1. Success story:

ICAR-NRCG has made significant progress in bio-intensive disease management of grapevine through innovative microbial research. The institute successfully isolated, characterized, and evaluated a range of beneficial microbial strains, including *Trichoderma* spp., and *Bacillus spp.*, for their antagonistic activity against major grapevine diseases such as downy mildew, powdery mildew and anthracnose and bio-remediation of chemical pesticides. Some of these native microbial isolates viz. *Trichoderma asperelloides* 5R, *Trichoderma afroharzianum* and *Bacillus subtilis* DR39 were developed into effective biocontrol formulations that demonstrated strong disease suppression and pesticide degradation under field conditions, reducing the reliance on chemical fungicides by over 40%. The research also integrated microbial biopesticides into a broader bio-intensive disease management module, emphasizing ecological sustainability and residue-free grape production. Moreover, the use of molecular tools helped in the identification of microbial strains with plant resistance inducing traits and enhanced rhizosphere competence. Field validation trials across different agro-climatic zones confirmed their efficacy and farmer acceptability. This achievement has contributed to sustainable viticulture practices and aligns with national goals for safe food production and environmental health. The bio-intensive strategies developed have been disseminated through demonstration on the farmers' plot and included in Good Agricultural Practices (GAP) guidelines. These technologies were recognized by ICAR. Along with these the work on grapevine epiphytic bacteria were initiated. Three effective epiphytes isolates viz. *Bacillus aerius* strain Cg1, *Bacillus subtilis* strain Cg3 and *Bacillus velezensis* strain Cg2 were identified for effective management of *Colletotrichum gloeosporioides*. Two microbes viz. *Trichoderma asperelloides* 5R and *Bacillus subtilis* DR39 are in the process of CIB-RC registration.

Condition of Vineyard after flood in Sangli region of Maharashtra

Severe infection of rust and downy mildew on vines

Vineyard after adopting the bio-intensive disease management schedule after flood in Sangli region of Maharashtra

Collaborative study with IPL Biologicals on biointensive practices for grape cultivation was initiated in 2019–20, with the objective of evaluating the efficacy of biofertilizers,

biofungicides, and bioinsecticides in enhancing crop health, reducing chemical pesticide use, and ensuring compliance with export residue standards. Key observations of these studies are:

- Even during stress conditions, the biointensive plots exhibited a better vine stand and health as compared to chemical treatment.
- During the study period, particularly in seasons of heavy rainfall, treated plots showed significantly lower incidence of pests and diseases as compared to untreated plots.
- Residue analysis: Treated plots consistently recorded zero detectable pesticide residues, meeting export compliance norms without compromising yield or quality. Even if residue was detected, it was much lower than the MRL of the EU.