Research Highlights - Vegetable Production

Institute Project 1: Precision Farming in High Value Vegetable Crops

- **Optimized Nutrient Scheduling**: Growth-phase based nutrient management in capsicum achieved 18.6% higher yields at 125% EDF compared to 100% EDF, with capsicum removing 179.65 kg/ha N, 38.15 kg/ha P_2O_5 and 181.22 kg/ha K_2O.
- **Superior Rootstock Performance**: Tomato rootstocks EC-520074 and WIR-4360 demonstrated 133% and 136% higher fruit yields respectively, while brinjal grafted on S. incanum and Zippy showed 58% and 48.7% yield increases over conventional varieties.
- **Innovative Pomato Technology**: Triple tomato scion grafting on potato rootstock registered 18.6% higher tomato yield and 47.3% more potato yield with 26.3% enhanced cumulative productivity.

Institute Project 2: Harnessing Grafting Techniques and Bio-regulators to Improve Vegetable Crops Resilience Against Abiotic Stresses

- **Waterlogging Tolerance**: Cucumber grafted on ash gourd and Summerfit rootstocks demonstrated superior waterlogging tolerance, with ash gourd + cucumber showing better stress recovery compared to un-grafted and other graft combinations.
- **Drought & Salinity Resilience**: Ash gourd and Summerfit rootstocks exhibited better moisture deficit and salinity stress tolerance in cucumber based on morpho-physiological parameters (RWC, MSI, chlorophyll, MDA, proline) and root architecture analysis.
- **Brinjal Stress Tolerance**: S. torvum, S. macrocarpon, S. sisymbriifolium and Zippy rootstocks showed superior moisture deficit tolerance in brinjal with better maintenance of physiological and biochemical parameters under 50% field capacity conditions.

Institute Project 3: Development of Technologies for Production of Vegetables under Organic Farming

- **High-Yielding Organic Varieties**: Okra genotypes VRO-217, VRO-220, and VRO-230 and brinjal lines IVBHL-31, IVBHL-22 (Kashi Utsav), IVBL-30 achieved yields at par with inorganic systems under organic farming with reduced pest infestation.
- **Optimal Cropping Systems**: Okra-broccoli-bottle gourd sequence recorded significantly higher productivity of 346.02 q/ha with net profit of Rs 4,10,637/ha and B:C ratio of 2.06, while okra-pea-cowpea sequence yielded 255.02 q/ha with Rs 3,04,670/ha returns.
- **Microbial-Enriched Nutrient Management**: Application of 100% recommended dose of N through FYM enriched with microbial consortium (Trichoderma, BC6, CRB7, Actinomycetes) achieved yields equivalent to inorganic fertilization while improving soil organic carbon (0.62-0.63%) and bulk density.

Institute Project 4: Exploration of vegetables for processing amenability, bioactive potential and development of value-added products

- **Bioactive Compounds Identification**: VBT-58, VBT-1, VBT-97 and VBT-80 bitter gourd genotypes demonstrated higher relative bioactive compounds by UHPLC-HRMS analysis, indicating significant potential for health benefits.
- **Chilli Processing Optimization**: IIVRC 18253 green chilli powder achieved maximum consumer acceptance and purchase preference; 31 germplasm screened identified genotypes with highly pungent (25,000-70,000 SHU) to very highly pungent (>80,000 SHU) categories.
- **Novel Product Development**: Eggplant dip (P2 variant) exhibited superior physico-chemical attributes with 96.80% extractable DPPH inhibition and maximum antioxidant capacity and color stability.

Institute Project 5: Validation and Economic Impact of Technologies Developed at ICAR-IIVR

- **Significant Economic Returns**: Kashi Ganga variety (Bottle Gourd) generated total economic surplus of Rs. 78.45 crores (producer surplus: Rs. 30.33 crores; consumer surplus: Rs. 48.12 crores) with 86% Internal Rate of Return.
- **Large-Scale Adoption**: Kashi Ganga variety spread across 73,414 ha covering 218 districts in 30 states; Kashi Taru variety (brinjal) expanded to 48,216.6 ha across 41 districts in 19 states with total economic surplus of Rs. 55.54 crores.
- **Kitchen Garden Impact**: Validation of nutri-garden module among marginal farmers produced 226.64 kg leafy vegetables and 377.5 kg other green vegetables annually from 100 m^2 area, providing sufficient nutrition for families of 5-6 members with seasonal crop diversity (13 kharif, 18 rabi, 8 summer crops).