnish gaining popularity in India as it makes salad more nutritious, healthier and attractive appearance.

VRRAD-143

BK Singh and B Singh

ICAR-Indian Institute of Vegetable Research, Varanasi-221305, UP

EMERGING PESTS

Late blight: An emerging disease of tomato in eastern Uttar Pradesh

The occurrence of late blight (*Phytophthora infestans*) in potato is well documented. In the last couple of years, its occurrence on tomato is being noted in and around research farm, ICAR-IIVR, Varanasi. Recently, its outbreak on tomato was observed at research farm of the institute and also in farmer' field in adjoining districts of eastern U.P., coinciding with cooler months of mid-January to February 2016. It initiated from 3rd week of January with a maximum severity during 4th week of January at research farm where >60% plants were infected by this disease. It was more severe in hybrid tomato with 90% severity in net-house conditions. Initially, the symptoms appeared as irregular water soaked and light brown lesions on leaves which enlarged rapidly and often showing brown coloured necrotic lesions. These lesions were normally observed to be covered with white cottony mycelial growth on the lower side of leaves. Water soaked brown lesions expanded rapidly on stem, petiole and fruits. Infected tomato fruits showed typical symptoms at all stages particularly in green fruits as olivaceous brown, water soaked lesions in wet weather and become leathery and hard in sunny weather. All diseased fruits eventually fall-off from the plants and they were neither fit for marketing nor human consumption. Finally, all the affected leaves blighted, dried and defoliated. The infected tomato leaf bits inoculated aseptically on sterilized potato slices and colonization on slices was observed after 7 days of incubation at 18±1 °C. Microscopic studies of colonized pathogen on potato slices revealed lemon shaped papillate

Water soaked lesions with white cottony mycelial growth on leaves

sporangia on sporangiophores. On the basis of morphological characteristics of sporangia, tomato infecting late blight pathogen was confirmed as *P. infestans*. For isolation of the tomato late blight pathogen (*P. infestans),* several semi-synthetic agar media *viz.*, barley grain agar, corn meal agar, carrot extract agar, frozen pea agar media, green pea extract agar, oat meal agar, planta corn meal agar, potato dextrose agar, rye agar, wheat grain extract agar, and their modification with carbon sources, pH, water content, agar concentration and temperature were tried, but pathogen failed to be isolated in any of these media. Standardization of culture media for isolation of the pathogen is underway in our laboratory.

Colonization of *P. infestans* of tomato on potato slices

AN Tripathi, KK Pandey, AB Rai and Sunil Gupta

ICAR-Indian Institute of Vegetable Research, Varanasi-221305, UP

VEGETABLE FOR HEALTH

Vegetable soybean: A potential, nutritious and healthy crop for new niches

Vegetable soybean [*Glycine max* (L.) Merrill], also known as green-soybeans, sweet-beans, *mao dou* and *edamame*, is gaining popularity among the Indian growers due to its rich nutritional profile. It is valued for its tender 'green-pods' which could be served as snacks, salad-mixes, stir-fried or for 'immature green-seeds' that are harvested, slightly before it gets mature and become dry. Compared to grain type soybean, vegetable soybean has some specific consumption quality parameters *e.g.* green-color, soft-texture, large and sweet seeds, and less beany flavor. Sugar and volatile components are the main chemical substances which affect the eating quality of pod and green seed. Vegetable soybean classifies as functional food, as it is rich source of fiber, isoflavones, omega-3 fatty acid and folic acid with potential health benefits. It is one of the few green vegetables that contain all nine essential amino acids, making them an excellent source of quality protein. It has short crop-duration and thus easily fits in a crop rotation, with average pod yield of 3-5 t/ha in 75-80 days. The crop residues or haulms can also be used as livestock feed or as green manure.

Vegetable soybean pods maturing for seed

ICAR-Indian Institute of Vegetable Research, Varanasi has made a humble beginning on vegetable soybean research. A total of 86 germplasm were augmented from all over the country including IIHR, Bangalore; CSKHPKV, Palampur, HP; HARP, Ranchi and World Vegetable Center South Asia, ICRISAT Campus, Patancheru, Hyderabad. These include a range of diverse genotypes including recently released variety 'Swarna Vasundhara' which are being characterized for various horticultural traits. A sufficient genetic variability was observed for the traits like days to 50% flowering; flower-, leaf- and pubescence- colour; first flowering node; number of leaflets and leaf shape; plant-height; number of pods per plant; number of seeds per pod; pod length and width; average pod-weight; seed colour; etc.

Despite its immense nutritional importance, the consumer has low acceptance for vegetable soybeans as it is not digested easily because of the presence of anti-nutritional compounds like trypsin inhibitor and saponins. On the other hand, the vegetable soybean cultivars have, in general, low seed viability than its grain counterparts. Our breeding strategies include quality aspects such as dark-green unblemished pods, free from trypsin-inhibitor with sweet and savory flavor, adequate seed-size and seeds per pod. Besides, photo- and thermo- insensitive cultivars with early picking, long harvest duration, resistance to major pest and diseases are the important traits under consideration. It is expected that in years to come we will be having a range of varieties more suitable for North Indian conditions and also having greater acceptance to the consumer as vegetable.

Jyoti Devi, SK Tiwari, RK Dubey, C Manimurugan, PM Singh and B Singh

ICAR-Indian Institute of Vegetable Research Varanasi-221305, UP

CLIMATE FRIENDLY AGRO-PRACTICES

Mulching: A climate resilient technology for vegetable production

Mulch can reduce water evaporation, retain soil moisture, modify soil temperature, and enhances the production. Organic mulch such as paddy or pea straw and

Paddy straw mulch in tomato

Pea straw mulch in okra

Polyethylene mulches in furrow irrigated raised bed transplanted tomato

Transparent polyethylene mulch is better option for realization of higher yield during winter

dry grass clipping @ 12-15 t/ha can enhance vegetable production by 20-80%, particularly during summer season. It also reduces water requirement by 20-30% and improves soil fertility. In spring-summer okra, it has been noticed that application of grass clipping or pea straw mulch @ 10 t/ ha saves water around 30%. Similarly in tomato, application of paddy straw mulch @ 15 t/ha alone or in combination of furrow irrigated raised bed can save about 15% and 49% water, respectively as compare to bare soil with flatbed transplanting.

Polyethylene mulches are mostly used in conjunction with drip irrigation system for more benefits. Plastic mulches used in vegetables are mostly black, black-silver or transparent with thickness of 20-30 micron. These mulches work as barrier for soil evaporation loss, thus conserve soil moisture for longer time. In tomato, with use of black and transparent polyethylene mulch, 15-25% water savings was achieved. However, when black polyethylene mulch was used in combination of raised bed planting or drip irrigation, 46% and 66% water savings were achieved, respectively. Besides water savings, it also enhances the yield by 35-50% as compared to un-mulched soil.

Anant Bahadur and Paresh Chaukhande

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

Conservation tillage in vegetable production

Vegetable crops, generally, are input and labour intensive. In vegetable cultivation, usually the soil is subjected to intensive primary and secondary tillage operations to prepare a fine seed bed for crop establishment either through seedling transplanting or seed sowing. Intensive tillage not only destroys soil aggregates, soil structure and soil organic matter through oxidation but also causes loss of soil nutrients and soil degradation through soil erosion. A number of scientific research reports showed widespread deficiency of macro- (NPK), secondary- (Ca, S, Mg) and micro-nutrients (Zn, Fe, Mn, etc.) in vegetable crop production. Under this situation, there is demand for identification of an environmental friendly and crop yield sustainable system of tillage. Conservation tillage, the most important aspect of conservation agriculture, is thought to take care of the soil health, plant growth and the environment. Conservation tillage is any tillage system that leaves at least 30% of the soil surface covered with crop residue after planting to reduce soil erosion by water. Minimum and zero tillage are part of conservation tillage and are considered as a suitable technique for physical protection of soil organic carbon (SOC), productivity enhancement, soil erosion control, more retention of soil water, reduced cost of cultivation and improved economic benefits. Very little and scattered information is available on vegetable based conservation agriculture, hence, ICAR-IIVR had initiated a long term trial on conservation agriculture for production of vegetable crops. The experimental trial conducted consists of combination of minimum till (MT), Zero till (ZT) and conventional tillage coupled with residue retention/removal with different vegetable crops.

Conservation tillage and crop performance: It was found that during the first year of tillage experiment, crop yield under conservation tillage was significantly lower as compared to conventional and the yield gap was reduced in subsequent year. In first year, at par yield of cowpea was obtained across the tillage systems (10.4 t/ha in ZT), while in tomato the yield in ZT (31.1 t/ha) was lower than in conventional tillage (32.9 t/ha). However, the results of third year indicated that tomato fruit yield in conservation tillage

Table: Energy Use Efficiency (EUE) and Benefit-Cost (B:C) ratio under different tillage management

Treatment	Cowpea (Summer)		Cowpea (Kharif)		Chilli (Winter)	
	EUE	B:C	EUE	B:C	EUE	B:C
Conventional tillage	4.55	2.32	4.54	2.58	1.06	1.87
Conservation tillage	4.93	2.58	5.16	2.85	1.14	1.86
Residue retention	1.48	2.65	1.54	2.80	0.79	1.97
Residue removal	8.00	2.24	8.20	2.63	1.40	1.77
Treatment	Cabbage (Winter)		Tomato (Winter)			
	EUE	B:C	EUE	B:C		
Conventional tillage	2.42	3.15	2.49	2.73		
Conservation tillage	2.70	3.66	2.87	2.79		
Residue retention	1.48	3.53	1.34	2.86		
Residue removal	3.65	3.28	4.02	2.66		

and conventional tillage was statistically similar, but in fifth year 23% higher yield was recorded in tomato under conservation tillage as compared to conventional tillage. Similarly, conservation tillage produced higher yield in summer cowpea, kharif cowpea, cabbage, pea and chili. Tillage impact on crop yield is related to its effects on root growth, water and nutrient use efficiencies, and ultimately the agronomic yield. Conservation tillage improved the water and energy use efficiency as well as the Benefit:Cost ratio (Table). Higher energy use efficiency as well as benefit cost ratio is also obtained under ZT as a result of reduced input used particularly energy and capital input and subsequently reduction in input cost.

Crop residue is an important renewable resource. Developing techniques for effective utilization of this vast resource is a major challenge. The principle of conservation tillage involves maintenance of surface soil cover through retention of crop residues achievable by practicing zero tillage and minimal mechanical soil disturbance. Retention of crop residue was found to be highly beneficial in reducing weed population and increasing the water holding capacity of soil and thereby improved the yield of tomato, cabbage, chili and cowpea.

Conservation tillage and soil properties: Analysis of soil samples collected from the surface layer of 0-15 cm revealed that organic carbon content, SOC stock, labile pool carbon and carbon sequestration, microbial biomass carbon, water holding capacity and available water increased due to conservation tillage as well as due to residue retention as compared to conventional tillage and residue removal, respectively. Zero tillage also recorded higher soil organic carbon and microbial biomass carbon as compared to conventional tillage. Due to retention of crop residue, organic carbon content increased by 15-18% in residue retained soil as compared to the field where crop residue was removed. There was increase in microbial biomass carbon, the soil organic matter content influences to a large extent the activities of soil organism which in turn influence the SOC dynamics. Conservation tillage recorded higher soil organic carbon and microbial biomass carbon. The total microbial activity assessed in terms of fluorescein diacetate hydrolytic activity (FDHA) in the upper 0-15 soil layer was 34% higher in conservation tillage (6.03 fluorescein/g soil) as compared to conventional tillage (4.5 fluorescein/g soil). Soil organic carbon and microbial activity is indicator of soil quality, and their values under conservation tillage and residue retention indicates better soil health.

SK Singh, Paresh Chaukhande, Raghwendra Singh and RN Prasad

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

SUCCESS STORY

आलू की व्यवसायिक खेती

श्री अनुज कुमार सिंह, पिता - श्री जगत नारायण सिंह ग्राम व पोस्ट - खामपार, भाटपार रानी जिला - देवरिया के निवासी है इनकी उम्र 32 वर्ष, शैक्षणिक योग्यता एम.ए. (हिन्दी) और इनके पास कुल 27 एकड़ कृषि योग्य भूमि है। ये लगभग 8 वर्षों से खेती कर रहे है और सब्जियों की खेती पर विशेष ध्यान देते है क्योंकि इनका मानना हैं कि सब्जियों की खेती में आय अधिक होती है। श्री सिंह पहले पीढ़ी दर पीढ़ी चली आ रही परम्परागत विधि से खेती कर रहे थे जिससे फसल का उत्पादन कम होता था और इसकी गुणवत्ता निम्न श्रेणी की होने से शुद्ध लाभ जो मिलना चाहिए वह नहीं मिल पाता था। वर्ष 2010 में इन्होंने कृषि विज्ञान केन्द्र, मल्हना, देवरिया में सम्पर्क किया और केन्द्र द्वारा आयोजित अग्रिम पंक्ति प्रर्दशन के अन्तर्गत भारतीय सब्जी अनुसंधान संस्थान, वाराणसी द्वारा विकसीत लोबिया की प्रजाति काशी कंचन और लौकी की प्रजाति नरेन्द्र रश्मि को लगाया जिससे इन्हे अच्छी शुद्ध आय प्राप्त हुई। उसके बाद वह कृषि विज्ञान केन्द्र, की विभिन्न गतिविधियों में आते रहे और वैज्ञानिक तकनीकी की जानकारी लेकर खेती करते रहे। इसी दौरान इनसे आलू की उन्नतशील प्रजातियों की वैज्ञानिक ढंग से खेती पर चर्चा हुई और रबी, 2012 में इन्होंने केन्द्र द्वारा दिये गये आलू के अग्रिम पंक्ति प्रर्दशन के अन्तर्गत प्रजाति कुफरी अशोका और कुफरी पुखराज को अपने खेत पर लगाया व क्रमशः 360 कुन्टल/हे. और 352 कुन्टल/हे. की दर से उपज प्राप्त किया। पूरे उपज को इन्होंने बीज के रूप में लगाने के लिए शीत गृह में भण्डारीत कर दिया।

रबी, 2013 में शीत गृह से आलू का बीज निकाल कर उसमें से 7 कुन्टल, 2,600 रू. प्रति कुन्टल की दर से अन्य किसान को बीज के लिए बेच दिया और शेष आलू को बीज के रूप में अपने खेत में लगभग 2.0 एकड़ में बुवाई की। 2013 में केन्द्र के विशेषज्ञों के सलाह मिलने के बाद आलू बोने की मशीन (पोटैटो प्लान्टर) लाये और मशीन से आलू की बुवाई की। इस मशीन से इन्होंने अपने अलावा, गाँव के अन्य किसानों और आस पास के किसानों की भी बुवाई की। ये नियमित रूप से कृषि विज्ञान केन्द्र के सम्पर्क में रहते है और कौन सी दवा कब डालनी है, कितना खाद व पानी देना है इसकी जानकारी लेते रहते है। इस समय इनके खेत पर 2.0 एकड़ क्षेत्र में बीज उत्पादन हेतु आलू की दो प्रजातियाँ कुफरी अशोका और कुफरी पुखराज लगी हुई है इसके साथ-साथ इन्होंने इस वर्ष रबी, 2013 में TPS विधि से भी बीज उत्पादन हेतु आलू लगाये थे। वर्ष 2015 में आलू बीज उत्पादन का कार्य लगभग 5 एकड़ भूमि में लगाये। इनसे प्रभावित होकर और भी किसान आलू की खेती पर जोर दे रहे है और आलू बीज का उत्पादन कर रहे है। ये किसानों के मार्ग-दर्शक का भी काम करते है आस-पास अन्य गाँवों के किसान इनके पास आकर खेती का व्यवहारिक ज्ञान सिखते है। इस प्रकार आलू बीज उतपादन का कार्य श्री अनुज कुमार सिंह द्वारा प्रत्येक वर्ष किया जा रहा है।

अनुज कुशवाहा, अनुराधा रंजन कुमारी, शमशेर सिंह एवं कमलेश मीना

कृषि विज्ञान केन्द्र, देवरिया

शौक से व्यावसायिक सब्जी की खेती तक अंजाम दिया रमाशंकर ने

श्री रमाशंकर तिवारी, पिता स्व. राम नारायन शर्मा ग्राम - भड़सर, पोस्ट - टिकमपार, बनकटा ब्लॉक, जिला - देवरिया के निवासी है। इनकी उम्र 58 वर्ष, शैक्षणिक योग्यता बी.ए., बी.एड. और इनके पास कुल भूमि लगभग 20 एकड़ है। पेशे से शिक्षक श्री तिवारी का खेती करना शौक और पैतृक व्यावसाय है। पिछले चार वर्षों (वर्ष 2012) से कृषि विज्ञान केन्द्र, मल्हना, देवरिया से जुड़े हुए है। आज इनकी खेती शौक से आगे बढ़कर व्यावसायिक हो गई है ये नियमित कृषि विज्ञान केन्द्र आकर खेती की नवीनतम एवं वैज्ञानिक जानकारी प्राप्त करते रहते है। सब्जी के इतने अच्छे अनुभवी किसान हो गये है कि गाँव ही नहीं इलाके के किसान इनके यहाँ आकर इनकी खेती देखते है और इनसे जानकारी हासिल कर अपनी खेती करते है। श्री रमाशंकर तिवारी क्षेत्र के किसानों का मार्ग-दर्शक का काम कर रहे है। पहले वर्ष खरीफ, 2012 में इन्होंने केन्द्र की सलाह पर भारतीय सब्जी अनुसंधान संस्थान, वाराणसी द्वारा विकसीत लोबिया की काशी कंचन प्रजाति का समेकित नाशीजीव प्रबंधन कर खेती किया और मात्र 0.7 एकड़ से सभी खर्च बाटकर 40000 रूपये शुद्ध लाभ अर्जित किया। लोबिया की कम समय में खेती से ये प्रभावित हुए और खरीफ, 2013 में 1.5 एकड़ काशी कंचन प्रजाति लगाकर 75000 रूपये शुद्ध लाभ अर्जित किए। साथ ही इन्होंने कृषि विज्ञान केन्द्र के मार्ग-दर्शन में खरीफ, 2013 में मिर्च 0.7 एकड़ लगाकर रूपये 80000 शुद्ध लाभ, अरबी 0.5 एकड़ से 46800 रूपये शुद्ध लाभ अर्जित किए। खरीफ, 2013 में ही इनके खेत पर 0.25 एकड़ में कृषि विज्ञान केन्द्र की समेकित नाशीजीव प्रबंधन के प्रदर्शन अंतर्गत लगाई गई बैगन की काशी तरू प्रजाति से अच्छी आमदनी हुई। रबी, 2013 में इन्होंने कृषि विज्ञान केन्द्र, मल्हना, देवरिया से टमाटर की काशी विशेष और काशी अनुपम प्रजातियाँ के अग्रिम पंक्ति प्रदर्शन 0.3 एकड़ में लगाई गयी जो रोग व कीट से बिल्कुल मुक्त थी। रबी, 2013 में इन्होंने सब्जी मटर (1.5 एकड़), फुलगोभी हाइब्रीड (0.7 एकड़), पत्तागोभी हाइब्रीड (0.25 एकड़), मिर्च नेपाली (1.0 एकड़) लगायी जिसका विस्तृत विवरण सारणी में दिया गया है। इससे पहले रमाशंकर तिवारी गन्ना (चीनी मिल हेतु), धान, गेहूँ, सरसों आदि की खेती करते थे।

सब्जी से वार्षिक आय का ब्यौरा

मौसम व वर्ष	सब्जी का नाम	क्षेत्रफल (एकड़)	शुद्ध आय / शुद्ध लाभ (रू.)	वार्षिक आय (रू.)
रबी, 2010	पत्तागोभी (हाइब्रीड)	1.2	6500	6500
रबी, 2011–12	टमाटर (हाइब्रीड)	0.3	20,000	1,20,000
	पत्तागोभी (गोल्डन एकड़)	0.7	50,000	
	पत्तागोभी (हाइब्रीड)	0.3	50,000	
खरीफ 2012	लोबिया (काशी कंचन)	0.7	40,000	2,52,000
	अरबी	0.7	47,000	
रबी, 2012–13	पत्तागोभी (हाइब्रीड)	3.0	1,65,000	
खरीफ, 2013	लोबिया (काशी कंचन)	1.5	75,000	3,81,800
	अरबी	0.5	46,800	
	मिर्च (हाइब्रीड)	0.7	60,000	
	बैगन (काशी तरू)	0.25	40,000	
रबी, 2013–14	टमाटर (काशी विशेष, काशी अनुपम)	0.30	30,000	
	सब्जी मटर	1.5	80,000	
	फुलगोभी (हाइब्रीड)	0.7	20,000	
	पत्तागोभी (हाइब्रीड)	0.25	30,000	
खरीफ 2014	लेबिया (काशी कंचन)	0.5	25,000	80,000
रबी 2014–15	फुलगोभी (हाइब्रीड)	1.0	35,000	
	पत्तागोभी (हाइब्रीड)	0.50	20,000	
खरीफ 2015	लोबिया (काशी कंचन)	0.7	40,000	72,000
	अरबी	0.5	32,000	

मनोज पाण्डेय, अनुराधा रंजन कुमारी,
कमलेश मीना एवं शमशेर सिंह
कृषि विज्ञान केन्द्र, देवरिया

KVK ACTIVITIES

Pre-Rabi Kisan Sammelan at Bhadohi, U.P.

Pre-Rabi Kisan Sammelan along with exhibition stalls of different Govt. and Private Agencies was organized by KVK Bhadohi on 19.03.2016 at office of DDA (Bhadohi), Gheraon. Dr RN Prasad, Coordinator, KVKs and Principal Scientist, ICAR-IIVR, Varanasi chaired the Sammelan. He urged the farmers for adopting the improved package of practices for the cultivation of crops. He also insisted the farmers to come up for awareness about soil health. Each farmer must know about the status of their farm soil. Dr RK Maurya, DDA briefed about the Govt. schemes related to agriculture, likewise Shri SMP Patel, DHO focused about the cultivation of spices under Govt. subsidy and Dr RB Maurya, CVO stated upon Kamdhenu Dairy Project. Shri OP Mishra, DAO urged the farmers to adopt organic farming in the district. Besides, Smt Vidya Singh, Chairperson of the farmers showed her interest on women empowerment.

About 460 farmers & farm women participated in the sammelan.

Rajendra Prasad

KVK Bhadohi

Promotion of IPM techniques in vegetables

Training-cum-awareness programme for farmers under NABARD funded project entitled "Scientific intervention for validation and popularization of traps for management of insect-pests in vegetable growing areas of Jammu Region" organized by Division of Entomology, SKUAST at Kanhachak (village Panjore) on 05 April 2016 in collaboration with Directorate of Agriculture, Jammu under the guidance of Dr. J. P. Sharma, Director Research, SKUAST-Jammu. More than 50 progressive farmers participated in the training-cum-awareness programme. Dr. Devinder Sharma, Principal Investigator of the project while interacting with the farmers emphasized the need to adopt the preventive and scientific methods to manage insect-pests of vegetable crops. He urged up on the farmers to abstain from using excessive pesticides and adopt those measures which do not affect the environment and human health. He demonstrated the low cost and scientifically validated technologies for the control of various insect-pests in the vegetable crops. He urged the farmers to follow the SKUAST-Jammu recommendations for updating their knowledge on various agricultural aspects. Dr. A.K. Singh, Co-PI of the project also emphasized the uses of eco-friendly trap-based methods in brinjal, tomato and cucurbits. Mr. Mohan Singh, AEO, Mishriwalla and Mr. Nirmal Prakash, JAEO, Mishriwalla apprised the participants about the latest scientific techniques, especially adoption of pheromone/sticky and bait traps for the integrated insect-pests management in tomato, brinjal and cucurbit crops. On this occasion, the traps were distributed to the selected farmers for promoting organic management of insect-pests in vegetable crops.

Devinder Sharma

Division of Entomology, SKUAST, Jammu-180009, Jammu & Kashmir

मृदा स्वास्थ्य

कृषि विज्ञान केन्द्र के बेजवाँ गाँव में विश्व मृदा दिवस का आयोजन किया गया। जिसमें मुख्य अतिथि मानूनीय सांसद श्री वीरेन्द्र सिंह ने भदोही जनपद के किसानों को मृदा के गिरते स्वास्थ्य के बारे में चिंता जताई। सांसद महोदय ने मिट्टी की सजीवता को अक्षुण्ण बनाये रखने के लिए किसानों को केचुएं से बनी खाद (वर्मी कम्पोस्ट), नाडेप कम्पोस्ट के प्रयोग को बढ़ावा देने की बात कही साथ ही मृदा में कार्बन के गिरते स्तर को गोमूत्र से निर्मित जैव पदार्थों का प्रयोग करने की सलाह दी। इसके अतिरिक्त फलों के उत्पादन विशेष रूप से लंगड़ा आम की फल पट्टी को विकसित करने की सलाह दी। दलहन एवं तिलहन की जनपद में असीम संभावनाएं व्याप्त हैं किसान भाई उच्च उत्पादन तकनीकि के द्वारा जनपद की उत्पादकता को उच्च स्तर तक ले जा सकते है। पशुधन विकास हेतु सघन डेयरी योजना से जुड़कर किसानों को लाभ लेने के लिए प्रेरित किया। भारतीय सब्जी अनुसंधान संस्थान वाराणसी के निदेशक महोदय डॉ विजेन्द्र सिंह ने मृदा में उपलब्ध पोषक तत्वों को अधिकाधिक रूप में प्रयोग में लेने की बात कही। कुल 17 पोषक तत्वों की पौधों की बढ़वार में आवश्यकता होती है जिसको सूक्ष्म पोषक तत्वों जैसे जिंक, बोरान, आयरन आदि के प्रयोग द्वारा दूर किया जा सकता है। जैविक संवर्द्धन के प्रयोग द्वारा मिट्टी की सजीवता को टिकाऊ बनाया जा सकता है। सभी किसान भाईयों को मृदा परीक्षण के आधार पर संतुलित उर्वरकों का फसल विशेष के आधार पर प्रयोग करना चाहिए। डा. ए.के. चतुर्वेदी ने मृदा परीक्षण के प्रस्तुतिकरण में बताया कि जनपद के 39 ग्राम सभा के सिंचित भूमि 2.5 हे. एवं असिंचित भूमि में 10 हे. के ग्रिड में कुल 42 ग्रिड का चयन करके

250 कृषकों के मृदा नमूनें एकत्रित किये गये। इन नमूनों का केन्द्र द्वारा परीक्षण कराया गया तथा सांसद महोदय द्वारा किसानों को मृदा स्वास्थ्य कार्ड का वितरण किया गया। जनपद में मृदा में उपलब्ध जीवांश की मात्रा अति न्यून से मध्यम तथा पी.एच. सामान्य से क्षारीय के बीच पाया गया। साथ ही उपलब्ध नत्रजन अति न्यून से न्यून जबकि उपलब्ध फास्फोरस की मात्रा उच्च स्तर पर पाई गई। जबकि सूक्ष्म पोषक तत्वों की उपलब्धता कम स्तर पर आंकी गई। इस अवसर पर डा. आर.पी. चौधरी ने मृदा स्वास्थ्य बनाये रखने के लिए बिन्दुवार तकनिकियों पर सविस्तार बताया। केन्द्र के डा. राकेश पाण्डेय ने मंच का संचालन एवं डा. ए.के. सिंह, डा. रेखा सिंह, वी.वी. दीप्तिकार, डा. प्रभाश चन्द्र सिंह तथा धनंजय सिंह ने कार्यक्रम के संचालन मे तकनीकि सहयोग दिया।

कार्यक्रम समन्वयक

कृषि विज्ञान केन्द्र, भदोही

EVENTS

National farmers' fair cum vegetable show casing at ICAR-IIVR, Varanasi

National farmers' fair cum vegetable show-casing was organized in collaboration with National Horticulture Board

(NHB), Gurgaon and Association for Promotion of Innovation in Vegetable (APIV) on 30th January 2016 to educate the farmers regarding vegetable and agriculture production which is economically, environmentally and technologically sustainable. This event was inaugurated by Prof. Gautam Kalloo, Former Vice Chancellor, JNKVV, Jabalpur, and Former DDG (Hort. & Crop Sciences), ICAR, New Delhi. In his inaugural address, he highlighted the new research and development in the area of vegetable production. He emphasized the importance of micronutrients and utilization of microbes in vegetable production. Dr. Gopalji Trivedi, former Vice Chancellor, RAU, Pusa, Bihar; Dr. A.K. Mehta, Former ADG (Extension), ICAR, New Delhi; and Dr. R.P. Singh, Director, Institute of Agricultural Sciences, BHU, Varanasi were the special guests of the function. Dr. B. Singh, Director of the institute highlighted the achievements and transfer of technologies by ICAR-IIVR. He also emphasized women empowerment and farmers' participation in hybrid seed production.

The event was attended by about 4000 farmers from Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Jharkhand, Bihar, Uttarakhand, West Bengal and Gujarat. A total of 40 stalls related to vegetables, spices, potato, seeds, fertilizer, beneficial microbes, fisheries, etc. had been displayed by various ICAR institutes, KVKs, SAUs, and other Government and Private Sectors. At the end of the function, famers' were awarded for their contribution in vegetable production. At national level category, Shri Rajeshwar Mahato, Ranchi, Jharkhand; Shri Ram Chandra Prasad Kushwaha, Purbee Champaran, Bihar; and Shri Rajendra Singh Rana, Deharadoon, Uttarakhand were awarded with gold, silver and bronze medal, respectively. Moreover, at regional level, Shri Raghupat Singh (Muradabad) received gold medal, Smt. Rajani Devi (Sonbhadra) and Shri Ramji Maurya (Bhadohi) shared silver medal, and Shri Anuj Kumar Singh (Deoria)

received bronze medal. Hundreds of farmers participated in Vegetable Show-casing Competition with their produce and received first, second and third prizes in different categories.

Neeraj Singh and Shubhadeep Roy

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

National symposium on "Vegetable legumes for soil and human health" to commemorate "International Year of Pulses"

To celebrate 2016 as "International Year of Pulses," a National symposium on "Vegetable legumes for soil and human health" was organized at ICAR-IIVR, Varanasi during February 12-14, 2016. Dr. NK Krishna Kumar, DDG (Horticultural Sciences), ICAR, New Delhi inaugurated the symposium on 12th February 2016. In his inaugural address, Dr. Kumar emphasized for holistic approach in research on legume vegetables for nutritional security and improving soil health. He opined that legumes have great significance in

dry lands for sustainable production as they maintain soil fertility and reduce soil erosion. He expressed concern over problems of pod borer and white fly in legumes and also emphasized to develop varieties resistant to viruses. He appreciated and congratulated the scientists of the Institute for their efforts for developing new varieties in pea, cowpea and Indian bean.

On this occasion, Dr. Kirti Singh, Ex-Vice Chancellor and Ex-Chairman, ASRB; Dr. G. Kalloo, Ex-Vice Chancellor, JNKV, Jabalpur & Ex-DDG (HS & CS), ICAR; Dr. D.P. Ray, President, ISVS and Ex-Vice Chancellor and Dr. R.R. Hanchinal, Chairman, PPVFRA expressed their views on the importance of legumes towards food, nutritional and health security. Dr. Bijendra Singh, Director, ICAR-IIVR, Varanasi highlighted the status of vegetable legumes in the country along with their importance for nutritional security and soil health. Dr. N.P. Singh, Director, ICAR-IIPR, Kanpur stressed the need for increasing the production of legumes because per capita availability of legumes is only 37 g/day as against recommended quantity of 54 g/day. Altogether 260 abstracts from 77 organizations across the country were received for presentation in the symposium divided into 09 sessions covering 35 lead lectures, 50 oral presentations, besides many poster presentations. The thematic areas of symposium include Vegetable legume genetic resources and conservation, Underutilized and underexploited legume vegetables, Pre-breeding and Breeding, Biotechnological applications, Production technology and cropping system, Climate change-Biotic stresses, Climate change-Abiotic stresses, Post-harvest and value addition, Seed enhancement, and marketing and public-private partnership.

Neeraj Singh and Shubhadeep Roy

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

Pradhan Mantri Fasal Bima Yojana organized by KVKs

Awareness programme on Pradhan Mantri Fasal Bima Yojana (PMFBY) was organized by three KVKs of ICAR-IIVR to sensitize farmers about the benefits of scheme. Hon'ble Member of Parliament, Bhadohi, Shri Virendra Singh Ji inaugurated this awareness programme at Bhadohi on 23rd April 2016. Hon'ble MP focused the core benefit of PMFBY and instructed to the line department officials along with banking personnel to execute this programme.

Accordingly, at Deoria the awareness programme was conducted under chairmanship of Hon'ble Member of Parliament, Salempur, Deoria Shri Ravindra Kushwaha Ji on 30th April 2016 at Bapu Inter Collage, Salempur, Deoria. On the same day, at Kushinagar this awareness programme was inaugurated by Hon'ble Cabinet Minister, Government

PMFBY awareness programme at Bhadohi

of India, Ministry of Micro, Small and Medium enterprises; and Member of Parliament, Deoria Shri Kalraj Mishra in the presence of Hon'ble Member of Parliament, Kushinagar, Shri Rajesh Pandey; Dr. Bijender Singh, Director, ICAR–IIVR, Varanasi; Shri Nand Kishore Mishra, Ex MLA, Seorahi, Kushinagar; Shri Ram Ashish Rai, Ex MLC Deoria; and various dignitaries, media persons and over 1000 farmers and farm women. The minister also inaugurated the Agricultural Exhibition pertaining to transfer of recent technologies.

PMFBY awareness programme at Kushinagar

Neeraj Singh and Shubhadeep Roy

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

Kisan Gosthi and Krishi Vikash Parv celebrated at Deoria

Kisan Gosthi and Krishi Vikash Parv were celebrated at Deoria which was inaugurated by Hon'ble Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singh at Deoria, U.P. on 11th June 2016. In his inaugural address, Chief Guest, Shri Radha Mohan Singh emphasized on

Pradhan Mantri Fasal Bima Yojana (PMFBY) and others activities of Government awarded to small and marginal farmers, Pradhan Mantri Sichai Yojana, Ujwala Yojana, Soil Health Card, etc. He urged the farmers to take advantage of the schemes for enhancing their productivity, profitability and income. The Administrative Building of KVK (ICAR-IIVR), Malhana, Deoria was inaugurated by Hon'ble Minister. Dr. B. Singh, Director, ICAR-IIVR, Varanasi welcomed the Chief Guest and the farmers, and informed the gathering about activities of Institute & KVK. He was also emphasized the importance of vegetable cultivation for income generation, livelihood and nutritional security. About 2000 farmers, farm women and rural youth from various part of eastern UP participated actively.

Shubhadeep Roy and Neeraj Singh

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

Promotion of kitchen garden for nutritional security in east Champaran (Bihar)

Kisan gosthi cum vegetable demonstration conducted in Tetaria Gram Panchyat along with Chakia, Motihari and Areraj blocks of East Champaran (Bihar) for promotion of kitchen garden for nutritional security on 14th and 15th June 2016 where more than 1000 farmers had actively participated, including 20 progressive vegetable growers from Khairimal, Sansad Adarsh Gram of Hon'ble Union Minister of Agriculture and Farmers Welfare, Shri Radha Mohan Singhji. Lectures on modern vegetable production techniques were delivered by the scientists of ICAR-IIVR under the leadership of Institute's Director, with special emphasis to promote kitchen garden for nutritional security through vegetables. On this occasion, the seeds of various vegetables like okra, cowpea, sponge gourd, bottle gourd and pumpkin were distributed among more than 1000 growers. Selected vegetable growers were also provided with seeds of tomato, brinjal and chilli for nursery preparation for their own as well as other growers.

Neeraj Singh and Shubhadeep Roy

ICAR-Indian Institute of Vegetable Research
Varanasi-221305, UP

Editorial Board
Chairman
B Singh
Director, ICAR-IIVR
Members
BK Singh, Subhadeep Roy and Tanmay Kumar Koley
Member Secretary
Neeraj Singh
Published by
B Singh
Director, ICAR-IIVR
ICAR-Indian Institute of Vegetable Research
Post Bag No.-1, P.O.-Jakhini (Shahanshahpur), Varanasi-221 305, Uttar Pradesh, India
Phone: +91-542-2634247; 263523 Tele-fax: +91-5443-229007
Emails: directoriivr@gmail.com, bsinghiivr@gmail.com

Printed at Army Printing Press, 33, Nehru Road, Sadar Cantt., Lucknow-226 002. Tel. : 0522-2481164, 6565333