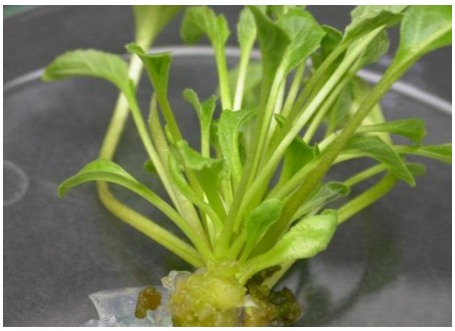
BIOTECHNOLOGY

IIHR uses cutting-edge research technology in molecular biology, genetics, biochemistry, biotechnology and cell biology to improve understanding of biological mechanisms underlying growth regulation in plants and make this knowledge applicable to breeding and production of horticultural crops with a focus on specified research activities like gene discovery, regeneration & Transgenics development, Molecular markers, Marker Assisted Selection (markers to identify male sterility/ insect pest & virus vectors), SSR markers developed using NGS and Functional Genomics, Bioinformatics, Micropropagation techniques etc., have been developed.

Technologies at a Glance:

1. Mass Production of Vesicular Arbuscular Mycorhizzal (VAM) Fungus
2. Micropropagation Technology for the Rapid Multiplication of Triploid Seedless Watermelon
3. Micropropagation of Anthurium
4. Micropropagation of Gerbera
5. Micropropagation of Orchids
6. Micropropagation of Hippeastrum
7. Micropropagation of Tuberose
8. Micropropagation ofpapaya
9. Microbial Strains as Biofertilisers and Biocontrol Agents
10. Micropropagation of Banana (cvsElakki Bale)
11. Development of Chitinase Gene Construct
12. Micropropagation of Male Sterile Lines of Cauliflower
13. Micropropagation of Pointed Gourd
14. Regeneration of Banana cv. NanjungudRasbale (Silk group Rasthali AAB) through Embryogenic Cell Suspension using male flowers
15. Okra SSR Markers
16. Gene Constructs: Antimicrobial peptide mRNA, partial cds
17. Gene Constructs:Defensin LF1 for Zea Mays

Mass Production of Vesicular ArbuscularMycorhizzal (VAM) Fungus • (VAM) are the most common nonpathogenic beneficial fungus associated with crop plants • They help in energy storage and facilitate ready exchange of nutrients • Helps in Better absorption of P and Zn • Helps in protection from Parasitic fungi and nematode • Very useful in horticultural crop nursery production.	
	**Micropropagation Technology for the Rapid Multiplication of Triploid Seedless Watermelon** • Seedlessness in watermelon is a highly value trait for the consumers industry • The tissue culture protocol would allow clonal propagation of the seedless variety • The yield of micropropogated plants is comparable to diploid parental line with similar fruit • size, quality with added advantage of seedlessness
Micropropagation of Anthurium • Technology helps in reducing the cost of production • High rate of proliferation through this method is novelty and also seedlings could be made available in 9 months	



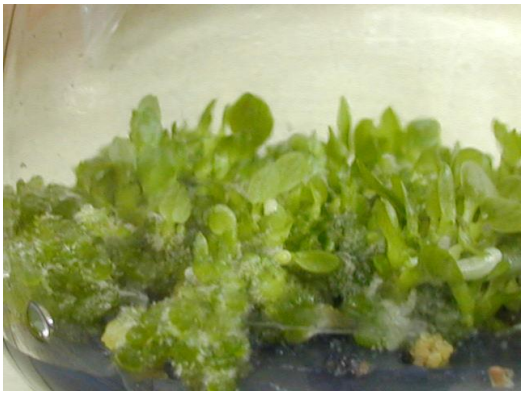
Micropropagation of Gerbera

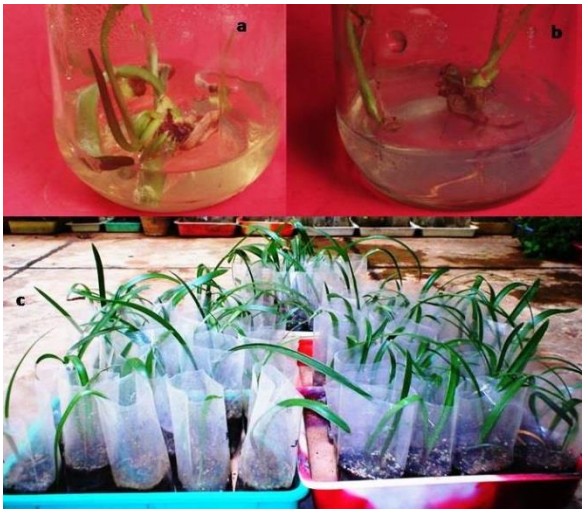
- A tissue-culture based technology for the rapid clonal propagation of elite and new gerbera lines. A commercial multiplication of Gerbera using shoot tip has been standardized.
- Potential for multiplication of millions of plants per year without the occurrence of vitrified shoots.

Micropropagation of Orchids

- A tissue-culture based technology for the rapid clonal propagation of Dendrobium "Queen Sonia. A commercial multiplication of Dendrobium "Queen Sonia using protocorm Like Bodies (PLB's) has been standardized.

- Potential for multiplication millions of plants per year without the occurrence of chimeric plants.





Micropropagation of Hippeastrum

- Protocol for large scale propagation of selected pre-release hybrid of Hippeastrum using bulb scale explants (both single and twin scale) has been standardized.
- Proliferation of shoots could be achieved by subculturing the bulblets generated in the same medium. There was no need of a rooting medium as the same proliferating medium could induce root formation.
- Large scale propagation in a short time (high multiplication rate)

Micropropagation of Tuberose

- Micropropagation of tuberose achieved through axillary shoot propagation. A viable protocol for large scale propagation using scale stem sections which gives a multiplication rate of more than 5 shoots / explant
- Protocol for double type of tuberose (Suvasini) developed for first time

Micropropagation of papaya:

- The technology facilitates rapid clonal multiplication of papaya avoiding the reliance on seed propagation
- Allows selective multiplication of desired sex form – hermaphrodite or female - overcoming the unpredictable segregation with seedlings
- Protocol involves accelerated in vitro multiplication followed by ex vitro rooting combined with hardening thus saving time and other resources
- Offers a multiplication potential of > one million plantlets per year per start culture
- Micropropagated plants behaved identical to the seed plants or superior in respects such as uniformity and dwarf stature
- Protocol optimized for papaya 'Arka Surya' and 'Arka Prabhath' with applicability to other genotypes

Microbial Strains as Biofertilisers and Biocontrol Agents

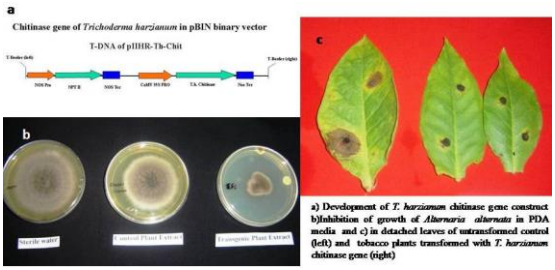
- Efficient nitrogen fixing strains of Azotobacter
  Azospirillum
- Phosphate solubilising strains:
  - *polymixa*
  - *B. subtilis*
  - *B. magaterium*
- Beneficial for maintaining the sustainability of soil.
- Help in nitrogen fixing, solubilising phosphorus, producing hormones and growth promotion
- They are useful in controlling the pathogens

Micropropagation of Banana (cvsElakki Bale)

- *Invitro*Micropropagation of cvsElakki bale &NanjungudRasbale were achieved using suckers as explants
- MS basal medium supplemented with different growth regulators were used
- The regenerated shoots started multiplying from the 2nd subculture and were multiplied upto 5 – 6 cycles
- Multiplication rate was 4- 5 from an individual shoots in both the cultivars

Development of Chitinase Gene Construct

- *Trichodermaharzianum*chitinase gene construct has been developed using the chitinase gene isolated from local isolates of *T. harzianum* for use in plant transformation for fungal resistance.
- chitinase gene isolated through RT-PCR is expressed through constitutive promoter CaMV 35S in the pBIN binary vector
- The efficacy gene was demonstrated *in vitro* through pathogen inhibition studies and *in vivo* through enhanced resistance to blight in tobacco.

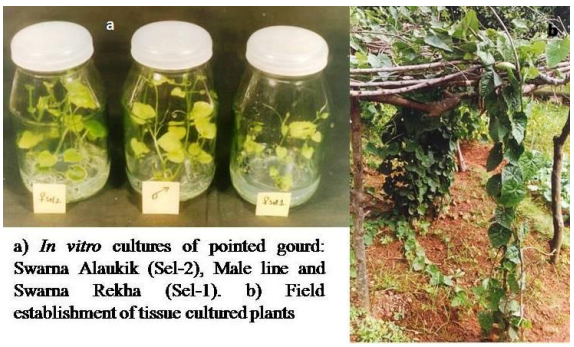


Micropropagation of Male Sterile Lines of Cauliflower

- A protocol for Micropropagationof GMS plants has been developed for two male sterile lines of cauliflower using immature curd & shoot tip explants.
- This technique is useful in identifying Male Sterile lines without markers.

Micropropagation of Pointed Gourd

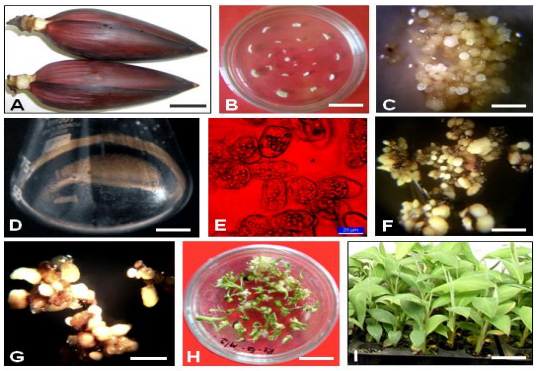
- Protocol for rapid *in vitro* multiplication of two female cultivars (`SwarnaAlaukik' and `SwarnaRekha') with multiplication rate of 6.6 and 4.9x and one male line of pointed gourd (5.3x)has been developed.
- The significant aspect is that a single medium formulation facilitated culture initiation, multiplication and rooting in all the genotypes. Further, the rooted stumps left after the subculture of nodes could be effectively used for *ex vitro* establishment.
- *in vitro* propagation gives a much higher multiplication rate at a shorter duration (25 acclimatised plants per explant in 4 months).



a) *In vitro* cultures of pointed gourd: Swarna Alaukik (Sel-2), Male line and Swarna Rekha (Sel-1). b) Field establishment of tissue cultured plants

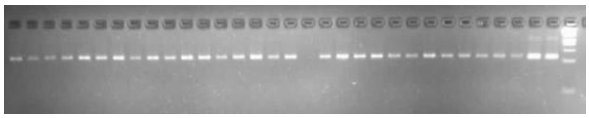
Regeneration of Banana cv. NanjungudRasbale (Silk group Rasthali AAB) through Embryogenic Cell Suspension using male flowers

- Using immature male flowers, embryogenic cell suspension (ECS) has been developed for NanjungudRasbale**(**Silk group Rasthali AAB).
- The ideal calli was identified and on transfer to suitable media to give rise to cell suspensions.
- From one ml of ECS around 1500 plantlets can be formed.
- Plants developed through ECS are found to be superior in fruit size.

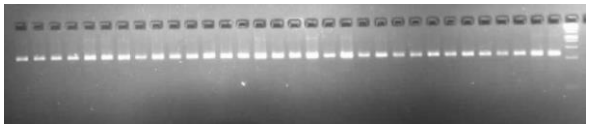


Okra SSR Markers

- SSR markers extensively used in marker assisted breeding program
- For Okra (Abelmoschusesculentus (L.) Moench), till date there were no SSR makers available
- IIHR has successfully developed SSR markers for okra and optimized these SSR markers for DNA amplification useful in varietal identification, DNA finger printing, hybrid purity test & mapping



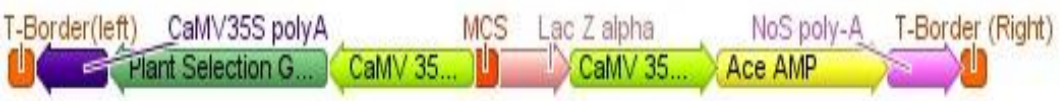
AeKVR-10 Primer screening for 32 Okra genotypes including wild relativ



AeKVR-10 Primer screening for 32 Okra genotypes including wild relativ

Gene Constructs:

A: Antimicrobial peptide mRNA, partial cds



Antimicrobial peptide cloned from onion seeds or from maize leaves have the potential to control pathogen by interfering with the membrane permeability of the pathogen

Gene Constructs:

B: Defensin LF1 froZea Mays