

VEGETABLE IMPROVEMENT DIVISION

Activities: Externally Funded Projects

1. National Innovations in Climate Resilient Agriculture (NICRA) This flagship ICAR network project addresses climate change adaptation in vegetable crops through identification of heat-tolerant and moisture-deficit tolerant varieties, development of climate-smart production technologies, and capacity building of farmers. Research generates climate-resilient genotypes and validated adaptation strategies. Farming communities in vulnerable regions gain access to technologies ensuring stable vegetable production under changing climate scenarios.

2. CRP on Hybrid Technology Project (Tomato) The Consortia Research Platform project focuses on developing high-yielding, disease-resistant tomato hybrids for fresh market and processing through exploitation of heterosis and CMS-based hybrid seed production. Research identifies superior hybrid combinations with ToLCV resistance and high TSS content. Seed industries gain access to improved parental lines while farmers benefit from hybrid vigour ensuring enhanced productivity and quality.

3. CRP on Agro-biodiversity This project characterizes and evaluates vegetable germplasm diversity for morphological, nutritional, and stress-related traits to identify promising accessions for utilization in breeding programmes. Research documents phenotypic and genotypic variability in brinjal, cucumber, and okra collections. The characterized germplasm serves as genetic resource for developing improved varieties addressing diverse consumer preferences and climatic adaptations.

4. Agri Business Incubator (ABI) The ABI facilitates entrepreneurship development in vegetable sector by providing incubation support, mentoring, and handholding to agri-startups and FPOs. Services include technology access, business plan development, and market linkages. Entrepreneurs gain access to IIVR technologies for establishing seed production, processing, and input supply enterprises, thereby creating employment and strengthening vegetable value chains.

5. Zonal Technology Management Unit (ZTMU) The ZTMU coordinates intellectual property management and technology commercialization across ICAR horticultural institutes in the eastern zone. Activities include technology licensing, variety registration, and IPR awareness programmes. The unit facilitates seamless technology transfer from laboratory to field, generating revenue for institutes while ensuring wider dissemination of improved technologies to end users.

6. ICAR-LBS Award Project This prestigious award-funded project employs CRISPR/Cas9-based genome editing for enhancing total soluble solids in tomato through targeted modification of invertase inhibitor and vacuolar processing enzyme genes. The research pioneers SDN-1 type editing for quality improvement without foreign gene introduction. The outcomes will provide processing industries with high TSS tomato varieties suitable for paste and puree manufacturing.

7. Discovery of novel genes and QTLs conferring resistance to ToLCNDV disease (NASF)

This NASF-funded project identifies and validates resistance genes and QTLs against Tomato Leaf Curl New Delhi Virus in cucurbits through bi-parental mapping populations and genome-wide association studies. Research develops linked molecular markers for marker-assisted selection. The outcomes enable development of virus-resistant cucumber and muskmelon varieties reducing crop losses and pesticide usage for vector management.

8. Proteomics and metabolomics of stress-challenged tomato (CABIN) This Centre for Agricultural Bioinformatics-funded project employs multi-omics approaches to understand stress response mechanisms in tomato and identify biomarkers associated with tolerance. Research generates proteomic and metabolomic profiles distinguishing tolerant and susceptible genotypes. The identified biomarkers facilitate early selection of stress-tolerant genotypes, accelerating breeding programmes for climate-resilient variety development.

9-15. DUS Testing Projects (PPV&FRA) These Protection of Plant Varieties and Farmers' Rights Authority-funded projects conduct Distinctiveness, Uniformity, and Stability testing for vegetable varieties submitted for registration in pointed gourd, okra, brinjal, cucumber, pumpkin, tomato, bitter melon, bottle gourd, pea, French bean, and gourds. The testing ensures only distinct and stable varieties receive protection, safeguarding breeders' rights while preventing spurious varieties from entering markets, thereby protecting farmer interests.

16. CRP on Hybrid Technology for Cauliflower This consortia project develops heat-tolerant cauliflower hybrids for early season cultivation using CMS-based hybrid technology. Research identifies stable CMS lines and superior hybrid combinations with compact curd and early maturity. Farmers benefit from off-season cultivation fetching premium prices while seed industries gain access to improved parental lines for commercial hybrid seed production.

17. Promotion of Horti-based IFS modules (UP State) This Uttar Pradesh-funded project validates and promotes integrated farming system models combining horticulture with livestock, fisheries, and apiculture for marginal farmers. Research demonstrates multi-tier cropping systems and enterprise diversification strategies. Marginal farmers achieve year-round income, improved nutritional security, and reduced risk through diversified farming systems.

18. CRP on Molecular Breeding - Tomato This consortia project employs marker-assisted selection for pyramiding disease resistance genes including Ty-2, Ty-3 for ToLCV, Ph-3 for late blight, and Mi-1 for nematodes in high-yielding tomato backgrounds. Research develops gene-pyramided lines with multiple resistance. Farmers benefit from durable disease resistance reducing crop protection costs while ensuring stable yields.

19. CRP on Molecular Breeding - Cucumber The project introgresses downy mildew resistance QTLs from wild cucumber accessions into popular cultivars through marker-assisted backcross breeding. Research develops molecular markers flanking resistance loci for efficient selection. Disease-resistant cucumber varieties will reduce fungicide dependency and enable cultivation during monsoon season with humid conditions favouring disease development.

20. Field Heat Project (DBT) This Department of Biotechnology-funded international collaborative project screens tomato germplasm for adaptation to dry and humid heat conditions characteristic of Indian monsoonal climate. Research employs multi-trait genotype-ideotype distance index for identifying superior heat-tolerant genotypes. The identified heat-tolerant germplasm serves as donors for developing tomato varieties suitable for summer cultivation and changing climate scenarios.

21. SNP Discovery in Pea (DST-SERB) This Science and Engineering Research Board-funded project develops high-density genetic maps using SNP markers for QTL mapping of multi-flowering trait in vegetable pea. Research establishes marker-trait associations for indirect selection in breeding programmes. Multi-flowering pea varieties with extended harvesting duration provide higher yields and sustained income to farmers.

22. AINP on Biotech Crops This All India Network Project advances transgenic vegetable lines expressing Cry genes for insect resistance and stress-tolerance genes for abiotic stress management through confined field trials. Research generates biosafety data and evaluates agronomic performance of transgenic events. The project contributes to regulatory dossier development for eventual commercialization of biotech vegetables in India.