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**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Variety</th>
<th>Parentage</th>
<th>Duration (Days)</th>
<th>Characters</th>
<th>Year of Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kakatiya</td>
<td>IR 8/W-1263</td>
<td>120</td>
<td>R-Gm 1</td>
<td>1974</td>
</tr>
<tr>
<td>2</td>
<td>Surekha</td>
<td>IR 8/SIAM -29</td>
<td>135-140</td>
<td>R-Gm 1, LS, good cooking quality</td>
<td>1976</td>
</tr>
<tr>
<td>3</td>
<td>Pothana</td>
<td>IR 579/W 12708</td>
<td>125</td>
<td>R-Gm 1, LS grain type</td>
<td>1985</td>
</tr>
<tr>
<td>4</td>
<td>Divya</td>
<td>WGL-23022/Surekha</td>
<td>125-130</td>
<td>R-Gm 1, LS grain type</td>
<td>1989</td>
</tr>
<tr>
<td>5</td>
<td>Erramallelu</td>
<td>BC 5-55/WR-708</td>
<td>120</td>
<td>T-Cold, LS</td>
<td>1991</td>
</tr>
<tr>
<td>6</td>
<td>Kava</td>
<td>WGL-27120/WGL-17672/Mashuri///Surekha</td>
<td>135</td>
<td>R-Gm 1 &amp; 3, MS grain type</td>
<td>1991</td>
</tr>
<tr>
<td>7</td>
<td>Orugallu</td>
<td>OB 5677/IR 70-473-2-5</td>
<td>140-145</td>
<td>R-Gm 1, LS grain type</td>
<td>1993</td>
</tr>
<tr>
<td>8</td>
<td>Bhadrakali</td>
<td>Phalguna/IR-36</td>
<td>130-135</td>
<td>LS grain type</td>
<td>1994</td>
</tr>
<tr>
<td>9</td>
<td>Shiva</td>
<td>Phalguna/IR-50</td>
<td>130-135</td>
<td>LS grain type</td>
<td>1995</td>
</tr>
<tr>
<td>10</td>
<td>Keshava</td>
<td>WGL-28712/IR-36</td>
<td>120-125</td>
<td>R-Gm 1, LS grain type</td>
<td>1996</td>
</tr>
<tr>
<td>11</td>
<td>Varalu</td>
<td>WGL-20471/CR-544-1-2</td>
<td>90-95</td>
<td>R-Gm 1, LS grain type</td>
<td>2002</td>
</tr>
<tr>
<td>12</td>
<td>Warangal Samba</td>
<td>BPT-5204/ARC 5984//BPT 3291</td>
<td>140</td>
<td>R-RTV, low incidence of SB</td>
<td>2005</td>
</tr>
<tr>
<td>No.</td>
<td>Variety Name</td>
<td>Parentage</td>
<td>Yield (t/ha)</td>
<td>Reaction to Pests</td>
<td>Area of Adoption</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------</td>
<td>--------------------</td>
<td>--------------</td>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>13</td>
<td>Warangal Sannalu</td>
<td>Divya/BPT-5204</td>
<td>130-135</td>
<td>T-Salinity</td>
<td>2006</td>
</tr>
<tr>
<td>14</td>
<td>Ramappa</td>
<td>Kavya/AC-20</td>
<td>125-130</td>
<td>R-Gm 1,3, 4, 5, 6</td>
<td>2009</td>
</tr>
<tr>
<td>15</td>
<td>Siddhi</td>
<td>BPT-5204/ARC 5984/Kavya/BPT-5204</td>
<td>140-145</td>
<td>R-Gm &amp; BPH</td>
<td>2012</td>
</tr>
<tr>
<td>16</td>
<td>Sheethal</td>
<td>Chaitanya/Tellahamsa</td>
<td>130</td>
<td>T-Cold &amp; BPH</td>
<td>2012</td>
</tr>
</tbody>
</table>

**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 (Biotype 1 and 3) resistant
- **Salient features**: Plant is pigmented with pink tinge, long slender grain, suitable for kharif, rabi and edagaru
- **Area of adoption**: Popular in Telangana
**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/Telahamsa  
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/Lt + Propiconazole @ 1 ml/Lt and Profenophos @ 2 ml + Propiconazole @ 1 ml/Lt spray have proved most effective.
• Propargite @ 570 g a.i./ha followed by Ethion 500 g a.i./ha, Fenpropothrin 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/Lt, Lambdacyhalothrin 2.5% EC @ 1 ml/Lt, Chlorpyriphos 20% EC @ 2 ml/Lt caused resurgence of BPH after 2nd application. Among the three insecticides, Lambda cyhalothrin @ 1 ml/Lt 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 3rd week of September and 2nd 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).