*Mysore J. Agric. Sci., 57 (4) : 59-67 (2023)*

# Field Evaluation of Local Landraces of Rice and Popular Cultivars for Resistance against Yellow Stem Borer, *Scirpophaga incertulas* (Walker)

B. N. Balaji[1], L. Vijaykumar[2], B. Shivanna[3], D. Jemla Naik[4], H. R. Raveendra[5] and K. Pushpa[6]
[1,3&4]Department of Agricultural Entomology; [6]Department of Agronomy, CoA, UAS, GKVK, Bengaluru - 560 065
[2]Department of Agricultural Entomology, College of Agriculture, V. C. Farm, Mandya - 571 405
[5]Division of Plant Pathology, AICRP on Small Millets, ZARS, V. C. Farm, Mandya - 571 405
e-Mail : balajibn456@gmail.com

**Authors Contribution**

B. N. Balaji : Conceptulization, investigation, draft prepration and analysis;
L. Vijaykumar : Conceptulization, framed research proposal and draft correction;
B. Shivanna :
D. Jemla Naik :
H. R. Raveendra &
K. Pushpa : Conceptulization and manuscript correction

***Corresponding Author :***
B. N. Balaji
Department of Agricultural Entomology, College of Agriculture, UAS, GKVK, Bengaluru

*Received* : November 2023
*Accepted* : November 2023

**Abstract**

Evaluation of 50 local landraces and ten popular cultivars against paddy yellow stem borer (YSB), Scirpophaga incertulas (Walker) was carried out at the College of Agriculture, V.C. Farm, Mandya during *kharif* 2022. The per cent of damage by YSB on different genotypes was evaluated at 30, 60 and 90 days after transplanting (DAT). Based on the mean per cent incidence genotypes were grouped into different resistance categories using the standard evaluation system for rice (SES) developed by IRRI. Out of 50 local landraces, five genotypes recorded resistance reaction with a damage score of 1,23 genotypes were found to be moderately resistant with a score of 3, 17 genotypes reacted as moderately susceptible with score of 5 and five genotypes showed susceptible reaction with score of 7. Among all the screened popular cultivars four genotypes were found to be resistant, four genotypes showed moderately resistant reactions, one genotype was moderately susceptible and one genotype reacted as susceptible. None of the local landraces and popular cultivars were found to be highly resistant or highly susceptible to YSB.

*Keywords* : Screening, Local landraces, Popular cultivars, Paddy yellow stem borer

Rice (*Oryza sativa* Linn.) is the staple food of more than half of the world's population (Kulagod, 2011). Rice belongs to the genus Oryza, family 'Poaceae' (Gramineae) and contributes about 40 per cent of the total food grain production. More than 92 per cent of the world's rice is produced and consumed in Asia. Rice covers about one-fourth of the total cropped area and provides food for more than half of the Indian population. United Nations designated the year 2004 as the 'International Year of Rice' because of its importance. Asia's rice production mainly depends on irrigated rice fields, which produce 3/4$^{th}$ of all rice harvested.

India is the second-largest producer and consumer of rice in the world after China with an area of 463.79 lakh ha with an annual production of 130.29 million tonnes and productivity of 2809 kg ha$^{-1}$ (Anonymous, 2023). In India, Rice ranks first in area and production and is majorly cultivated in West Bengal, Andhra Pradesh, Tamil Nadu, Orissa, Chhattisgarh, Punjab, Uttaranchal, Bihar, Uttar Pradesh, Haryana and Assam. In Karnataka Rice is being cultivated in an area of 14.84 lakh ha with a production of 47.17 lakh tonnes and productivity of 3179 kg ha$^{-1}$ (Anonymous, 2021).

In modern agriculture, high-yielding Rice varieties are extensively grown with the use of fertilizers and manures. Such a cultivation pattern of rice accidentally or inadvertently offers infestation of a large number of insect pests, which results in severe loss in crop yields (Neeta *et al*., 2013). The rice plant is attacked by more than 100 species of insects and 20 of them can cause economic damage (Pathak and Khan,1994). Rice is attacked by several insect pests from nursery to harvest, which cause severe yield loss across the countries. In India, the major constraints of rice production are due to the occurrence of insect pests at various stages of crop growth due to biotic factors. Among the insect pests, the most important and widely distributed pest species are yellow stem borer (*Scirpophaga incertulas* Walker), planthoppers, (BPH, WBPH and GLH) and defoliators like leaf folder (*Cnaphalocrocis medinalis* Guenee), paddy caseworm (*Nymphula depunctalis* Guenee) and rice horned caterpillar (*Melanitis leda ismene* Cramer) (Salim, 2002).

Rice yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) is the most destructive pest causing about a 25-30 per cent reduction in yield. This results in an annual yield loss of 27.34 per cent (Pasalu *et al*., 2002) of the production. The adult moths lay eggs in clusters of 50 to 75 on the upper surface of the leaves towards the tip. It attacks all stages of the plant with the infestation starting at the nursery till the flowering stage. During the vegetative stage of the crop, the newly emerged caterpillar bores into the stem and feeds on the internal content. As a result, the central shoot dries up and produces dead heart. In the reproductive stage of the crop, grownup larvae bore into the peduncle leading to white ear heads and offering higher loss to the crop (Karthikeyan and Purushothaman, 2000).

For effective management of YSB, growing resistant variety is an excellent alternative compared to other management strategies. It is also highly compatible with all other methods of pest management. Hence, identifying the source of resistance against yellow stem borer is an important step. So recognizing this significance, the current study aims to screen the genotypes for resistance to YSB under field conditions.

## Material and Methods

Field evaluation of local landraces and popular cultivars of rice, for resistance against YSB in rice was conducted at A-block, College of Agriculture, Vishweshwaraiah Canal Farm, Mandya, UAS, GKVK, Karnataka during *kharif* season of 2022.

*Screening Material* : A total of 50 local landraces of rice (Table 2) along with 10 popular cultivars of the Cauvery command area (Table 3) were collected from Zonal Agricultural Research Station, V. C. Farm, Mandya and sown separately for the evaluation. 25 days old seedlings of local landraces and popular cultivars were transplanted in 3 rows, with the spacing of 20 x 15 cm between rows and plants, respectively. Each entry was raised as per the package of practice, except the plant protection measures (Anonymous, 2016).

In each genotype, the infestation of YSB was recorded during the vegetative stage (before panicle emergence) by counting the number of dead hearts to the total number of tillers, in 10 random hills in each test entry at 30 and 60 days after transplanting (DAT). Likewise, at pre-harvest, the infestation of YSB was recorded by counting total number of ear-bearing tillers and white ears in 10 randomly selected hills and per cent white ears was worked out at 90 DAT.

$$\text{Dead heart (\%)} = \frac{\text{Number of dead hearts}}{\text{Total number of tillers}} \times 100$$

$$\text{White ear (\%)} = \frac{\text{Number of white ears}}{\text{Total number of productive tillers}} \times 100$$

The mean and standard deviation were worked out and based on the level of infestation, rice genotypes were grouped into different resistance categories for the data interpretation. Further, the scoring of rice yellow stem borer infestation was made and interpreted based on the Standard Evaluation System

TABLE 1
Standard evaluation system for rice

| For dead heart | | | For white ear | | |
|---|---|---|---|---|---|
| Scale | Per cent | Category | Scale | Per cent | Category |
| 0 | No damage | Highly resistance | 0 | No damage | Highly resistance |
| 1 | 1- 10% | Resistance | 1 | 1-5% | Resistance |
| 3 | 11- 20% | Moderately resistance | 3 | 6- 10% | Moderately resistance |
| 5 | 21-30% | Moderately susceptible | 5 | 11-15% | Moderately susceptible |
| 7 | 31-60% | Susceptible | 7 | 16-25% | Susceptible |
| 9 | 61% and above | Highly susceptible | 9 | 26% and above | Highly susceptible |

TABLE 2
Reaction of local land races of rice against yellow stem borer, *S. incertulas*, *kharif* 2022

| Genotypes | % DH | | % WE |
|---|---|---|---|
| | 30 DAT | 60 DAT | 90 DAT |
| Anekombu latte | 14.2 ± 3.54 | 15.2 ± 2.04 | 6.63 ± 2.54 |
| Andra Basamati | 14.52 ± 3.58 | 15.59 ± 2.94 | 7.11 ± 3.63 |
| Antra Sali (233) | 21.38 ± 3.39 | 22.78 ± 2.62 | 12.0 ± 3.31 |
| Adi kanne batta - 1 | 18.92 ± 4.35 | 17.1 ± 2.52 | 6.14 ± 2.44 |
| Bangara sanna - 1 | 15.11 ± 3.31 | 16.62 ± 3.53 | 8.69 ± 2.65 |
| Bangara sanna - 2 | 9 ± 2.61 | 9.34 ± 2.85 | 4.61 ± 3.35 |
| Bili mundaga | 14.06 ± 2.6 | 15.82 ± 1.21 | 7.95 ± 6.06 |
| Budda | 12.33 ± 2.18 | 14.1 ± 3.51 | 6.7 ± 4.16 |
| Black sticky | 12.41 ± 2.4 | 15.22 ± 2.94 | 7.88 ± 4.16 |
| Chinnur | 22.03 ± 4.01 | 24.58 ± 3.84 | 11.24 ± 5.58 |
| 11Chinne ponni - 3 | 7.23 ± 3.03 | 6.87 ± 2.2 | 2.68 ± 2.56 |
| Coimbatore sanna | 21.19 ± 2.84 | 22.2 ± 3.35 | 12.23 ± 2.1 |
| Duddoge | 9.58 ± 3.71 | 8.56 ± 2.99 | 4.2 ± 2.85 |
| Dappaneya Bilijaddi | 44.58 ± 13.03 | 46.82 ± 13.53 | 17.45 ± 5.23 |
| Dodda Batta | 13.47 ± 4.45 | 15.86 ± 4.19 | 7.12 ± 1.52 |
| G K - 7 | 11.64 ± 3.74 | 13.19 ± 4.51 | 7.62 ± 4.63 |
| Gandha sale - 2 | 12.1 ± 2.68 | 15.35 ± 3.91 | 8.81 ± 4.69 |
| Gowri sanna | 22.39 ± 3.8 | 24.17 ± 3.63 | 14.52 ± 5.8 |
| Gud batta - 2 | 28.61 ± 4.97 | 26.63 ± 5.52 | 11.49 ± 3.05 |
| HMT | 21.2 ± 5.7 | 23.87 ± 6.61 | 13.67 ± 4.22 |
| Game | 36.19 ± 10.19 | 33.56 ± 7.5 | 16.23 ± 2.99 |
| Itansel | 12.7 ± 2.45 | 15.72 ± 2.83 | 7.48 ± 3.61 |
| Jeerige batta | 23 ± 4.29 | 24.08 ± 3.96 | 12.97 ± 2.11 |
| Jig madike | 31.31 ± 6.24 | 32.5 ± 4.8 | 16.94 ± 3.28 |

**Table 2 Continued**



*The Mysore Journal of Agricultural Sciences*

| Genotypes | % DH | | % WE |
|---|---|---|---|
| | 30 DAT | 60 DAT | 90 DAT |
| Karikagga | 5.88 ± 4.39 | 6.23 ± 3.04 | 4.58 ± 3.64 |
| Kari batta | 23.57 ± 5.46 | 25.06 ± 5.85 | 12.47 ± 3.17 |
| Khushi adikshan | 11.08 ± 6.49 | 14.4 ± 4.24 | 6.85 ± 3.64 |
| Kanada thumba | 14.62 ± 6.56 | 16.22 ± 6.7 | 7.66 ± 1.84 |
| Kotayam - 1 | 4.5 ± 2.91 | 7.12 ± 1.86 | 3.75 ± 3.8 |
| Mara batta - 1 | 12.25 ± 3.59 | 15.04 ± 4.81 | 9.71 ± 1.32 |
| Narikel | 22.47 ± 3.85 | 23.7 ± 4.98 | 12.15 ± 2.19 |
| Neermullare | 23.9 ± 6.83 | 25.01 ± 5.67 | 12.14 ± 3.16 |
| PB Local | 12.27 ± 2.79 | 14.15 ± 3.03 | 7.75 ± 4.05 |
| PSB - 87 | 13.17 ± 2.96 | 14.39 ± 3.07 | 7.23 ± 1.57 |
| Pushpa | 22.59 ± 5.42 | 24.14 ± 3.81 | 12.29 ± 2.4 |
| Possugand | 12.9 ± 2.05 | 14.01 ± 2.3 | 7.45 ± 2.39 |
| Putta batta – 2 | 32.57 ± 7.13 | 34.24 ± 6.51 | 17.08 ± 3.2 |
| Roy bag | 17.93 ± 3.55 | 18.68 ± 2.97 | 7.94 ± 3.44 |
| Raskadar | 22.12 ± 4.66 | 22.96 ± 4.59 | 12.81 ± 1.97 |
| Rahodaya | 15.89 ± 8.5 | 17.26 ± 7.61 | 8.7 ± 3.16 |
| Rathanachoodi – 2 | 22.69 ± 5.22 | 24.61 ± 6.01 | 12.13 ± 3.17 |
| Rajakime | 17.83 ± 5.53 | 18.2 ± 4.53 | 7.79 ± 3.73 |
| Sirsi | 21.49 ± 4.02 | 23.59 ± 2.89 | 12.85 ± 2.53 |
| Siri sanna | 11.74 ± 3.87 | 14.11 ± 3.67 | 7.65 ± 2.04 |
| Sanna batta – 2 | 22.09 ± 3.9 | 24.54 ± 4.08 | 13.26 ± 3.79 |
| Selam sanna – 1 | 44.02 ± 6.74 | 41.8 ± 7.87 | 17.25 ± 4.51 |
| Tulasiya | 27.06 ± 11.48 | 28.1 ± 11.88 | 12.54 ± 1.96 |
| Ugi batta | 12.31 ± 2.17 | 14.23 ± 3.08 | 7.39 ± 2.26 |
| Vanasu | 12.92 ± 7.33 | 14.94 ± 7.54 | 7.46 ± 4.89 |
| White sticky | 22.63 ± 6.46 | 24.72 ± 4.93 | 13.98 ± 1.74 |

DAT- Days after transplanting, R- Resistance, MR- Moderately resistance, MS- Moderately susceptible; S- Susceptible; Resistance categories based on Standard Evaluation System of rice, IRRI, Philippines (IRRI, 2013); DH- dead heart; WE- white ears

for Rice (SES) developed by the International Rice Research Institute (IRRI, 2013) (Table 1).

## Results and Discussion

Results revealed that, among 50 local landraces studied, the per cent incidence of YSB due to dead heart ranged from 4.5 ± 2.91 to 46.82 ± 13.53 per cent, similarly the per cent incidence due to white ears ranged from 2.68 ± 2.56 to 23.56 ± 6.77 (Table 2). Among 10 popular cultivars screened the per cent incidence of YSB due to dead heart ranged from 5.79 ± 6.45 to 44.12 ± 6.81 per cent, whereas the per cent incidence ranged from 3.12 ± 3.55 to 18.06 ± 3.19 due to white ears (Table 3).

At 30 DAT, per cent incidence due to dead heart ranged from 4.5 ± 2.91 and 9.58 ± 3.71 per cent in Kotayam-1 and Duddoge, respectively and those land races were categorized as resistant genotypes with score 1. Whereas, in moderately resistant categories (score 3), the per cent dead heart ranged between 11.08 ± 6.49 and 18.92 ± 4.35 in the Khushi adikshan

TABLE 3
Reaction of popular cultivars of rice against yellow stem borer, *S. incertulas*, *kharif* 2022

| Genotypes | % DH | | % WE |
|---|---|---|---|
| | 30 DAT | 60 DAT | 90 DAT |
| Jaya | 41.39 ± 7.18 | 44.12 ± 6.81 | 18.06 ± 3.19 |
| BR 2655 | 5.79 ± 6.45 | 7.22 ± 6.6 | 3.63 ± 4.38 |
| Mandya vijaya | 14.62 ± 6.01 | 16.71 ± 4.84 | 7.4 ± 4.84 |
| IR 30864 | 15.37 ± 4.59 | 16.61 ± 4.06 | 8.58 ± 4.33 |
| IR 64 | 7.06 ± 6.76 | 8.42 ± 5.75 | 3.12 ± 3.55 |
| Rasi (IET 1444) | 11.56 ± 3.15 | 14.29 ± 3.62 | 8.23 ± 4.28 |
| Mukthi (CTH 1) | 12.21 ± 3.12 | 14.32 ± 2.87 | 7.49 ± 3.32 |
| CTH 3 | 21.54 ± 4.49 | 23.68 ± 3.8 | 12.63 ± 2.79 |
| Tanu (KMP 101) | 7.69 ± 2.06 | 8.09 ± 2.54 | 4.62 ± 3.03 |
| KRH 4 | 6.48 ± 3.47 | 7.42 ± 2.74 | 4.04 ± 2.88 |

and Adi kanne batta-1. Likewise, in moderately susceptible categories (score 5) the infestation varied from 21.19 ± 2.84 to 28.61 ± 4.97 per cent dead heart in the genotypes *viz*., Coimbatore sanna and Gud batta-2. However, per cent dead heart at 30 DAT were observed between 31.31 ± 6.24 and 44.58 ± 13.03 in Jig madike and Dappaneya Bilijaddi, which were categorized as susceptible (score 7). Of all the local landraces screened, none of the genotypes were found highly resistant (HR) and highly susceptible with scores of 0 and 9 (Table 2 and Table 4).

Similarly, at 60 DAT, none of the genotypes were found to be highly resistant (Scale 0) and the genotypes with per cent incidence ranged from 6.23 ± 3.04 to 9.34 ± 2.85 in Karikagga and Bangara sanna-2 were categorized as resistant genotypes with score 1. Whereas, in moderately resistant categories (score 3), the per cent dead heart showed between 13.19 ± 4.51 and 18.68 ± 2.97 in G K-7 and Roy bag. Likewise, in moderately susceptible categories (score 5) the infestation varied from 22.2 ± 3.35 to 28.1 ± 11.88 per cent dead heart in the genotypes Coimbatore sanna and Tulasiya. However, per cent dead heart at 60 DAT was observed between 32.5 ± 4.8 and 46.82 ± 13.53 in Jig madike and Dappaneya Bilijaddi and were categorized as susceptible (score 7), meanwhile, none of the genotypes were found to be highly susceptible (score 9) (Table 2 and Table 4).

At 90 DAT, per cent white ear was observed between 2.68 ± 2.56 and 4.61 ± 3.35 in Chinne ponni-3 and Bangara sanna-2, were considered as resistant varieties. Likewise, per cent white ear was observed between 6.14 ± 2.44 and 9.71 ± 1.32 in Adi kanne batta-1 and Mara batta-1 and were categorized as moderately resistant. The infestation varied from 11.24 ± 5.58 to 14.52 ± 5.8 per cent white ears in the genotypes Chinnur and Gowri sanna and they were regarded as moderately susceptible genotypes. The infestation from 16.23 ± 2.99 to 17.45 ± 5.23 per cent white ear in Game and Dappaneya Bilijaddi, were regarded as susceptible. However, none of the genotypes were found to be highly resistant and highly susceptible (Table 2 and Table 4).

In parallel to this, 10 popular rice cultivars were also tested for resistance against the YSB. The per cent incidence due to dead heart at 30 DAT ranged from 5.79 ± 6.45 to 41.39 ± 7.18. At 30 DAT, BR 2655 had the lowest incidence of 5.79 ± 6.45 per cent, followed by KRH 4, IR 64 and Tanu (KMP 101) were categorized as resistant with a damage score 1. Subsequently, four other genotypes *viz*., Rasi (IET 1444), Mukthi (CTH 1), Mandya Vijaya and IR 30864

TABLE 4

Categorization of different local landraces of rice against yellow stem borer, *S. incertulas kharif* 2022

| Scale | Per cent damage | | Category | Genotypes | Total Landraces |
|---|---|---|---|---|---|
| | DH | WE | | | |
| 0 | No damage | No damage | HR | - | - |
| 1 | 1-10 | 1-5 | R | Bangara sanna - 2, Chinne ponni - 3, Duddoge, Karikagga, Kotayam - 1 | 5 |
| 3 | 11-20 | 6-10 | MR | Anekombu latte, Andra Basamati, Adi kanne batta - 1, Bangara sanna - 1, Bili mundaga, Budda, Black sticky, Dodda batta, G K - 7, Gandha sale - 2, Itansel, Khushi adikshan, Kanada thumba, Mara batta - 1, PB Local, PSB-87, Possugand, Roy bag, Rahodaya, Rajakime, Siri sanna, Ugi batta, Vanasu | 23 |
| 5 | 21-30 | 11-15 | MS | Antra Sali (233), Chinnur, Coimbatore sanna, Gowri sanna, Gud batta - 2, HMT, Jeerige batta, Kari batta, Narikel, Neermullare, Pushpa, Raskadar, Rathanacho odi - 2, Sanna batta - 2, Sirsi, Tulasiya, White sticky | 17 |
| 7 | 31-60 | 16-25 | S | Dappaneya Bilijaddi, Game, Jig madike, Putta batta - 2, Selam sanna - 1 | 5 |
| 9 | 61 and above | 26 and above | HS | - | - |

were grouped as moderately resistant (score 3). Furthermore, one cultivar, CTH 3 was designated as moderately susceptible (score 5) with 21.54 ± 4.49 per cent incidence. The highest incidence was observed in Jaya (41.39 ± 7.18%) and was grouped as susceptible with a score of 7 (Table 3 and Table 5).

Corresponding to this, at 60 DAT, BR-2655 reported the lowest incidence of 7.22 ± 6.6 per cent dead heart caused by YSB among the evaluated popular rice cultivars. This was followed by KRH 4, Tanu (KMP 101) and IR 64 with per cent incidence of 7.42 ± 2.74, 8.09 ± 2.54 and 8.42 ± 5.75 per cent respectively and these four cultivars were categorized as resistant with a damage score of 1. Subsequently, four cultivars *viz.,* Rasi (IET 1444), Mukthi (CTH 1), IR 30864 and Mandya vijaya were grouped as moderately resistant with a damage score of 3 (Table 3 and Table 5). Likewise, CTH 3 was designated as moderately susceptible (score 5) with 23.68 ± 3.8 per cent incidence. With a score of 7, Jaya (44.12 ± 6.81%) was considered susceptible.

Similarly, at 90 DAT, IR 64, BR 2655, KRH 4 and Tanu (KMP 101) were categorized as resistant varieties with damage score of 1. Followed by Mandya Vijaya, Mukthi (CTH 1), Rasi (IET 1444) and IR 30864 were categorized as moderately resistant varieties with damage score of 3. Further, CTH 3 was designated as moderately susceptible (score 5). Jaya was grouped as susceptible with a score of 7 (Table 3 and Table 5).

Among all the screened local land races, none of them showed a highly resistant reaction, 5 genotypes recorded resistance reaction, which accounted for 10% with an incidence of 4.5 - 9.58, following 23 (46.00%) genotypes were found to be moderately resistant against YSB damage (11.08 – 18.92). Furthermore, in 17 genotypes (34%) moderately susceptible reactions were observed with damage ranging from 21.19 – 28.10 per cent and 5 genotypes (10.80%) were found to be susceptible (31.31 – 46.82), also none of them were found to be highly susceptible (Table 4 and Fig. 1).

TABLE 5

Popular cultivars of rice under different resistance categories against yellow stem borer, *S. incertulas, kharif* 2022

| Scale | Per cent damage | | Category | Genotypes | Total Landraces |
|---|---|---|---|---|---|
| | DH | WE | | | |
| 0 | No damage | No damage | HR | - | — |
| 1 | 1-10 | 1-5 | R | Tanu (KMP 101), KRH 4, IR 64, BR 2655 | 4 |
| 3 | 11-20 | 6-10 | MR | Mandya Vijaya, IR 30864, Rasi (IET 1444), Mukthi (CTH 1) | 4 |
| 5 | 21-30 1 | 11-15 | MS | CTH 3 | |
| 7 | 31-60 | 16-25 | S | Jaya | 1 |
| 9 | 61 and above | 26 and above | HS | - | — |

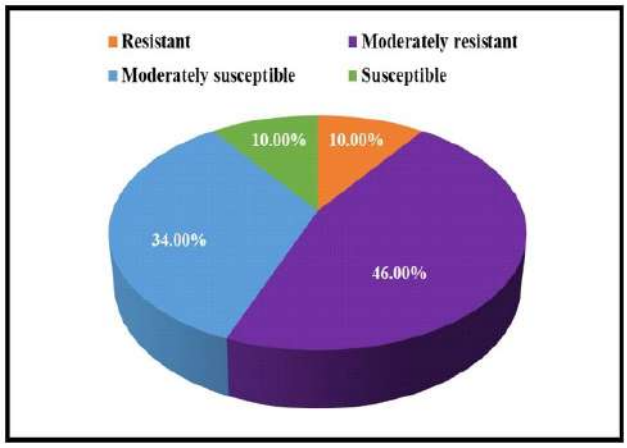


Fig. 1 : Per cent genotypes under different resistance categories (local landraces)

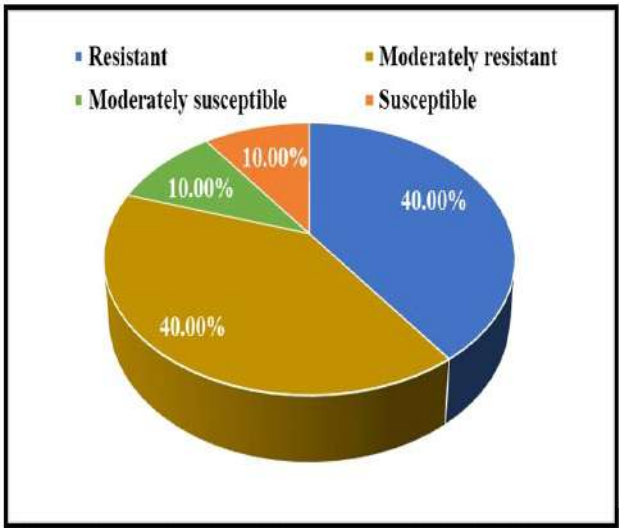


Fig. 2 : Per cent genotypes under different resistance categories (popular cultivars)

Corresponding to this, among all the screened popular cultivars four out of ten genotypes (40%) were found to be resistant and four genotypes (40%) were found to be moderately resistant. Further, one genotype each was found to be moderately susceptible and susceptible accounting for 20 per cent of the genotypes (Table 5 and Fig. 2). But none of them were found to be highly resistant or susceptible cultivars.

The results of the present study are in close agreement with the findings of Chatterjee *et al*. (2021), where the early duration variety *viz.* Narendra 97 and IR 50, the mid-early duration variety *i.e.,* IR 64 and IET 17904 proved resistant against yellow stem borer (dead heart). The medium-duration variety, Ranjit was highly resistant against YSB and the variety, Pratiksha showed a fair degree of resistance against YSB; while Jarava, the late-duration variety exhibited high degree of resistance against yellow stem borer.

Likewise, screening studies on fifty rice local landraces by Megha (2019) reflected high resistance in five genotypes, eight genotypes were recorded as resistant which included Kari munduga, Malgudi sanna-2, Jenugudu, Murkanna sanna, GK-1 and Adari batta. 14 genotypes were found to be moderately resistant. Similarly, seven genotypes were recorded as moderately susceptible and ten genotypes were

reacted as susceptible genotypes. Whereas, in the present investigation Kari munduga, Malgudi sanna-2, Jenugudu, Murkanna sanna, GK-1 and Adari batta were observed to exhibit resistant reactions.

Further, Pandit *et al*. (2023) recorded that out of 50 landraces screened against paddy caseworm, *Nymphula depunctalis* 20 landraces reacted as resistant (1% leaf damage), 9 genotypes showed moderately resistant reaction (1-10% leaf damage), 13 genotypes reacted as moderately susceptible (11-25% leaf damage) and 8 genotypes were showed susceptible reaction (26-50% leaf damage). Parallelly, among 532 rice genotypes evaluated to identify new sources of resistance against brown plant hopper, 6 genotypes were identified as highly resistant and 36 as resistant. Moderate resistance was observed in 112 varieties and the remaining genotypes were categorized in susceptible and highly susceptible groups (Shivukumara *et al*., 2022). The similar results were reported by Soumya and Jagadish (2017).

Similarly, the current findings are on par with the results of Nalini and Bhaskaran (2013) where the genotype CB 08504 had the lowest dead heart incidence (1.48%) with the resistance rating of 1 (resistant). It was followed by TM 08610 (4.65%) and CB 06651 (5.10%). The mechanism of rice varietal resistance to the yellow stem borer may be in terms of vascular bundle arrangement, layers of sclerenchyma tissue, water and silica content. Further, Rajadurai and Kumar (2017) reported that out of 193 genotypes screened, fifty-six genotypes were found resistant, ninety-five were found moderately resistant, twenty-eight were moderately susceptible, eight were susceptible and six were highly susceptible. The resistance in all the genotypes is due to the strong antibiosis and phenolics, as they cause mortality in rice stem (Zhu *et al*., 2002).

Likewise, eight promising rice cultures and six standard check varieties were screened against yellow stem borer under field conditions by Elanchezhyan *et al*. (2017). The stem borer infestation varied from 2.48 to 23.58 per cent dead heart during the vegetative stage and 1.94 to 12.25 per cent white ear during the reproductive stage. The promising rice genotypes ACK 14003, ACK 14004 and BRNS-WP-6 were considered resistant at both vegetative stage and also reproductive stage. ASD 16 was considered moderately resistant and TPS 5 was observed moderately susceptible at vegetative stage but resistant at reproductive stage. None of the genotypes were observed under highly resistance and highly susceptible, which are in line with the present study findings.

In the current investigation, we have undertaken an effort to identify rice varieties displaying resistance to the yellow stem borer on multiple fronts, with the potential for their inclusion in breeding programs. The utilization of host plant resistance mechanisms emerges as a promising, environmentally conscious and cost-effective strategy for pest control, which could lead to a reduction in pesticide usage. Furthermore, cultivating these resistant varieties stands as a vital strategy for efficiently managing insect pests. Our findings demonstrate that the majority of the tested genotypes fall within the categories of resistance or moderate resistance. As such, it becomes imperative to unravel the underlying mechanisms of this resistance, paving the way for their application in future breeding programs aimed at combating the yellow stem borer in paddy cultivation.

## References

ANONYMOUS, 2016, Package of practices for higher yield, University of Agricultural Sciences, Bangalore, Karnataka, India, pp. : 423.

ANONYMOUS, 2021, https://agricoop.gov.in

ANONYMOUS, 2023, https://agricoop.gov.in

CHATTERJEE, S., GANGOPADHYAY, C., DANA, I., ROY, S. K. AND MONDAL, P., 2021, Host plant resistance against yellow stem borer and rice leaf folder through varietal screening of rice. *Plants and Environ.*, **3** (1) : 23 - 29.

ELANCHEZHYAN, K., 2017, Evaluation of promising rice cultures against yellow stem borer, *Scirpophaga incertulas* Walker (Crambidae : Lepidoptera). *J. Entomol. Zool. Stud*., **5** (5) : 1903 - 1905.

KARTHIKEYAN, K. AND PURUSHOTHAMAN, S. M., 2000, Efficacy of carbosulfan against rice stem borer, *Scipophoga incertulas* Walker (Pyralidae: Lepidoptera). *Indian. J. Plant. Prot*., **28** : 212 - 214.

KULAGOD, S. D., HEGDE, M. G.., NAYAK, G. V., VASTRAD, A. S. AND HUGAR, P. S., 2011, Influence of fertilizer on the incidence of insect pests in paddy. *Karnataka J. Agric. Sci.,* **24** (2) : 241 - 243.

MEGHA, C. M., 2019, Studies on population dynamics of yellow stem borer, *Scirpophaga incertulus* (Walker) (Lepidoptera: Pyralidae) in rice with special reference to varietal response, mechanism of resistance and management. *M.Sc. Thesis* (Unpub)*,* Univ. Agric. Sci., Bangalore.

NALINI, R. AND BASKARAN, R. K. M., 2013, Screening of rice genotypes for resistance to yellow stem borer, *Scirpophaga incertulas* (Walker). *Madras Agric. J*., **100** (1-3) : 175 - 178.

NEETA, M., GEETA, C., DINSEH, P. AND AMITABH, M., 2013, Army worm-A serious sporadic insect pest of rice in rewa region of Madhya Pradesh. *Ind. J. of Appl. Res.,* **3** (9) : 489 - 490.

PANDIT., VIJAYKUMAR, L., THIPPAIAH, M., SHIVANNA, B., REDDY, C. L. AND KRISHANAMURTHY, R., 2023, Resistance response of local landraces and advanced rice genotypes to paddy caseworm, *Nymphula depunctalis* (Guenee) under Field Condition. *Mysore J. Agric. Sci.*, **57** (1) : 220 - 228.

PASALU, I. C., KRISHINATH, N. V., KOTTI, G. AND VARMA, N. G. R., 2002, *IPM in rice Mitr*. pp. : 45 - 55.

PATHAK, M. D. AND KHAN, Z. R., 1994, Insect pests of rice. *International Rice Research Institute*, UPLB, Philippines.

RAJADURAI, G. AND KUMAR, K., 2017, Evaluation of 193 rice entries against yellow stem borer, *Scirpophaga incertulas. J. Entomol. Res*., **41** (2) : 133 - 144.

SALIM, M., 2002, Final technical DFID project report. Tillage by nutrient interaction in rice-wheat system, *NARC*, Islamabad. pp. : 13 - 25.

SHIVUKUMARA., VIJAYKUMAR, L., KITTURMATH, M. AND SHIVANNA, B., 2022. Mechanism of host plant resistance in rice genotypes against brown planthopper. *Mysore J. Agric. Sci.*, **56** (2) : 345 - 352.

SOUMYA, M. S. AND JAGADISH, K. S., 2017, Field evaluation of sunflower (*Helianthus annuus* L.) genotypes for their reaction to green leaf hopper, *Amrasca biguttula biguttula* (Ishida) (Hemiptera: Cicadellidae) infestation. *Mysore J. Agric. Sci*., **51** (2) : 271 - 275.

ZHU, Z. P., BORROMEO, A. M. AND COHEN, M. B., 2002, Comparison of stem borer damage and resistance in semi-dwarf indica rice varieties and prototype lines of a new plant type. *Field. Crop. Res*., **75** (1) : 37 - 45.