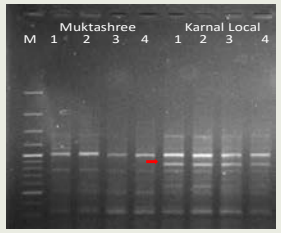
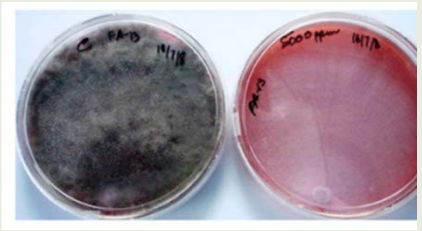
Achievements
Developing Rice Varieties with Reduced Accumulation of Grain Arsenic





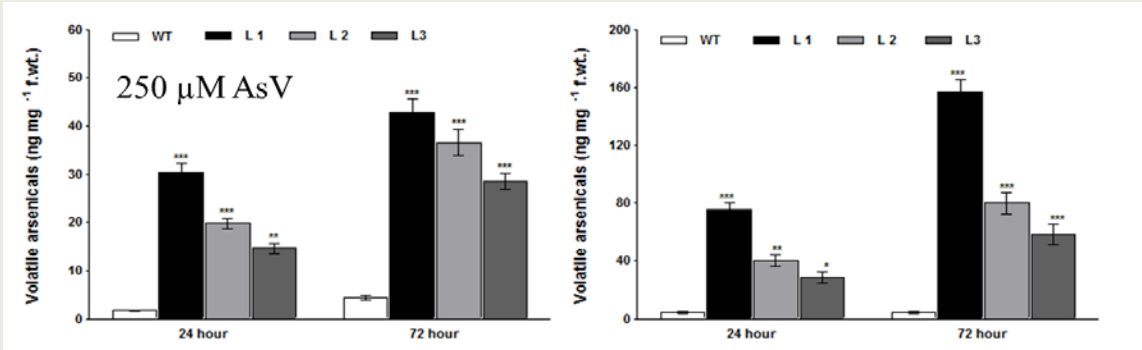
Overexpression of a fungal arsenic methyltransferase, *WaarsM* reduces arsenic accumulation in rice



Westerdykella aurantiaca

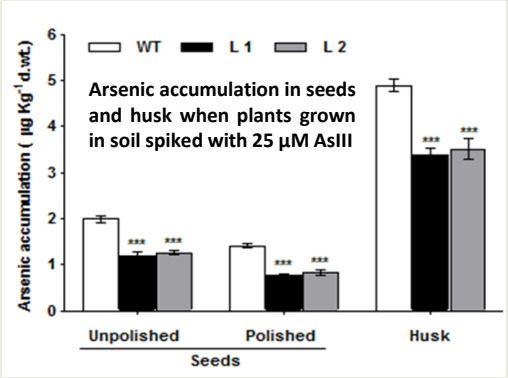
Arsenic methyltransferase gene

Transgenic rice overexpressing *WaarsM*



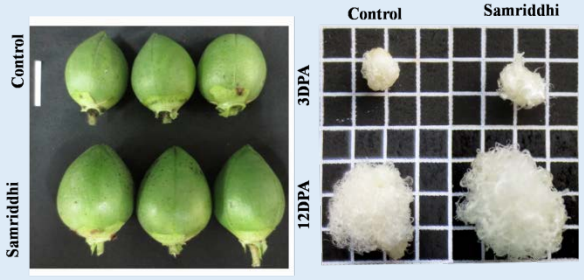
Control Condition

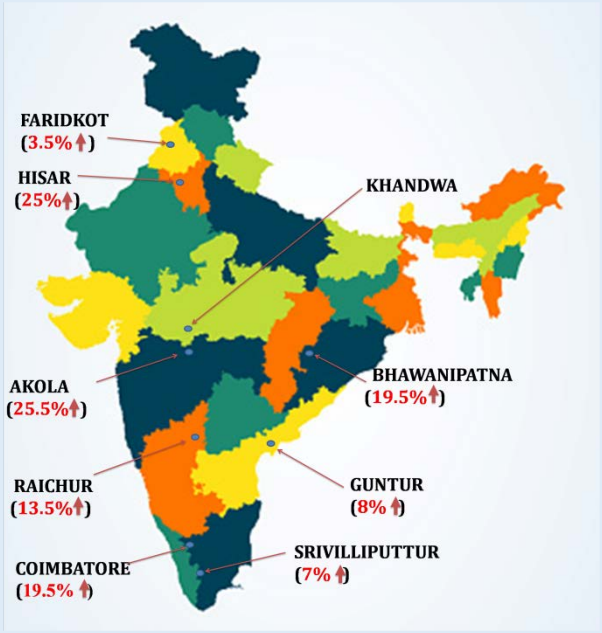
Grown under As irrigated water



Reduced arsenic accumulation in seeds of rice by 50% via volatilization

Achievements
SAMRIDDHI: A Biostimulant for Improving Cotton Yield





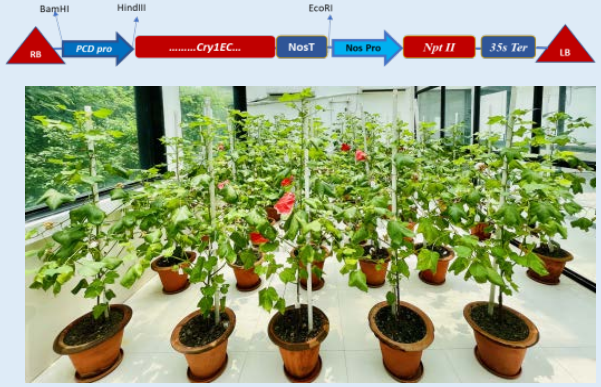
US Patent No.-10111427

OECD Pesticides Programme

Biosafety Assessment of Samriddhi in CSIR-IITR

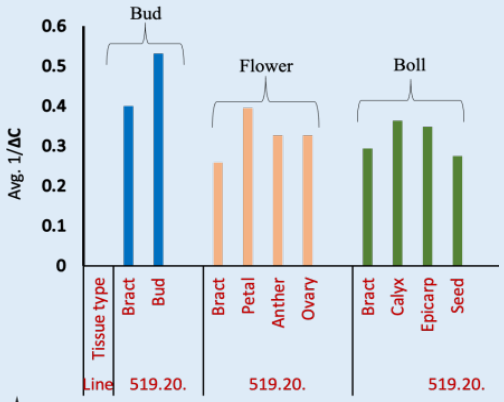
- Samriddhi is an anacardic acid-based biostimulant that improves cotton yield and brings earliness.
- AICRP-Cotton, ICAR, has evaluated technology for two years at eight location field trials and found yield improvement from 3% to 25%.
- The biosafety of anacardic acid has been evaluated at CSIR-IITR, Lucknow, and found safe under CIB guidelines.
- Technology promises Rs. 2000-5000/hectare profit to cotton farmers.
- Earliness will also help farmers with better pest and resource management.

Achievements
Cry1EC GM cotton efficacious to Pink Bollworm (PBW) and Leaf Armyworm

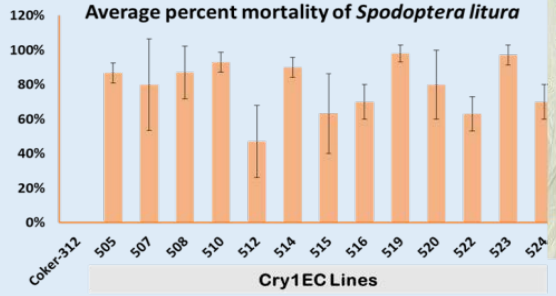


Cry1EC GM cotton

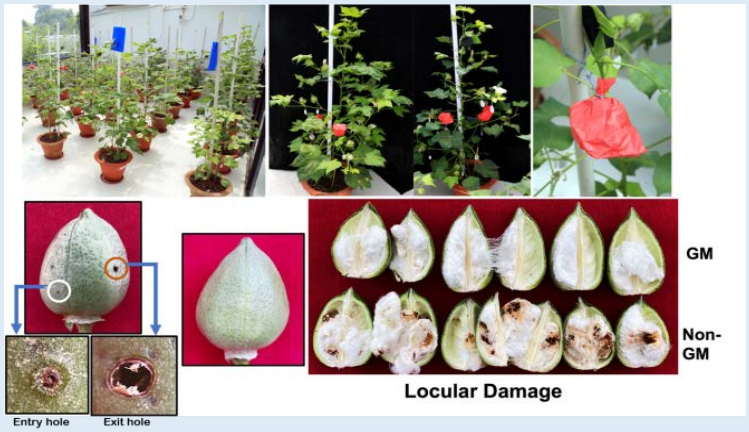
High expression in target tissues



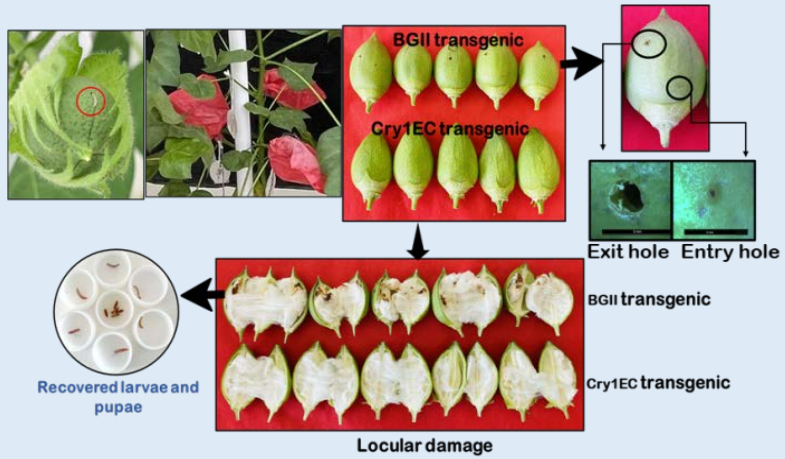
Protection against Leaf Armyworm (*S. litura*)



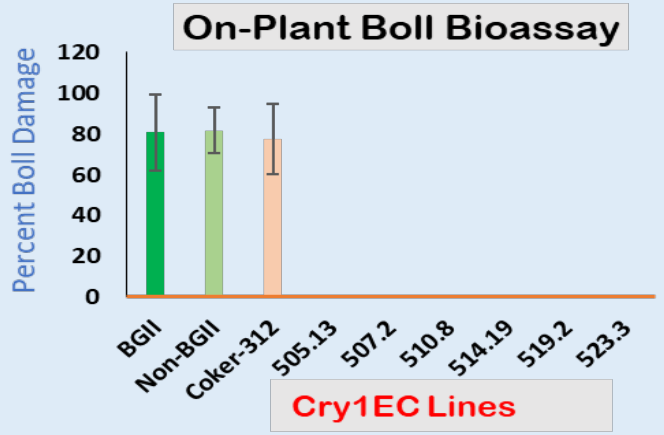
Protection against susceptible PBW



Protection against BGII resistant PBW



All Cry1EC lines showed 0% boll damage



Tomato root architecture modification by genome editing for enhanced yield (Dr. V A Sane/ Dr. A P Sane)

Achievements:

Development of CRISPR-edited lines of *SlWRKY75* and *SlWRKY23* from tomato

Salient features of edited lines

- CRISPR *SlWRKY75* plants (T2 generation) grow faster, have greater leaf area, leaf number, stem diameter and height. They flower earlier.

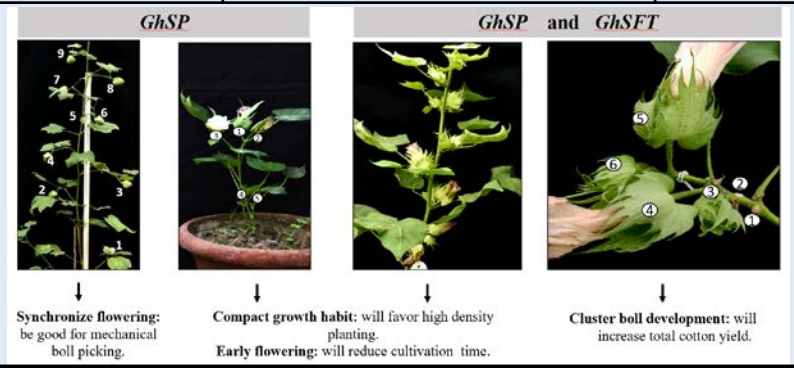
-Life cycle completed about 20 days earlier without yield loss.

- *SlWRKY23* CRISPR lines are taller with broader leaves than control in glasshouse conditions.

-Molecular analysis (in progress) reveals changes in hormone pathways.

Cotton genome editing to develop determinate/semi-determinate sympodial varieties for synchronized fiber yield and quality (Dr Samir V Sawant)

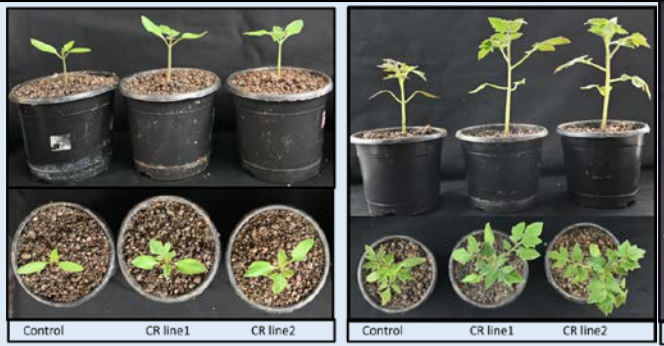
Genes	Function	Key objective
GhSP (already available literature)	Regulate vegetative growth	Modulate shoot architecture
GhSFT (already available literature)	Regulate flowering	Modulate shoot architecture



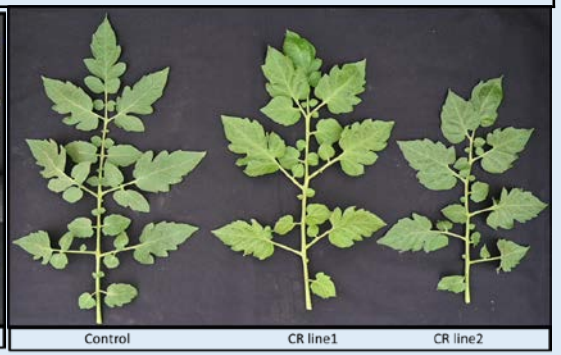
Phenotypes of genome-edited plants

Enhanced post-harvest life of tomato fruit by repressing ripening genes (Dr Praveen C Verma)

Genes	Function
α-mannosidase	Ripening-specific N-glycoprotein modifying enzymes, which produce free N glycans resulting in fruit softening at the time of ripening.
β-D-N-acetylhexosaminidase	
HSP90 chaperone-like gene 1	HSP90 chaperone-like genes upregulated in early ripening stages
HSP90 chaperone-like gene 2	

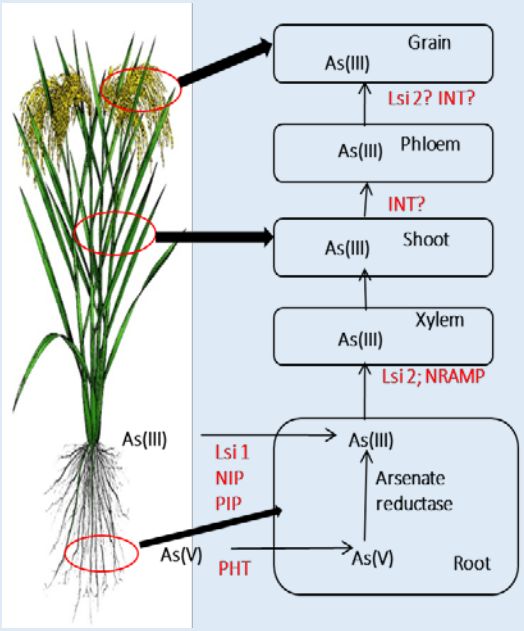


HSP90 chaperone-like gene 2 CRISPR lines showing increased height with more leaf number and leaf area (15 day old and 30 days old plants).

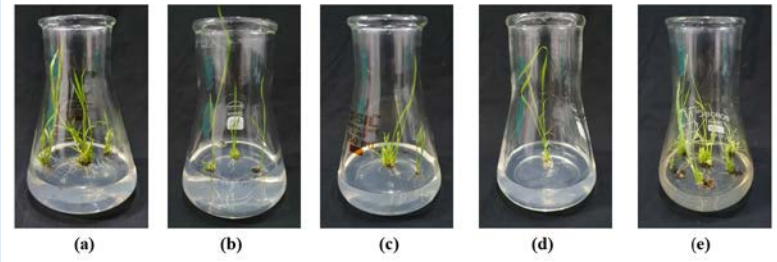


The HSP90 chaperone-like gene 2 CRISPR lines (60 days) show broader leaflets.

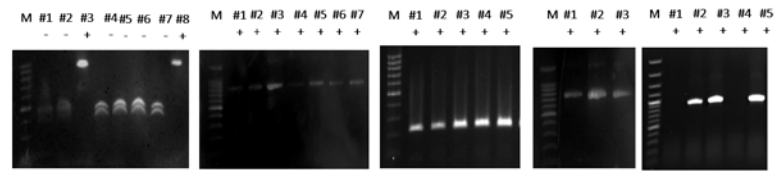
Generating knock-outs of arsenic transporters in rice *(Oryza sativa L.)* by genome editing (Dr Debasis Chakraborty)



Development of CRISPR edited lines of Lsi1, Lsi2, INT and NRAMP transporter genes in rice.



Generated Knock-out Lines of (a) Lsi1 (b) Lsi2 (c) NIP 3;1 (d) NRAMP (e) INT



PCR/RE assay of mutations in the T₀ rice plants of (a) Lsi1 (b) Lsi2 (c) NIP 3;1 (d) NRAMP (e) INT

Achievements
New Aloe vera Variety

Description

The genus *Aloe* is a group of leaf succulent plants belonging to the family Asphodelaceae. It is distributed natively in South Africa, Madagascar, Indian Ocean Islands, Arabian Peninsula, and India.

The availability of larger quantities of high-quality aloe gel can meet the growing demand for natural ingredients in cosmetic, pharmaceutical, and wellness products. The increased gel yield per plant allows for higher productivity without expansion of the cultivated area. This efficiency can reduce the pressure on land and water resources, minimizing the environmental footprint associated with Aloe vera cultivation.

Novelty

The variety '**NBRI-Nihar**' is a clonal selection having approximately 2.5 times high gel yield (20.7 t ha-1) in comparison to Aloe vera (8.6 t ha-1). As per the field observations, '**NBRI-Nihar**' is least affected due to *Alternaria* leaf spot and not affected due to bacterial soft rot caused by *Pectobacterium chrysanthem*i and basal stem rot caused by *Fusarium* sp. in comparison to widely cultivated *Aloe vera*.

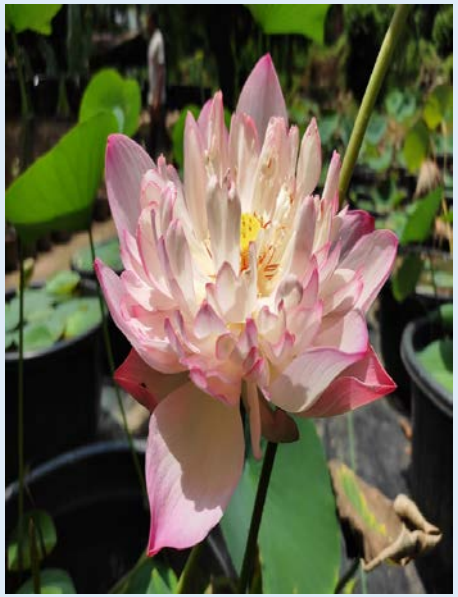
Uses

Utilization of Aloe juice is especially purgative, antiseptic, cosmetic, anthelminthic, and decorative.

'NBRI-Nihar'

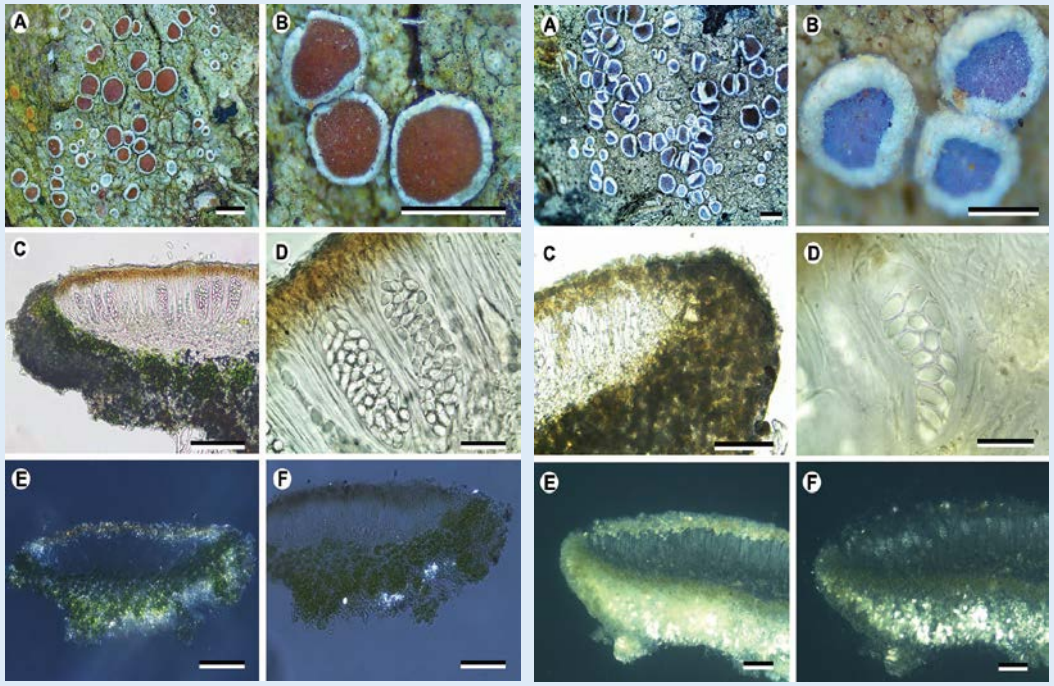
Achievements

A new variety of national flower "lotus" named as "NBRI- Namoh-108" has been developed by the institute which has been dedicated to the nation by Union Science and Technology Minister, Dr. Jitendra Prasad on 19th September 2023. This lotus variety is a new variety of special lotus with 108 petals and blooms longer than other lotus - almost 10 months from March to December. Considering the religious importance of the lotus flower and “the digit 108” this combination gives an important identity to this variety. It’s not just a flower, but a tribute to India’s tradition. This is the first flower whose genome is completely sequenced for its characteristics.



Achievements

- Discovered 48 species of new lichens and plants and reported 88 species for the first from India.
- Surveyed 23 states and 50 protected areas including Chambal, Corbett, Gowind WLS, Khaziranga, Kishanpur, Suhelwa, Pachmarhi.
- Revised 26 taxonomically complex or interesting taxa.
- Published 9 checklists of lichens and plants for different areas.
- Book ‘Plant resources of Uttar Pradesh – A checklist’ which includes complete list of all algae, lichens, bryophytes, pteridophytes, gymnosperms and angiosperms occurring in the state has been published.
- An e-Flora of Uttar Pradesh has been launched. The herbarium LWG of the institute is recognized as a ‘National Repository’ by the National Biodiversity Authority (NBA).
- The digitisation of the herbarium is initiated, and virtual herbarium is launched. In the last 5 years the herbarium is enriched with 15,450 specimens, and a total of 3359 persons visited the herbarium.



New species of lichen - *Lecanora pruinomarginata* R. Adhikari, Ngangom & Nayaka

New species of lichen - *Lecanora jatoliensis* R. Adhikari, Ngangom & Nayaka