

# WARANGAL

## Regional Agricultural Research Station, Warangal Professor Jayashankar Telangana State Agricultural University (PJTSAU) Telangana State

Rice gall fly research at Warangal was initiated during 1959–1960 with one Assistant rice specialist and this was strengthened in 1965 with a rice breeder and supporting staff for developing high yielding varieties of rice with gall midge resistance. In 1966, the station along with the scheme was transferred to Andhra Pradesh Agricultural University. In the year 1969, this station was recognized as a National centre for breeding gall midge resistant varieties. All India Coordinated Rice Improvement Project (AICRIP) started with an Entomologist in the year 1969. Subsequently one Scientist (Breeding) position was also sanctioned in XI plan under AICRIP. Presently, it is under Professor Jayashankar Telangana State Agricultural University (PJTSAU), formerly part of Acharya N.G. Ranga Agricultural University (ANGRAU).



## Major Achievements

### Crop Improvement

#### Plant Breeding

RARS, Warangal centre has the distinction for

- Development of India's first gall midge resistant variety 'Kakatiya' in 1974.
- Development of first extra early maturing rice variety "Varalu" for contingency situation. Development of cold tolerant high yielding varieties "Erramallelu" and "Sheethal".
- Development of high yielding varieties having good cooking quality viz., Surekha, Warangal Samba, Warangal Sannalu, Ramappa and Siddhi.

- Development of high yielding, gall midge resistant varieties like Surekha, Pothana, Divya, Kavya, Orugallu, Bhadrakali, Keshava, Shiva, Ramappa and Siddhi.
- New gall midge biotype (4m) and new gene conferring resistance (Gm-11t) to gall midge were identified.
- Inheritance of gall midge resistance was studied and reported. Resistance was found to be under the control of single dominant gene.
- About 250 germplasm lines were collected and maintained every year and 30 lines were documented.

### Varieties developed and released

S. No.	Variety	Parentage	Duration (Days)	Characters	Year of Release
1	Kakatiya (WGL-13801)	IR 8/W-1263	120	R-Gm 1	1974
2	Surekha (WGL-13400)	IR 8/SIAM -29	135-140	R-Gm 1, LS, good cooking quality	1976
3	Pothana (WGL-22245)	IR 579/W 12708	125	R-Gm 1, LS grain type	1985
4	Divya (WGL-44645)	WGL-23022/Surekha	125-130	R-Gm 1, LS grain type	1989
5	Erramallelu (WGL-20471)	BC 5-55/WR-708	120	T-Cold, LS	1991
6	Kava (WGL-48684)	WGL-27120/WGL-17672/Mashuri// Surekha	135	R-Gm 1 & 3, MS grain type	1991
7	Orugallu (WGL-47970)	OB 5677/IR 70-473-2-5	140-145	R-Gm 1, LS grain type	1993
8	Bhadrakali (WGL-3962)	Phalguna/IR-36	130-135	LS grain type	1994
9	Shiva (WGL-3943)	Phalguna/IR-50	130-135	LS grain type	1995
10	Keshava (WGL-3825)	WGL-28712/IR-36	120-125	R-Gm 1, LS grain type	1996
11	Varalu (WGL-14377)	WGL-20471/CR-544-1-2	90-95	R-Gm 1, LS grain type	2002
12	Warangal Samba (WGL-14)	BPT-5204/ARC 5984//BPT 3291	140	R-RTV, low incidence of SB	2005

13	Warangal Sannalu (WGL-32100)	Divya/BPT-5204	130-135	T-Salinity	2006
14	Ramappa (WGL-23985)	Kavya/AC-20	125-130	R-Gm 1,3, 4, 5, 6	2009
15	Siddhi (WGL-44)	BPT-5204/ARC 5984//Kavya// Kavya/BPT-5204	140-145	R-Gm & BPH	2012
16	Sheethal (WGL-283)	Chaitanya/ Tellahamsa	130	T-Cold & BPH	2012

### Popular varieties released by RARS, Warangal

#### Kakatiya (WGL-13801)

Year of Release : 1974

Pedigree : IR-8/W-1263

Duration (days) : 120

Yield potential (t/ha): 5-5. 5

Reaction to pests : Gall midge resistant

Salient features: First gall midge resistant variety developed in India, Coarse grain

Area of adoption : Denotified



#### Surekha (WGL-13400)

Year of Release : 1976

Pedigree : IR-8/Siam-29

Duration (days):130

Yield potential (t/ha): 5.5-6

Reaction to pests: Gall midge (Biotype 1) resistant

Salient features: Long slender grain, good keeping quality after cooking.

Area of adoption : Telangana region and in Madhya Pradesh during kharif

#### Pothana (WGL-22245)

Year of Release : 1985

Pedigree: IR-579/W-12708

Duration (days) :125

Yield potential (t/ha) :6.0-6.5

Reaction to insects: Gall midge (Biotype1 and 3) resistant

Salient features : Plant is pigmented with pink tinge, long slender grain, suitable for kharif, rabi and edagaru

Area of adoption: Popular inTelangana





### Warangal Sannalu (WGL-32100)

Year of Release : 2006

Pedigree : Divya/BPT-5204

Duration (days) : 135 days

Yield potential (t/ha) : 6.5-7.0

Salient features: High yielding, slender than BPT-5204, tolerant to salinity

Area of adoption :Andhra Pradesh, Telangana State for kharif and Rabi season

### Siddhi (WGL-44)

Year of release : 2012

Pedigree: BPT-5204/ ARC-5984// Kavya//Kavya/BPT-5204

Duration : 140-145 days

Yield potential : 7 - 7.5 t/ha

Reaction to insects :Gall midge resistant

Salient features: High yielding with medium slender grain, good physico-cooking quality.

Area of adoption: Telangana, Andhra Pradesh particularly gall midge endemic areas for *kharif*



### Sheethal (WGL-283)

Year of release: 2012

Pedigree : Chaitanya/Tellahamsa

Duration : 125-130 days

Yield potential : 6.5 - 7.5 t/ha

Reaction to insect: Tolerant to BPH

Salient features : High yielding with cold tolerance, long slender grain with good physico-cooking quality traits

Area of adoption: Cold prone areas of Telangana during *rabi* season only.

- Varieties in pipeline: Three high yielding entries viz., WGL-347, WGL-482 and WGL-32183 have completed minikit testing. Three high yielding entries viz., WGL -401, WGL-505 and WGL-558 are in minikit testing now.
- Hybrid rice research: Developed gall midge resistant CMS line (WGL MS-1A) through conversion of Surekha. Few experimental hybrids (WGLRH-1, WGLRH-5, WGLRH-6 and WGLRH-8) were also developed and they are under confirmatory testing.



## Crop Protection

### Entomology

- **Gall midge biotype studies:** At Warangal, gall midge biotype studies were initiated in 1975. The differentials were standardized into 3 groups based on resistance genes involved. From 1988 onwards; gall midge population is being regularly monitored. W-1263, ARL-6605, Phalguna, Vellantachera, Aganni, Ptb10, T-1477 and Abhaya were found to be free from gall midge incidence, indicating the existence of native gall midge biotype-I population even from 1988-89.
- Since, 1996 change in reaction pattern was observed indicating mixed populations of biotypes. Later on, the deviation in reaction pattern continued and from 2002 to 2006, group I and Group II differentials were found to be susceptible and in group III differentials except CR-MR 1523 all other differentials have shown resistance to gall midge population at Warangal. During 2000-01, the gall midge biotype pattern was designed as S-S-R-S (Biotype-4) instead of earlier R-R-R-S pattern, indicating shift in the population of gall midge. This was later re-designated as Biotype-4M (S-S-R-R-S) during 2005. However, from 2009-10 onwards again there was shift in gall midge biotype. This was evident from the fact that, all the differentials were showing susceptible reaction.
- Identification of resistant donors against gall midge: Gall midge resistant donors HR 22, Eswarakorra, PTB-18, PTB-21, D. Jalita, Jhitpiti, Siam-29 were identified. Some lines with immune reaction to gall midge (Aganni/Banglai, Aganni/Abhaya, MR-1523/RP-2068-8-3-5, MR-1523/Abhaya, Bhumansan/MR-1523, etc.)
- **Gall midge population monitoring:** Characterization of local gall midge population / biotype on three gall midge differentials *viz.*, W-1263 (gm-1), Phalguna (gm-2) and TN-1 revealed that 23% population was of biotype-I, 10% was of biotype-2, 8% biotype-3, 2% biotype-4 and 57% non-descriptive.
- Insecticide evaluation trial: Number of new insecticides were evaluated for their efficacy against insect pests of rice:
- Broadcasting of granular insecticides Isazophos 3G @ 2 kg *a.i.*/ha or Cartap hydrochloride 4G @ 1.5 kg *a.i.*/ha or Carbofuran 3G @ 2 kg *a.i.*/ha in nursery 5 days before pulling of nursery, protected the transplanted crop up to 30 DAT from gall midge, stem borer, whorl maggot and leaf folder.
- Carbofuran 3G @ 2 kg *a.i.*/ha was effective against gall midge up to 40 DAT. Seed treatment with Fipronil 5 SC @ 10 ml/l and Imidacloprid @ 2.5 ml/l solution and spraying at 5 days before pulling nursery gave higher yields.

- Triazophos 20 EC followed by Imidacloprid and Curacron at 30 DAT, Indoxacarb @ 12.25 g a.i./ha, Flubendiamide @ 4 g a.i./ha and Methofenozide 22.9 EC @ 100 g ai/ha were effective against leaf folder.
- Triazophos 20 EC followed by Imidacloprid and Curacron at 30 DAT, Chlorpyriphos 10 G @ 1 kg a.i./ha, Carbofuran 3G @ 1 kg a.i./ha, Confidor ultra 100 EC @ 30 g ai/ha and Confidor 200 SL @ 20 g ai/ha were effective against gall midge.
- Against BPH, sulfaxoflor @ 70 g a.i./ha and sulfaxoflor @ 90 g a.i./ha recorded significantly lower population of 19.3 hoppers/10 hills and 27 hoppers/10 hills at 10 days after second spray followed by buprofezin @ 200 g a.i./ha (19.6 hoppers/10 hills).
- Imidacloprid 200 SL @ 25 g a.i./ha and Silafluofen 20 EC @ 100 G a.i./ha, Canfidor ultra 100 EC @ 30 g a.i./ha and Confidor 200 SL @ 20 g a.i./ha, Buprofezin @ 800 ml/ha were effective against BPH.
- In the study conducted on efficacy of certain miticides against panicle mite, dicofol @ 5ml/lit + Propiconazole @ 1 ml/lit and Profenophos @ 2 ml + Propiconazole @ 1 ml/lit spray have proved most effective.
- Propargite @ 570 g a.i./ha followed by Ethion 500 g a.i./ha, Fenprothrin 150 g a.i./ha and Spiromesifen 72 g a.i./ha were found better in reducing discoloured spikelets by panicle mite.
- Insecticide induced resurgence studies: Profenophos 50%EC @ 2 ml/lit, Lambda cyhalothrin 2.5% EC @ 1 ml/lit, Chlorpyriphos 20% EC @ 2 ml/lit caused resurgence of BPH after 2<sup>nd</sup> application. Among the three insecticides, Lambda cyhalothrin @ 1 ml/lit was found to cause severe resurgence.
- Population dynamics through light trap catches: Long term data revealed that gall midge population attains peak during October. Stem borer occurs in two peaks, during October and during first week of April. BPH peaks were also recorded in 3<sup>rd</sup> week of September and 2<sup>nd</sup> week of October.
- **Integrated pest management:** Adoption of IPM practices in the Variety- Shiva, (IPM components - Pheromone traps for yellow stem borer, formation of alleys, balanced fertilization, chlorpyriphos spray) resulted in low pest incidence and higher yield over farmer's practice.
- Insect pest incidence in different rice cultivation systems: Study on the incidence of insect pests in different rice cultivation systems revealed that, leaf folder incidence was more in SRI than normal; gall midge was more in SRI, stem borer less in SRI (per cent dead hearts).