Preamble

The State Level Biotechnology Centre at Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, was established to integrate biotechnological interventions with conventional plant breeding through advanced biotechnological interventions, creating a specialized hub for advanced agricultural biotechnology research and education.

Here is a chronological overview of how the Centre was established and expanded based on the provided text:

Year / Period		Milestone Event
1992		An independent Plant Tissue Culture Laboratory was established, funded by the Statutory Development Board for the Rest of Maharashtra
2001		The Biotechnology Centre is officially formed by consolidating resources and personnel under a single umbrella.
2001–2003		Financial assistance from the University's revenue receipts supports the early activities of the Centre.
2003–2004		Following recommendations from a committee chaired by Dr. M. S. Swaminathan, the Government of Maharashtra provides funds for the establishment of a Biotechnology Research Centre at the University with an independent building, scientific instruments, and furniture to facilitate research in advanced areas of biotechnology.
2006		The 67th meeting Statutory Committee, of MCAER, Pune, recommended starting a postgraduate programme without extra staff or grants.

2007–2008		The M.Sc. (Agricultural Biotechnology) degree programme officially launches with an initial annual intake of eight students
2023		Degree nomenclature renamed as M.Sc. (Agri.) (Molecular Biology and Biotechnology)

The main objective of the M.Sc. programme is to build a skilled workforce in Agricultural Biotechnology to meet the needs of the State and support research activities in State Agricultural Universities (SAUs), semi-government organizations, and the public and private sectors.

The Centre conducts comprehensive basic and applied biotechnological research, focusing on transgenic development, marker-assisted selection (MAS) for disease, pest, and drought tolerance, and quantitative trait locus (QTL) mapping to identify critical stress-response genes in crop plants. These biotechnological advancements have enabled researchers to pinpoint precise genes and QTLs, allowing for the discovery and strategic utilization of favorable alleles. Notably, gene expression profiling has been conducted in sugarcane to evaluate salinity and drought tolerance mechanisms. Molecular markers are routinely deployed for DNA fingerprinting, genetic diversity analysis, and molecular tagging and marker–trait association studies across diverse crops.

In targeted crop improvement, Marker-Assisted Selection (MAS) has significantly accelerated the development and official release of resilient, high-yielding crop varieties. A major milestone includes the development of KDS 1188, a Kunitz trypsin inhibitor-free soybean variety that was officially released and notified at the National Level in 2026. Additionally, the advanced-generation blast-resistant rice variety, Phule Super Radha (RDN MABC 5), was successfully released during the Joint AGRESCO 2026.

The Centre continues to expand its molecular breeding pipeline. In soybean research, molecular markers have been successfully identified for critical traits such as rust resistance, long juvenile periods, seed longevity, pod shattering resistance, and specific quality parameters including Kunitz trypsin inhibitor, lipoxygenase, and oleic acid content. Utilizing these markers, the Centre has developed drought-tolerant and early-maturing soybean lines that have now advanced to later-stage evaluations. Concurrently, MAS interventions have been effectively employed to develop drought-tolerant chickpea lines, which have already undergone rigorous field evaluations.

Complementing these approaches, the Centre has achieved significant breakthroughs in tissue culture technology. It has standardized high-efficiency micropropagation protocols for bamboo and banana, and developed a premium, fast-growing Eucalyptus clone named

'Yashwant' (RHE 99-4) for commercial cultivation in Maharashtra by selecting superior somaclonal variants from the SRY-16 lineage. Furthermore, complete *in vitro* regeneration systems have been established for valuable medicinal, aromatic, and economically important field and horticultural crops. Advanced embryo rescue techniques have been deployed to successfully recover unique hybrids in cotton and jujuba from wide interspecific crosses, effectively bypassing natural cross-incompatibility barriers.

Expanding its scope into plant protection and microbiology, the Centre has formulated key agricultural recommendations for the molecular diagnostics targeting bacterial blight of pomegranate and dry root rot of chickpea. Alongside these diagnostic advancements, the Centre conducts extensive diagnostic /divergence studies on various other critical plant pathogens as well as agriculturally beneficial microbes to support sustainable crop health and soil productivity.

State Level Biotechnology Centre



Faculty

Name	Designation	Specialization	Email	Remark
Dr. V. P. Chimote	Professor and Officer Incharge SLBTC, MPKV, Rahuri	Molecular Biology & Plant /Microbial Biotechnology	Email: vpchimote@gmail.com ; vivekchimote@rediffmail.com Cell: 9423467595/ 9689901911	Pooled from PGI, MPKV, Rahuri
Dr. D. N. Damse	Assistant Professor of Agril Botany, MPKV, Rahuri	Agricultural Biotechnology/ Genetics & Plant Breeding	Email: dipakdamse4346@gmail.com Cell: 7588611032/ 9923242578	Additional charge with regular posting as Academic Incharge at department of Agril, Botany

Academic Programmes

M.Sc. (Agri.) in (Molecular Biology and Biotechnology)
Capacity of students: 8/Year
Year of start: 2023
Prior nomenclature: M.Sc. (Agril. Biotech.) from 2007 till 2022

Course Layout

M.Sc. (Molecular Biology and Biotechnology)

Sr. No.	Subject	Minimum credit(s)
1.	Major	21
2.	Minor	09
3.	Supporting	06
4.	Seminar	01
5.	PGS (Non-Credit Courses)	05
6.	Research	10
	Total Credits	**52**

A) Major Subjects (Min. 21 credits)

Sr. No.	Course No.	Course Title	Credits
1.	MBB 501	Principles of Biotechnology	3(3+0)
2.	MBB 502	Fundamentals of Molecular Biology	3(3+0)
3.	MBB 503	Molecular Cell Biology	3(3+0)
4.	MBB 504	Techniques in Molecular Biology-I	3(0+3)
5.	MBB 505	Omics and Systems Biology	3(2+1)
6.	MBB 506	Plant Genetic Engineering	3(3+0)
7.	MBB 509	Plant Tissue Culture	3(2+1)
			21(16+5)

B) Minor Subjects (Min. 09 credits)

Sr. No.	Course No.	Course Title	Credits
1.	MICRO 504	Microbial Genetics	3(2+1)
2.	GPB 506	Molecular Breeding and Bioinformatics	3(2+1)
3.	BIOCHEM 507	Plant Biochemistry	3(2+1)

			9(6+3)

C) Supporting Subjects (Min. 06 credits)

Sr. No.	Course No.	Course Title	Credits
1.	PP 504	Physiological and Molecular Mechanisms of Mineral Nutrient Acquisition and their Functions	3(2+1)
2.	STAT 522	Data Analysis Using Statistical Packages	3(2+1)
			6(4+2)

D) Seminar (01 credit)

Sr. No.	Course No.	Course Title	Credits
1.	MBB 591	Masters Seminar	1(0+1)
			1(0+1)

E) Masters Research (10 credits)

Sr. No.	Course No.	Course Title	Credits
1.	MBB 599	Masters Research Work	10(0+10)
			10(0+10)

F) Non-Credit Compulsory Courses* (05 credits)

Sr. No.	Course No.	Course Title	Credits
1.	PGS 501	Library and Information Services	1(0+1)
2.	PGS 502	Technical Writing and Communications Skills	1(0+1)
3.	PGS 503	Intellectual Property and its Management in Agriculture	1(1+0)
4.	PGS 504	Basic Concepts in Laboratory Techniques	1(0+1)
5.	PGS 505	Agricultural Research, Research Ethics and Rural Development Programmes	1(1+0)
			5(2+3)

List of equipments available at State Level Biotech. Centre

Sr. No.	Name of Equipment:
1	Deep Freezer (-80)
2	Deep Freezer (-40)
3	Deep Freezer (-20)
4	Refrigerator
5	Thermal cycler
6	Palm PCR machine
7	RT-PCR
8	Generator (35 KVA)
9	Mini and Maxi electrophoresis system including power supply
10	Electronic balance
11	Ice flaking system
12	Liquid nitrogen container with dispenser
13	High speed refrigerated centrifuge
14	Table top centrifuge
15	Elisa reader and Washer
16	Nano drop spectrophotometer
17	Spectrophotometer
18	Laminar Air flow
19	Autoclave
20	Rotary Shaker
21	Micropipettes
22	DNA concentrator
23	Hot plate magnetic stirrer
24	Vortex
25	Micro plate shaker
26	Water bath
27	UV transilluminator
28	Gel documentation system
29	Water purification system
30	Flow cytometer
31	Microarray
32	DNA sequencer (4 capillary)
33	Fume Hood

Thesis submitted by Agril. Biotech. /Mol. Biol. Biotech students till date

Sr. No.	Student Name	Reg. / No.	Guide Name	Research Title / Topic
1	Mr. Wagh Dipak S	07/231	Dr. AA Kale	Molecular analyses of sugarcane F1s, their parents and some varieties in relation to salt stress tolerance
2	Mr. Salunke Dnyaneshwar S	07/232	Dr. AS Jadhav	Molecular and biochemical analysis in selected genotypes of tomato (*Lycopersicon esculentum* Mill.) for β-carotene.
3	Mr. Pawar Bhausaheb D	07/233	Dr. AS Jadhav	Development of an efficient Agrobacterium mediated transformation system for tomato (*Lycopersicon esculentum* Mill.)
4	Mr. Kale Prashant Bhaskar	07/234	Dr. VP Chimote	Characterization of microbial flora found in oily spot disease in pomegranate (*Punica granatum* L.)
5	Miss Sadaphal Shubhangi V	07/235	Dr. SC Patil	Assessment of molecular diversity in custard apple (*Annona squamosa*)
6	Mr. Kamble Varun A	07/237	Dr. AA Kale	Molecular analysis of cytoplasmic male sterility in pearl millet (*Pennisetum glaucum*)
7	Mr. Koskewar Sandeep U	08/251	Dr. SV Pawar	Micropropagation studies in Sarpagandha (*Rauvolfia serpentina* L.)
8	Mr. Borse Nilesh B	08/252	Dr. VP Chimote	Stability of micropropagated Musa acuminata cv. Grande Naine: A molecular assessment
9	Mr. Palan Bhavesh V	08/253	Dr. AA Kale	Molecular analysis of cytoplasmic male sterile system of sorghum
10	Miss Thokale Suwarna J	08/254	Dr. SC Patil	Micropropagation studies in Ashwagandha (*Withania somnifera*)
11	Miss Takale Vidya V	08/255	Dr. AS Jadhav	Development of Bt-pigeon pea by Agrobacterium mediated transformation
12	Mr. Newaskar Ganesh S	08/256	Dr. VP Chimote	Molecular Characterization of cotton parent progeny combination (*Gossypium arboreum* x *Gossypium anomalum*) x *Gossypium hirsutum* differing for fiber traits
13	Mr. Markad Nanasaheb R.	08/257	Dr. AA Kale	Identification of Molecular Marker/s Associated with Salt tolerance in Sugarcane
14	Miss Gulve Dipali P.	08/258	Dr. AS Jadhav	Introduction and expression of *CryAbc* gene construct into tomato
15	Mr. Bhat Sudarshan V.	09/277	Dr. AS Jadhav	Regeneration study in brinjal (*Solanum melongena*)
16	Miss Ghumatkar Reshma M	09/278	Dr. AA Kale	Molecular Characterization of sex in Simarouba glauca D.C. using RAPD and ISSR markers
17	Mr. Gosavi Gokul U	09/279	Dr. AS Jadhav	Assessment of heat shock proteins, biochemical constituents and molecular characterization in sorghum in relation to Heat Shock response
18	Miss Hinge Pushpalata N	09/281	Dr. AA Kale	Assessment of heat shock proteins, biochemical constituents and molecular characterization in sorghum in relation to drought response
19	Mr. Dhage Shishir S	09/283	Dr. VP Chimote	Regeneration studies in Fig (*Ficus carica*)
20	Mr. Deshmukh Krishna S.	10/328	Dr. AA Kale	Construction of SCAR marker for salinity tolerance in sugarcane
21	Mr. Panpatil Amol	10/331	Dr. VP	Characterization of gene encoding enzymes

	U.		Chimote	involved in reactive oxygen species tolerance during drought stress in sorghum
22	Miss Ujjainkar Nayana R	10/332	Dr. VP Chimote	Characterization of gene encoding desiccation tolerance protein during drought stress in sorghum
23	Miss Mahagaonkar Pooja N	10/333	Dr. AS Jadhav	Molecular analysis of sterile, maintainer, restorer and hybrid lines of Gossypium sp.
24	Mr. Rayate Shriram J	011/307	Dr. PL Kulwal	Quantitative trait loci mapping for yield and yield contributing traits in chickpea (*Cicer arietinum* L.)
25	Mr. Rahane Vijay B	011/308	Dr. SV Pawar	In vitro studies in Malkangoni (*Celastrus paniculatus* Wild) an endangered medicinal plant
26	Mr. Jadhav Amol A	011/309	Dr. PL Kulwal	Marker-trait association study for grain protein content in chickpea
27	Miss Bande Rashmi B	011/310	Dr. AS Jadhav	Characterization of genes involved during drought stress in pearl millet
28	Miss Chaudhari Priya G (Patel)	011/312	Dr. AS Jadhav	*cry1Aabc* gene expression study in T2 population of tomato
29	Mr. Band Naresh S	011/313	Dr. AA Kale	SSR and ISSR based DNA fingerprinting and assessment of quality parameters of the rice landraces collected from plain and Western Ghat Zone
30	Mr. Acharya Bhaiyasaheb Lakshman	12/395	Dr. SV Pawar	Micropropagation studies in Stevia (*Stevia rebaudiana*)
31	Miss Hipparkar Maya	12/298	Dr. AS Jadhav	*cry1Aabc* gene expression study in T3 population of tomato
32	Miss Shingare Rohini B	12/301	Dr. VP Chimote	Molecular characterization of candidate genes controlling seed coat colour in soybean
33	Mr. Mokate Yogesh S	12/299	Dr. VP Chimote	Molecular diversity analysis in Soybean (*Glycine max* L. Merill)
34	Miss. Borse Vaishali Vasantrao	13/192	Dr. PL Kulwal	Marker based diversity in germplasm showing variation for seed weight in chickpea
35	Miss. Dere Supriya Sitaram	13/193	Dr. SV Pawar	Micropropogation studies in bedki (*Gymnema sylvestre* R.Br.) a rare medicinal plant.
36	Miss. Patil Nilam Prakashrao	13/194	Dr. VP Chimote	Development of molecular diagnosis technique for *Xanthomonas axonopodis* pv. puniceae
37	Miss. Pawar Kalyani R.	13/195	Dr. VP Chimote	Characterization of T2 population of transgenic tomato having antisense banana *ACC oxidase* gene
38	Mr. Nalge Swapnil Sunil	13/196	Dr. AS Jadhav	DNA fingerprinting of the soybean cultivars
39	Mr. Vyawahare Tushar Gajanan	13/197	Dr. AS Jadhav	Molecular marker study in the groundnut genotypes showing rust resistance
40	Mr. Kamble Abhijit Bhimrao	13/198	Dr. AA Kale	Validation of SCAR marker for salinity stress in sugarcane germplasm
41	Mr. Muthe Santosh Tukaram	13/199	Dr. PL Kulwal	Validation of known marker(s) linked with the gene Lr34 conferring resistance against leaf rust in wheat.
42	Miss Chavan Pooja Narayanrao	14/314	Dr. PL Kulwal	Marker assisted foreground selection of backcross genotypes for leaf rust resistance in wheat
43	Miss Chavan Priti Santosh	14/315	Dr. AS Jadhav	Genetic transformation for development of Bt-rice
44	Miss Barate Pallavi	14/316	Dr. VP	Evaluation of molecular markers for pod shattering

	L.		Chimote	in soybean
45	Mr. Shaikh Saddamhussain A.	14/318	Dr. AA Kale	Expression of salinity tolerant genes in sugarcane
46	Miss Dongare Manjushri D.	15/310	Dr. VP Chimote	Molecular Characterization of maturity loci in soybean
47	Miss Shinde Archana Vishwanath	15/311	Dr. PL Kulwal	Molecular marker based characterization of chickpea genotypes for wilt and collar rot resistance
48	Miss Salve Snehal Gorakh	15/312	Dr. SV Pawar	Molecular characterization of rabi sorghum genotypes using SSR markers
49	Mr. Gavhane Dnyaneshwar B	15/315	Dr. PL Kulwal	Validation of markers for blast resistance in rice.
50	Mr. Kalanar Shivaji Kisan	15/316	Dr. AS Jadhav	Validation of novel markers for rust resistance in groundnut (*Arachis hypogaea*)
51	Mr. Shirsat Dhananjay Vitthal	15/317	Dr. AA Kale	Gene expression profile of sugarcane (*Saccharum officinarum*) under drought stress
52	Miss Dudhabate Jayashri Goroba	16/287	Dr. PL Kulwal	QTL analysis for blast resistance in rice
53	Miss Kalunge Sonali Dattaraya	16/288	Dr. VP Chimote	Molecular characterization of genes imparting seed longevity in soybean
54	Mr. Prasad Dilip Shelke	016/291	Dr. AA Kale	Gene expression profiling in sugarcane under salinity stress conditions
55	Mr. Tajne Sachin Arunrao	016/293	Dr. AS Jadhav	Isolation & cloning of antimicrobial gene from *Withania somnifera*
56	Mr. More Janardhan Dattatraya	16/294	Dr. AA Kale	Molecular and biochemical characterization of endophytic bacteria isolated from sugarcane in response to salinity
57	Miss Inamdar Shaheen Badshah	017/305	Dr. PL Kulwal	Candidate gene analysis for salinity stress in chickpea
58	Miss Patil Priyanka Dnyanoba	017/306	Dr. AS Jadhav	Isolation and characterization of antimicrobial gene from onion (*Allium cepa*)
59	Miss Rajurkar Shweta Mukindrao	17/307	Dr. VP Chimote	Molecular characterization of genes conferring seed longevity in soybean
60	Mr. Mule Krushna Dnyandev	17/308	Dr. AA Kale	Effect of polyamine on gene expression to alleviate drought tolerance in sugarcane
61	Mr. Patil Akash Ravindra	17/310	Dr. SV Pawar	Micropropagation studies in Guggul (*Commiphora wightii*)
62	Mr. Netawane Akshay Ladesh	17/312	Dr. VP Chimote	Molecular characterization of genes conferring seed longevity in soybean
63	Miss. Mote Gopika Krishna	18/286	Dr. AS Jadhav	Screening for antimicrobial gene sequences from medicinal plants (Ashwagandha, Kartoli, Tulas, Korphad)
64	Miss. Mawalkar Mugdha Shyam	18/287	Dr. PL Kulwal	Characterization of gene responsible for aroma in landraces and improved varieties of rice (*Oryza sativa*)
65	Miss. Savalkar Ashwini Dilip	18/288	Dr. PL Kulwal	Molecular characterization of safflower by using ISSR marker
66	Miss. Gore Goroba Dagadu	18/291	Dr. SV Pawar	Genetic analysis of leaf blast resistant introgressed lines of rice (*Oryza sativa* L.)
67	Mr. Vasekar Akshay Anil	18/292	Dr. VP Chimote	Molecular tagging of photoperiod insensitivity and long juvenility in soybean
68	Mr. Gawali Anand	19/296	Dr. VP	Identification of molecular markers for high oleic

	Hanmant		Chimote	acid in soybean
69	Mr. Parwate Ashik Rupchand	19/295	Dr. SV Pawar	Micropropagation studies in Vekhand (*Acorus calamus*)
70	Miss. Sawant Amruta Shankar	19/289	Dr. AA Kale	Molecular analysis of sugarcane under water stress condition at different growth stages with the application of putrescine
71	Miss. Yenare Snehal Appasaheb	19/291	Dr. AS Jadhav	Molecular and biochemical studies of antimicrobial properties of turmeric (*Curcuma longa*).
72	Mr. Bhandekar Munna Chandrabhan	19/294	Dr. VP Chimote	Characterization of advanced generations of soybean for Kunitz trypsin inhibitor free trait
73	Mr. Sakhare Vaibhavkumar Vashishta	19/292	Dr. PL Kulwal	Molecular marker based characterization of different isolates of dry root rot in chickpea (*Cicer arietinum* L.)
74	Miss Nikita Kailas Mhaske	20/291	Dr. VP Chimote	Molecular characterization of candidate genes associated with seed longevity in soybean
75	Miss Pragati Ramesh More	20/292	Dr. AR Aher	Molecular characterization in groundnut by using ISSR markers.
76	Miss Monika Dharmendra Andhale	20/293	Dr. AA Kale	Molecular characterization of sucrose phosphate synthase gene from sugarcane
77	Miss Vishakha Rahul Bhosale	20/294	Dr. PL Kulwal	Molecular marker based characterization of chickpea genotypes differing for dry root rot resistance
78	Mr. Memane Akshay Namdev	20/295	Dr. PL Kulwal	Characterization of genes responsible for amylose content in rice (*Oryza sativa*)
79	Mr. Wagh Yogesh Gangaram	20/297	Dr. AR Aher	Micropropagation studies in Bael (*Aegle marmelos*)
80	Mr. Sahane Rutik Dnyaneshwar	20/298	Dr. AA Kale	Molecular evaluation of genetic divergence for differential sucrose accumulation in sugarcane.
81	Mr. Sanket Arunrao Ghumde	21/295	Dr. AA Kale	Molecular diagnosis of brown rust and evaluation by candidate gene markers for its resistance in sugarcane
82	Miss. Vrushali Kishor Kathe	21/293	Dr. VP Chimote	Molecular confirmation of soybean segregants for dysfunctional Kunitz Trypsin Inhibitor & Lipoxygenase-2 genes
83	Miss. Gayatri Madhukar Tale	21/291	Dr. PL Kulwal	Identification of cross combination of genotypes for improving amylose content in Indrayani variety of rice using molecular markers
84	Mr. Pruthviraj Devwami Sidam	21/297	Dr. VP Chimote	Molecular characterization of soybean (*Glycine max*) with seed longevity linked markers
85	Miss. Priyanka Shripati Ghadge	21/292	Dr. AA Kale	Molecular and biochemical characterization of the invertase inhibitor in sugarcane
86	Miss. Priyanka Ravindra Sangle	21/294	Dr. PL Kulwal	Marker-Assisted Evaluation of backcross derived lines for drought tolerance in chickpea
87	Miss. Priya Bhausaheb Gawali	21/290	Dr. AR Aher	Molecular characterization with Glutenin gene (*Glu-A1*) specific markers in emmer wheat (Triticum dicoccum)
88	Miss. Zambare Aditee Avinash	22/283	Dr. AR Aher	Establishment of efficient in vitro regeneration protocol of soybean (*Glycine max* L.)
89	Mr. Balpande Sanket Ramdasji	22/285	Dr. PL Kulwal	Screening of segregating lines for amylose content in rice using molecular markers
90	Mr. Panzade Shyam Atmaram	22/287	Dr. VP Chimote	Molecular evaluation of soybean genotypes and segregants for null kti and lox2 alleles

91	Mr. Nikam Shubham Shankarrao	22/288	Dr. VP Chimote	Molecular evaluation of genes contributing for drought stress tolerance in soybean.
92	Mr. Mahalle Rushikesh Mohan	22/289	Dr. AA Kale	Molecular mechanisms underlying in biostimulant mediated drought stress tolerance in sugarcane
93	Miss. Chaudhari Gauri Dhananjay	23/325	Dr. AR Aher	De novo regeneration studies of Opuntia (*Opuntia ficus* indica)
94	Miss. Kolhe Rachana Santosh	23/326	Dr. PL Kulwal	Characterization of races of chickpea wilt in Maharashtra
95	Miss. Patil Sonal Bhausaheb	23/327	Dr. PL Kulwal	Genetic and molecular diversity study for grain quality traits in rice (*Oryza sativa* L.)
96	Mr. Deokate Omkar Rajkumar	23/328	Dr. AA Kale	Studies on expression analysis of DREB and IGS gene in sugarcane under water stress condition with semi-quantitative RT-PCR.
97	Mr. Karade Omkar Jivandas	23/331	Dr. AA Kale	Molecular evaluation of brown spot (*Cercospora longipes*) disease resistance by candidate gene markers in sugarcane
98	Miss. Kunjir Dipti Bhagwan	23/332	Dr. VP Chimote	Molecular analysis of divergence in genes contributing toward drought stress tolerance in soybean
99	Miss. Serena Jasmine J.	23/333	Dr. AR Aher	Molecular diversity study for studies of Opuntia (*Opuntia ficus* indica)
100	Miss. Kale Vaishnavi Chandrakant	24/336	Dr. VP Chimote	Exploration of novel SSR markers for screening of segregating population for quality traits (*KTi* and *Lox2*) in soybean)
101	Miss. Pawade Shruti Surendra	24/337	Dr. VP Chimote	Exploration of novel SSR markers in advanced soybean lines for Kunitz trypsin inhibitor though molecular and biochemical approaches
102	Miss. Jadhao Sneha Vinayak	24/338	Dr. AR Aher	De novo regeneration studies in Madhunashini/ Bedki (*Gymnema sylvestre*)
103	Mr. Zaware Prathamesh Ramesh	24/340	Dr. PL Kulwal	Assessment of drought tolerance in cotton (*Gossypium hirsutum*).
104	Mr. Lokare Sanket Haribhau	24/341	Dr. AR Aher	Assessment of genetic diversity and identification of informative molecular markers for genotype characterization in sesame (*Sesamum indicum*)
105	Mr. Choudhari Ganesh Santosh	24/342	Dr. AR Aher	Assessment of genetic diversity and fingerprinting of safflower (*Carthamus tinctorius* L.) by using ISSR markers
106	Mr. Kanawade Prasad Ravindra	24/343	Dr. PL Kulwal	Characterization of cotton genotypes in relation to of temperature stress (*Gossypium hirsutum*)
107	Miss. Ranade Gauri Haridas	24/344	Dr. VP Chimote	Molecular evaluation of markers contributing towards drought stress tolerance in soybean [Glycine max (L.) Merrill)]

Institutional Projects (Theme Areas)

1. Marker-Assisted Selection for Crop Improvement
2. Gene Mining (Genes/ cDNA isolation, cloning and sequencing)
3. Candidate Gene Expression /Protein Profiling
4. Candidate Genes /DNA characterization / sequencing
5. Plant Tissue Culture
6. Molecular Diagnosis of microbes/pathogens

Objectives

- To develop genotypes with improved performance by molecular breeding.
- To identify and characterize genes/ alleles for biotic and abiotic stress tolerance/ physiological / quality traits.
- To develop DNA Fingerprints, divergence analysis.
- To develop in vitro cultured plantlets of various crops.
- Molecular diagnostics of transgenics and pathogens.
- To develop genetically modified (Gene Edited/ transgenics) for biotic stress tolerance and quality improvement in crop plants

❖ Significant achievements of State Level Biotechnology Centre, MPKV, Rahuri

i. Varieties released by SLBTC, MPKV, Rahuri:

1. Yashwant (Eucalyptus)

- Developed through tissue culture technology by selecting somaclonal variants from the SRY-16 lineage, resulting in the high-quality, fast-growing Eucalyptus clones 'Yashwant' (RHE 99-4) for commercial cultivation in Maharashtra.
- It is suitable for agroforestry, pulpwood production, and timber applications, with straight boles and fewer lateral branches. The clone has essential oil content (0.99%), with cineole accounting for 69.89% of the oil.
- It has a relatively short 4–6-year harvest cycle, along with drought tolerance .





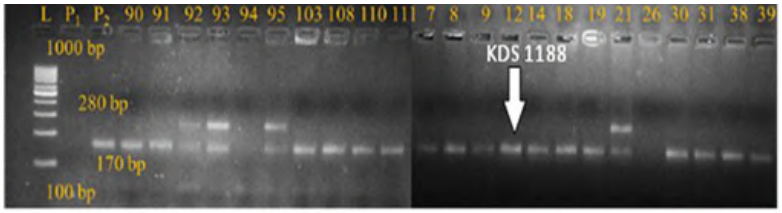


2. Released for NE India KDS 1188

- KDS 1188 is a Kunitz Trypsin Inhibitor (KTI)-free soybean variety has been released and notified at the national level.
- It was developed using marker-assisted selection (MAS) to improve the nutrition. quality of soybean.
- The recessive null allele (titi) associated with the seed-specific KTI3 gene was transferred from donor NRC 101 into the Phule Agrani genetic background.
- Significantly reduced Trypsin Inhibitor (KTI) activity, enhances its digestibility and direct nutritional suitability for food and feed purposes.







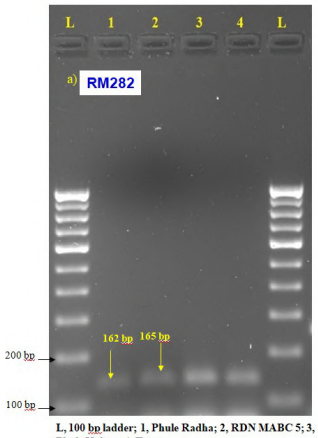
PCR amplification pattern observed with Satt409 primer in parents (KDS 344 and NRC 101) and advanced breeding lines derived there from including KDS 1188 (#12)

3. Released Phule Super Radha (RDN MABC 5) at national level

- A high-yielding, medium-duration rice variety recommended for *Kharif* season cultivation in Western Maharashtra.
- Developed from the popular rice variety 'Phule Radha' using Marker-Assisted Backcross Selection (MABC).
- It combines good resistance to rice blast disease with local adaptability and high grain-yielding potential.







L, 100 bp ladder; 1, Phule Radha; 2, RDN MABC 5; 3, Phule Kolam; 4, Tetep

ii. Human Resource Development:

- One Hundred Seven students have completed their M.Sc. (Molecular Biology and Biotechnology) degree using facilities of this center for their post graduate research work.

iii. Molecular Markers for Crop Improvement

- DNA fingerprinting of released and popular varieties of field and horticultural crops
- Divergence analysis of available germplasm necessary for classical breeding programme
- Identified different molecular markers in soybean, rice, chickpea, wheat, sugarcane and cottonfor genetic improvement.
- Development of anti-nutritional Kunitz trypsin inhibitor free soybean (Phule Agrani/Sangam/Kimya) using KTI gene linked markers is in progress. Advanced lines are in MLT field trials and are being re-assayed at molecular and biochemical level.
- Marker-assisted selection programme for blast resistance in rice variety Phule Radha is underway and the progenies are being evaluated under preliminary yield trial. Rice SSR marker *RM204* was found significantly as sociated with blast resistance.
- Marker-assisted selection programme for drought stress tolerance in chickpea is underway inthe background of variety Digvijay with genotype *ICC 4958* as the donor.
- In chickpea, GDP associated inhibition factor gene marker *Chk14a558* was noticed for droughttolerance; while three SSR markers, *H4G07*, *TR72* and *H1B04* were found to be promising forheat stress tolerance.
- Molecular marker study for dry root rot tolerance in chickpea is underway.
- SSR Marker gwm148 was found to be associated with heat tolerance trait in wheat
- Soybean SSR markers *Satt674* (*qPDH3*-5 linked) and *SRM1* (*qPDH1* linked) were associatedwith pod shattering tolerance.
- The SSR primer *Satt215* amplified *Satt215170* p and *Satt215150* bp markers linked to *qPDH3*-4 that exhibited contrasting allelic efficiency in genotypes differing for pod shattering.
- Molecular Tagging for important traits like seed longevity, pod shattering tolerance, oleic acidcontent and rust resistance has been done in soybean.
- Marker-trait associations have been identified for protein content and heat stress response inchickpea.
- Gene pyramiding and confirmation of soybean rust resistance *Rpp1* to *Rpp4* genes was doneusing linked SSR markers.
- Microsatellite analysis confirmed that the derivates of the tri species [2 (*Gossypium arboreum* × *G. anomalum*) × *G. hirsutum* var. BWR] line × G. *hirsutum* var. JLH168 hybrid, sharedmultigenomic background from the three cotton species (*A2*, *AhDh* and *B1*

genome).

- Molecular Tagging for important qualitative traits was done for traits like Fusarium wiltresistance, sucking pest tolerance and male sterility in cotton
- Identified sources of tolerance to heat stress in chickpea.
- Developed sources of resistance to leaf blast in rice.
- Identified source of resistance to dry root rot in chickpea.

iv. Genes/ cDNA isolated cloned and sequenced

- Pearl millet *P5CS* (partial cDNA, 1179 bp) for drought tolerance with NCBI GenBank accession No. FJ827591
- Banana *ACC oxidase* (Full length cDNA, 980 bp) for ripening with NCBI GenBank accessionNo. EU131109
- Fig *ACC Synthase 1* (partial cDNA, 1059 bp) and *ACCS2* (partial cDNA, 301 bp) for ripeningwith NCBI GenBank accession No. FJ827771 and FJ827772
- Wild sorghum *LEA1*-$_{546bp}$ and *LEA3*-$_{816bp}$ (Full length cDNA, 980 bp) for drought tolerancewith NCBI GenBank accession No. KI637318 and KT030731.

v. Candidate Gene Expression /Protein Profiling studies:

- In sugarcane, DREB and IGE genes were found to be expressed only in drought tolerant cultivar Co-740.
- In sugarcane, under salinity stress, the *SOS1*, *SOS2*, *SOS3* and *P5CS* gene were up-regulated in the cultivar CoM- 265 as compared to CoC671.
- Different cellulose synthase genes are expressed during fibre elongation in between *G. hisrutum* and *G. arboreum*. In particular, *cesA1* and *cesA2* cellulose synthase genes are highly expressed in *G. hirsutum;* than *G. arboreum* while in *G. arboreum* strong expression of *cesA1b* gene was observed at
- Application of 100 mM putrescine in sugarcane under drought stress condition resulted in higher fold expression of genes involved in combating the drought.
- Unique proteins were resolved in sugarcane variety CoM 0265 under salinity condition (79.49, 66.18 kDa by SDS-PAGE and 63.59, 61.01 and 25.23 kDa by Native PAGE).
- Dehydrin like protein bands (30 and 35 kDa) were observed under drought stress conditions in sorghum.
- Under heat stress, HSPs of ~77.6 and ~70.8 kDa were observed in sorghum cv. M 35-1. Under heat stress, HSPs of ~73.25 kDa were observed in wild sorghum genotype, IS 18855

vi. Candidate Genes /DNA amplified and sequenced

- Antimicrobial *mannose binding lectin* (*MBL*) (870 bp) cDNA from ashwagandha was

synthesized and sequenced. Antimicrobial gene, AceAMP1 specific primers were designed and used for synthesis of corresponding cDNA from onion and medicinal plants.

- Soybean *Phytochrome A3* (*E4* gene, two each partial cds. of four varieties): Eight accessions each of NCBI GenBank nucleotide and protein accessions for photoperiod sensitivity and maturity.
- Soybean *Early Flowering* (*J* gene, complete gene): Six accessions each of NCBI nucleotide and protein accessions for Long Juvenility and maturity.
- Molecular characterization genes conferring seed longevity in soybean, revealed Transparent Testa (TT-10) laccase 931th position SNP shared by all three high seed longevity varieties; while 6 SNPs were shared by two of them. In stachose synthase gene 11SNP were shared only between two high seed longevity varieties, with none being shared by all three together.
- For DNA barcoding: 18 genotypes from 10 Gossypium species were used from Germplasm bank, Cotton Scheme were sequenced for their ITS-rRNA region .to get 18 NCBI accessions
- In soybean 525 bp *E1* maturity gene sequence analysis revealed twenty two earliness specific SNPs shared by JS2034 and JS9560; while eighteen late maturing specific SNPs were sharedby both MAUS61 and MACS1180

vii. Plant Tissue Culture

- Micropropagation protocol has been standardized in bamboo, sugarcane and banana
- Developed regeneration protocol for medicinal, aromatic and other important plants viz.ashwagandha, sarpagandha, fig, gudmar, neem, simarouba, kal lavi, bedki etc.
- Interspecies (3 species) cross hybrids were recovered in cotton using embryo culture.
- Used embryo culture technique to recue interspecies cross hybrids in *Zizypus*

viii. Molecular Diagnosis of microbes/pathogens

- For designing SCAR-Xap primer for diagnosis, *X. axonopodis pv puniceae* hairpin loop-forming intergenic region genomic sequence with NCBI accession No. FJ827773
- For initial identification of *Xanthomonas axonopodis* pv puniceae, 16S rRNA gene, partial; 16S-23S ITS complete and 23S rRNA gene, partial seq. with NCBI GenBank accession No. FJ827774 was used.
- For SNP variation study: *Sclerotium (Athelia) rolfsii* ITS-rRNA sequence 7 NCBI accessionswere studied to develop a PopSet.
- *Klebsiella pneumoniae* causing root bark necrosis of pomegranate 16S rRNA gene, partial; 16S-23S ITS complete and 23S rRNA gene, partial seq. sequenced with NCBI GenBank accession No. KY941097.

Research Recommendations

1. During micropropagation of banana, number of subcultures should be restricted to 8 to minimize somaclonal variation.
2. For quick and accurate identification of *Xanthomonas axonopodis pv. punicae* causing oily spot in pomegranate SCAR-XAP primer amplifying a specific 152 bp fragment is recommended.
3. For soybean rust resistance breeding, complementary genes specific *Satt* 191- 222bp (*Rpp1b*) and *Satt* 215-123bp (*Rpp2*) molecular markers simultaneous use is recommended.
4. Molecular markers *csLV34* and *cssfr5* either individually or in combination are recommended for detection and rapid screening of leaf rust resistance gene *Lr34* in aestivum (bread) wheat improvement programmes.
5. Developed and validated '*SSScM1'* and '*SSScM3' SCAR* markers are recommended for early, rapid and precise selection of salinity tolerant plantlets in sugarcane improvement programme.
6. SSR markers, $Satt197_{179bp}$ and $Satt063_{116bp}$ are recommended to accelerate breeding of Long juvenile soybean varieties capable of withstanding climatic change.
7. Molecular markers *DRR*-08, *DRR*-13 and *DRR*-18 are recommended for distinguishing different isolates of the fungus causing dry root rot of chickpea.
8. A modified casein agar plate assay technique is recommended for rapid and cost-effective screening to identify Kunitz trypsin inhibitor-free soybean lines.
9. Based on plant physiological and biochemical parameters, desi chickpea varieties JSC 55 (RVG 202), JG 14 (ICCV 92944) and Vijay are recommended as potential donors for heat stress tolerance in the chickpea breeding programme.
10. Based on disease resistance reaction under natural and artificial epiphytotic conditions, desi chickpea genotype RVSSG-64 is recommended as potential donor for dry root rot resistance in the chickpea improvement programme.
11. Based on plant physiological and biochemical parameters, desi chickpea varieties *JSC 55* (*RVG 202*), *JG 14* (*ICCV 92944*) and Vijay are recommended as potential donors for heat stress tolerance in the chickpea breeding programme
12. . Developed three sources of resistance for blast disease in rice.

❖Overall Achievements

Sr. No.	Achievements	Previous achievements	Last 5 Years Achievements
1.	No. of varieties released	1 Yashwant (Eucalyptus)	1 Released for NE India KDS 1188 2.Released Phule Super Radha (RDN MBC 5) at national level
2.	Recommendations	10	5
3.	No. of research articles	255	70
4.	NAAS rating >5.0	118	45
5.	NAAS rating >6.0	62	14
6.	NAAS rating >7.0	30	8
7.	NAAS rating >8.0	19	5

Publications

Sr. No.	Name	Designation	Publication links
1.	Dr. V. P. Chimote	Professor and Officer Incharge SLBTC, MPKV, Rahuri	https://scholar.google.co.in/citations?hl=en&user=OA25ieQAAAAJ
2.	Dr. D.N. Damse	Assistant Professor of Agril. Botany	https://scholar.google.com/citations?user=cj03rBwAAAAJ&hl=en&oi=ao

❖ Funding received for establishment of State Level Biotechnology Centre

S. N.	Title of Research Experiment	Type of Project (ICAR / State)	Duration	Funds Received
1.	Plant Tissue Culture Laboratory establishment with Agro forestry Scheme	Statutory Development Board for Rest of Maharashtra	1992	33.00 Lakhs
2.	Biotechnology Centre started 2001 with available infrastructure and manpower.	University receipts grants	2001-03	--
3.	Grants for the establishment of State Level Biotechnology Centre, MPKV, Rahuri (Biotechnology Research Centre) for infrastructure construction to the centre at its present location.	State Government Grant	2003-04 to 2009-2010	667.00 Lakhs
4.	Productivity Enhancement of Dryland Agriculture System in Western Maharashtra to Meet the Changing Challenges.	Institute of Excellence Award of Rs. 100 Crore from the Union Government.	2008-09 to 2011-12	513.00 Lakhs
	Since then, it has been functioning on its own with product Testing, externally funded projects and to limited extent with revenue receipts.			

❖ Ongoing Externally Funded / Ad hoc Research Projects

S. N.	Title of the project	Funding agency	PI & Co-PI from MPKV	Budget (Rs.)
1.	Establishment of DNA Fingerprinting Laboratory at State Level Biotechnology Centre, MPKV, Rahuri (2025-26)	National Food Security and Nutrition Mission, Dept. of Agriculture and Farmers Welfare Govt. of India	Dr. V. P. Chimote Dr. A. R. Aher	200.00 Lakhs
2.	Strengthening of Research for Sustainable Yield and Value addition in Soybean.	State Govt. of Maharashtra ad hoc project	Dr. S. D. Kumbhar Dr. N. J. Danawale Dr. V. P. Chimote Dr. K. C. Gagare Dr. A. R. Aher Dr. S. D. Kale Dr. S. B. Mahajan	450.80 Lakhs (183.66 Lakhs for SLBTC)
3.	Revolving Fund for Production of Tissue culture seedlings, Human Resource Development and Product Testing in Agril. Biotechnology. ((2022-23 to 2027-28)	Revolving fund project	Dr. A. A. Kale Dr. V. P. Chimote Dr. A. R. Aher	20.00 Lakhs

4.	Bamboo Plantation Project (2017-2018 to 2021-2022; 2023-24 to 2025-26).	Maharashtra Bamboo Development Board, Nagpur	Dr. R. H. Kolase, Dr. A. R. Aher	319.31 Lakhs

❖ Newly Sanctioned Externally Funded Research Projects

S. N.	Title of the project	Funding agency	PI & Co-PI from MPKV	Budget (Rs.)
1.	Morphological, molecular, and biochemical profiling for identification of superior thornless opuntia, (*Opuntia ficusi* Indica) (2025-26 to 2027-28)	Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra	Dr. A. R. Aher Dr. V. P. Chimote	5.00 Lakhs
2.	Development of insect resistant and abiotic stress tolerant interspecific hybrids in cotton through embryo rescue culture (2025-26 to 2027-28)	Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra	Dr. B. D. Pawar Dr. A. R. Aher Dr. P. L. Kulwal Dr. N. R. Markad Dr. N. K. Bhute	5.00 Lakhs
3.	Mitigation of biotic and abiotic stresses in crop plants mediated through Potassium Meta Phosphate Dimer, a new nutrient immunity booster	Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra	Dr. P. K. Lokhande Dr. V. P. Chimote Dr. U. S. Surve Dr. S. R. Shelke	49.5 Lakhs
4.	Development of Photoperiod-insensitive Soybean Varieties in India through Marker Assisted Backcross Breeding (2025-26 to 2028-29)	Collaborative Inter-institutional Project funded by Department of Biotechnology (DBT), Govt. of India	Dr. M. P. Deshmukh Dr. V. P. Chimote	Sanctioned Rs 50.448 Lakhs for MPKV

❖ Completed Externally Funded Research Projects

S. N.	Title of the project	Funding agency	PI & Co-PI from MPKV	Budget (Rs.)
1.	Bioprospecting of genes for abiotic stress tolerance from Sorghum. (2009-10 to 2012-2013)	Collaborative Inter-institutional Project funded by National Agricultural Innovation Project (NAIP). ICAR (Component 4)	Dr. A. S. Jadhav Dr. A. A. Kale Dr. V. P. Chimote	57.1963 Lakhs (for MPKV)
2.	Germplasm characterization and trait discovery in wheat using genomics approaches and its integration for improving climate resilience, productivity and nutritional quality (2019-20 to 2024-25)	Collaborative Inter- institutional Project funded by Department of Biotechnology (DBT), Govt. of India	Dr. P. L. Kulwal Dr. S. S. Dodake	51.238 Lakhs
3.	Characterization of chickpea	Collaborative Inter-institutional	Dr. N. S.	96.97

	germplasm resource to accelerate Genomics-assisted Crop Improvement (2020-21 to 2024-25)	Project funded by Dept. of Biotechnology (DBT), Govt. of India	Kute Dr. P. L. Kulwal	Lakhs
4.	Spectral response-based breeding in different crops for screening of genotypes for biotic and abiotic stresses. (2022-23 to 2024-25)	Rajiv Gandhi Science and Technology Commission, Govt. of Maharashtra	Dr. P. L. Kulwal Dr. S. A. Kadam	5.00 Lakhs
5.	Strengthening of Biotechnology Academic facilities at MPKV Rahuri	Department of Biotechnology (DBT), Govt. of India	Dr. A. S. Jadhav Dr. A. A. Kale Dr. V. P. Chimote	5.0 Lakhs
6.	Delivering more produce and income to farmers through enhancing genetic gains for chickpea and pigeonpea (2017-2018 to 2019-2020)	Dept. Of Agri., Cooper. Famers Welfare Ministry of Agri. Farmers Welfare, Govt. of India	Dr. P. L. Kulwal	53.31344 Lakhs
7.	RFLP and RAPD markers based Varietal Identification	Department of Biotechnology (DBT), Govt. of India	Dr. S. S. Mehetre Dr. R. M. Naik	42.00 Lakhs

❖ Product Testing / Revenue Receipts

- Bt Cotton trial product testing (40% of trial receipts) to confirm their Bt status.
- Product testing of DNA fingerprinting of university released varieties.
- DNA fingerprinting of university released varieties under product testing.
- Product testing of DNA fingerprinting of private company varieties/ hybrids.
- DNA fingerprinting of varieties/ hybrids from private company under product testing.
- Selling of banana tissue culture plantlets.
- Training programme receipts.
- University Receipts aided funding (2010-2011- Rs 24.0 Lakhs).

❖ Year wise details of DNA fingerprinting work done under product testing

Sr. No.	Year	Number of cultivars
1	2022	38
2	2023	17
3	2024	5
4	2025	36
Total		**96**

❖ Year wise details of students trained under training programme

Sr. No.	Year	Number of Students Trained
1	2022	9
2	2023	3
3	2024	13
4	2025	25
Total		**50**

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