

## Agriculture Biotechnology Success stories:

Department's support has led to the development of improved varieties of crop plants through marker assisted backcross breeding. In cereals fourteen varieties have been released (Maize- 2, Rice- 8 and Wheat-4) with enhanced nutritional content, resistance to pathogens and tolerance to abiotic stresses. Of these 14 varieties, 6 have reached farmers field (Maize- 1, Rice- 4 and Wheat-1). In addition, one variety of soybean and two rose varieties have been released.

Crop	Variety developed	Trait
Maize	HQPM1 (improved) and Vivek QPM 9	Pro-vitamin A rich variety
	Pusa HM4 improved, Pusa HM9 improved, Pusa HM8 improved	High lysine and tryptophan
Rice	Pusa Basmati 1728, Pusa Basmati 1718, CARI Dhan 6, CARI Dhan 7	Bacterial blight resistant
	Improved White Ponni.	Drought tolerant and heat resistant
	Mushk Budji (improved)	Blast resistant variety
	HPR2143 (improved)	Blast and bacterial leaf blight resistant
	DRR Dhan -50	Two-in-one flood and drought tolerant
	Swarna- sub 1, IR64- sub 1, Samba-Mahsuri-sub 1, Ranjit-Sub1, Bahadur-Sub1 & CR_Dhan 802	Submergence tolerance variety
Wheat	Unnat PBW343 and Unnat 347	Resistance against leaf and stripe rust
	HI 8737 -Pusa Anmol, HI 8759 -Pusa Tejas	High Yield and quality
Pearl millet	TNBG 0608053 & TNBG 0608207	High grain yield and high beta carotene content
Soybean	CO3 (Soybean I) & JSS 35 (Soybean M) Improved	Phytophthora and Powdery mildew resistance
	NRC127	Kunitz trypsin inhibitor free
Tomato	Punjab Chuhhara (improved)	Leaf curl virus, late blight & root knot nematode (Mi) resistance
Grape	H90.24 and H98.23	Downy mildew resistance with bold berries and loose bunches
Rose	Pusa Mahak	Fragrant
	Pusa Aaradhana	Thornless



**Wheat:** Unnat PBW343



**Rice:** Pusa Basmati 1728, bacterial blight resistant



**Rice:** Improved White Ponni, drought tolerant and heat resistant



**Rice:** CARI Dhan 6 resistant to Bacterial blight



**Rice:** Bahadur-Sub1



**Rice:** Ranjeet-Sub1



**Maize:** HQPM1 (improved), Pro-vitamin A rich variety



**Soybean:** CO 3(Soybean I)& JSS 35 (Soybean M) Improved.



**Soybean:** NRC127



**Tomato:** Punjab Chuhhara (improved) resistant to Leaf curl virus, late blight & root knot nematode (Mi)



**Pusa Mahak**



**Pusa Aaradhana**



**Grape lines** H90.24 and H98.23 resistant to Downy mildew with bold berries and loose bunches



Nutritionally improved cauliflower using 'Or' gene introgression for enhancing  $\beta$ -carotene



A high Provitamin A (beta-carotenoid) in tomato line NBPGR 72

### Impact of the Varieties released:

Rice varieties which have reached farmers field include Pusa Basmati 1728, Pusa Basmati 1718, CARI Dhan 6 and CARI Dhan7. Basmati varieties Pusa Basmati 1728 and Pusa Basmati 1718 are resistant to bacterial blight and currently being cultivated in approximately **2 lakhs hectares** in Punjab, Haryana, West UP comprising 10% of Basmati grown area. 15 licenses to seed companies have given for seed production of these varieties. Samba Mahsuri rice variety resistant to bacterial blight developed through Marker Assisted Selection and backcross breeding is being cultivated on **90,000 ha** in Tamilnadu, Karnataka, Telangana and Andhra Pradesh.

Wheat variety Unnat PBW 347 (PBW 727) which is resistant to stripe and leaf rust is the 3<sup>rd</sup> most popular variety in Punjab and grown in **3.09 lakhs hectare**.

Maize (HQPM1) pro-vitamin A rich hybrid with 5 times more pro-vitamin A than normal maize occupies **1.70% area** under hybrid cultivation.

Soybean variety NRC 127 developed through financial support by the Department has been commercialized through company.

### Wheat Genome Sequencing

Department of Biotechnology partnered in The International Wheat Genome Sequencing Consortium (IWGSC) and supported the Indian researchers to achieve the most challenging task of decoding of complex wheat genome. The genome of bread wheat variety ‘Chinese Spring’ was published in the international journal Science. An insurmountable task of deciphering Bread wheat



genome which is hexaploid and five times larger than the human genome and 40 times larger than rice was realised. Indian effort in decoding the wheat genome by a team of eighteen scientists was spearheaded by Dr. Kuldeep Singh at Punjab Agricultural University Ludhiana (Now Director, ICAR-National Bureau of Plant Genetic Resources), Professor Nagendra Singh at ICAR-National Research Centre on Plant Biotechnology, New Delhi and Professor JP Khurana at the University of Delhi South Campus.

With the reference genome sequence now completed, breeders have at their disposal new tools to address these challenges. They will be able to identify more rapidly

genes and regulatory elements underlying complex agronomic traits such as yield, grain quality, resistance to fungal diseases, and tolerance to abiotic stress and produce hardier wheat varieties.