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Reaction of Manipuri local rice cultivars against different minor insect pests of paddy

Balaga Mohan Ganesh and Punam Bagang

Abstract
A field experiment has been conducted during *Rabi* 2017-18 at College of Agriculture, CAU, Imphal, Department of Entomology with 42 local Manipuri rice cultivars along with Susceptible check (Liemaphou). During the study period of whorl maggot infestation observed during 30, 45 and 60 DAT in terms of percent leaf damage ranged from 2.23 to 5.64. The rice case worm infestations were observed only in the early crop stage during the study period, the entries Shangao (2.50 Percent damage leaves) and Tatha (2.66 Percent damaged leaves) recorded lowest incidence. Whereas standard check (5.79) and Napduina (5.30. recorded the highest incidence. The incidence of the two hoppers *viz*. BPH and GLH were low during study period. No severe symptoms of BPH infestations were recorded and also no symptoms of hopper-transmitted diseases were also recorded. The average population of BPH among entries was recorded lowest in Phouren Phoujao with 0.10 population per hill and highest leimaphou with 0.83 population per hill.

Keywords: *Oryza sativa*, percent leaf damage**,** susceptible check (Liemaphou), whorl maggot, BPH, GLH and case worm

Introduction
Rice (*Oryza sativa* L.) is one of the major staple food crop of Poaceae family. Rice crop stands 2nd in the position of total world food production. Rice (*Oryza sativa* L.) is the most widely consumed stable food crop for a large part of the world's human population, especially in Asia and over half of the global population depends on it for their feed (Singh *et al*. 2014 and Lal *et al*., 2014) [8, 13]. Human population is increasing up to 7 billion and more than one half depend on rice as their major diet. India, the second largest rice growing country has a production of 104.32 million tonnes and cultivation area of about 44.6 million hectares with an average productivity of 2.34 tonnes per hectare (Anonymous, 2013 and Rajasekar and Jeyakumar, 2014) [2, 12]. Agriculture is a dominant occupation of the people in Manipur. Paddy is the most dominant and staple food crop grown in Manipur. It is grown in hilly and plain areas of the state and is mainly grown during kharif season. The crop is cultivated in an area of 1,76,310ha, with production of 435.9 thousand tonnes. The productivity of Rice in Manipur is 2413.52kg/ha (Anonymous, 2005) [1]. Rice productivity is adversely affected by numerous of biotic and abiotic factors in world. An approximately 52 Percent of the world food production of rice lost annually owing to the damage caused by the biotic factors, out of which 21 Percent loss is contributed due to insect pest attack (Brookes and Barfoot, 2003) [3]. The rice crop is subjected to the persistent pressure of more than 100 different insect species and 20 of them are of major economic significance (Pathak, 1969; Kapur, 1967) [10, 7]. In Asia pest alone reduce about 30 Percent of rice production (Heinrichs *et al.*, 1978) [5]. There are some pests which was earlier considered as minor pest like rice case worm, rice hispa, and whorl maggot which are turning now a days into major pests (Jenita *et al.* 2006) [6]. During the past 8-9 years several insect pests have begun to harm rice in Manipur. Some are spreading into new areas. Due to climate change, a new trends of insect pests of rice were also identified in Manipur. Considering the above facts, the present paper entitled as "Reaction of Manipuri Local Rice Cultivars against different Minor Insect Pests of Paddy".

Materials and Methods
To screen the rice entries against different minor insect pests *viz*. Whorl Maggot, Case worm, Brown Plant hopper and green leaf hopper, a field experiment has been conducted during *rabi* 2017-18 at College of Agriculture, CAU, Imphal, Department of Entomology with 42 entries along with Susceptible check (Liemaphou) were used for the experiment (Table 1).

The experiment was laid out in a Randomized Block Design with three replications. The entries were raised in nursery and at 25 days after sowing (DAS) the seedlings were transplanted in the main field with the spacing of 20 × 10 cm. The recommended dose of fertilizers of 120: 40: 40 kg/ha NPK were applied as per the crop production guide (Anonymous, 2005) [1].

Recording on infestation of different insect pest species was started from 30 days after transplanting and continued at 15 days interval till the crop reach near maturity. For observation of different insect species infestation following methods were followed.

a) Whorl Maggot (*Hydrellia philippina*)

Observations on Whorl maggot infestation were taken at 30, 45 and 60 DAT from randomly selected hills in each replication. In each hill, the total number of leaves and total number of damage leaves by whorl maggot were counted and converted into Percent damage leaves by whorl maggot with the following formulae

$$\text{Percent damage leaves} = \frac{\text{Number of damaged leaves per hill}}{\text{Total number of leaves per hill}} \text{X } 100$$

b) Case worm (*Paraponyx stagnalis*)

Case worm infestations were recorded as Percent damage leave by caseworm. Observations were recorded from randomly selected 10 hills in each replication. In each selected hill, the total number leaves and total number of damage leaves by leaf folder were counted and converted into Percent damage leaves by case worm with the following formulae

$$\text{Percent damage leaves} = \frac{\text{Number of damaged leaves per hill}}{\text{Total number of leaves per hill}} \text{X } 100$$

c) Brown plant hopper (*Nilaparvata lugens*)

Infestation by brown plant hopper was recorded at 30,45 60,75,90,105 DAT. During the observation, the population of BPH was va ery less and visible symptom of infestation were not express by the plants. Hence the damage assessment cause by BPH following standard evaluation system score could not be done. Only population per hill were counted from 10 randomly selected hills per replication.

d) Green leaf hopper (*Nephotettix virescens*)

Infestation by green leaf hopper was recorded at 30,45 60,75, and 90 DAT. During the observation, the population of GLH was very less and visible symptom of infestation were not express by the plants. Hence the damage assessment cause by GLH following standard evaluation system score could not be done. Only population per hill were counted from 10 randomly selected hills per replication.

Results and Discussion

During Rabi 2017-18, a total of 42 local rice accessions including susceptible check were screened for resistance reaction against major insect pests of rice in Manipur. Among insect pests, we observed 4 insect pests of rice (i.e. Whorl maggot, Case worm, Green leaf hopper and Brown plant hopper) which were reported as minor importance and their incidence studies has been discussed below.

Incidence of Whorl maggot (*Hydrellia philippina*)

The incidence of whorl maggot was high in the early crop stage and it reduces as the crop age advances. Rice whorl maggot as a pest of vegetative crop stage was reported by Litsinger *et al.*, (2013) [9]. The incidence of rice whorl maggot were observed at 30,45, and 60 DAT as the incidence of rice whorl maggot reduces when the crop advances to maturity (Table 1). The incidence was high at the early stage of the crop. At 30DAT, the incidence of the pest declined and at 60 DAT, the infestation ranges from 0 to 4.33 Percent damage leaves.

The average infestation of the observation ranges from 2.33 to 5.96 Percent damage leaves. Among the 42 entries, the lowest incidence was recorded in Phouren Khongnembi (2.65 Percent damage leaves), Moirangphou Khokngnbi (2.65 Percent damage leaves), Shangao (2.78 Percent damage leaves), Chingphou (2.85 Percent damage leaves) and Heitupphou (2.95 Percent damage leaves) in ascending order. In the contrary, the average highest incidence in terms of Percent damage leaves were recorded in standard check (5.96) Mileing Manthowean (5.64), Mashi Manui (4.99), Langzam (4.78) and Napi Phou (4.72). In contrast to the above findings, Chaterjee *et al.*, (2016) [4] reported that the lowest whorl maggot incidence was discernible in RP 5587-B-B-B-267-1 (4.78%) followed by RP 5588-B-B-B-B-76 (5.09%), RP 5588-B-B-B-258-1 (5.16%) and RP 5588-B-B-B-133 (5.29%).

Incidence of Case worm (*Paraponyx stagnalis*)

The incidence of case worm was recorded only at vegetative stage of the crop as the incidence was very low in the reproductive stage of the crop. The observations only at 30 and 45 DAT are shown in Table 2. At 30 DAT, the Percent damage leaves due to case worm infestation ranges from 3.02 in Thangjingphou to 10.54 in Napduina. However, at 40 DAT, the Percent damage of leaves ranged from 0.41 on Bungpat to 5.16 on Tareshang. The mean of the damage leaves. Among the entries the five average lowest infestations were observed in Shangao (2.50 Percent damage leaves), Tatha (2.66 Percent damage leaves), Chedo (2.69 Percent damage leaves), Ching Phou (2.74 Percent damage leaves) and Thangjingphou (2.77 Percent damage leaves) in ascending order. Higher mean Percent damage leaves were recorded in standard check (5.79), Napduina (5.30), Tareshang (4.88), Heimangphou (4.87), and Mieling Manthowean (4.70) in descending order. Similarly, Poonam *et al.*, (2021) [11] reported that the lowest incidence of caseworm was found in Radha-4 followed by Ramdhan, Mansuli, Sukkha-3, Sabitri and Sama Mansuli sub-1 respectively. The experiment showed that the yield loss was significantly lower in Radha-4 followed by Sabitri, Ramdhan, Mansuli, Makawanpur-1, Sukkha-3 and Sama Mansuli sub-1, respectively.

Incidence of Brown plant hopper (*Nilaparvata lugens*)

The infestation of Brown plant hopper was very low during the study period. Hence the population at 30 and 45 DAT only are shown at Table 3. During, the observation, the plant hopper populations were recorded as plant hopper per hill. At 30 DAT, the hopper population ranges from nil to 0.9. Entries with no incidence by green leaf hopper were observed in Naga Buh, Phouren Noining, Chedo, bupui, Heitupphou,

Phourel Amubi, Moirangphou keknagambi and Mathi Boro Mono. However, at 45 DAT the population of BPH recorded highest in leimaphou with 0.70 populations per hill and nil population in Moirang Phou. The average population of BPH among entries was recorded lowest on Phouren Phoujao with 0.10 population per hill and highest leimaphou with 0.83 population per hill.

Incidence of Green leaf hopper (*Nephotettix virescens*)

The infestation of green leaf hopper was very low during the study period. Hence the population at 30 and 45 DAT only are shown at Table 4. During, the observation, the leaf hopper populations were recorded as leaf hopper per hill. At 30 DAT, the leaf hopper population ranges from nil to 0.9. Entries with no incidence by green leaf hopper were observed in Napudina and Mathi Boro Mono. However, at 45 DAT the population of GLH recorded highest in leimaphou with 0.90 population per hill and lowest in Tathai with 0.10 population per hill. The average population of GLH among test entries was recorded lowest in Mashi and Mathi Boro Mono with 0.15 population per hill and highest on Leimaphou with 0.85 population per hill.

Table 1: Percent infestation of Whorl maggot of rice in certain rice cultivars of Manipur during *Rabi* 2017-18

Local rice accessions	Percent of damage leaves by Whorl maggot			Mean of Percent whorl maggot damage
	30DAT	45DAT	60DAT	
Naga Buh	11.30(3.43)	6.10(2.56)	1.63(1.46)	44.61.(2.48)8)
Tathai	8.47(2.99)	4.75(2.29)	1.12(1.27)	3.85(2.18)
Mashi Manui	15.55(4.00)	5.62(2.47)	0(0.70)	4.99(2.39)
Aso	10.41(3.39)	7.22(2.77)	0(0.70)	4.72(2.262)
Napduina	11.44(3.45)	6.36(2.61)	0(.707)	4.50(2.260)
Ago Manui (chakhao)	8.50(2.50)	8.06(2.92)	1.10(1.26)	4.34(2.396)
Mileing manthoweam	12.9(3.66)	8.6(3.01)	0(0.70)	5.64(2.46)
Moirangphou	11.39(3.44)	5.1(2.366)	0(0.70)	3.9(2.173)
Heimang Phou	10.15(3.26)	6.00(2.54)	1.21(1.3)	4.31(2.373)
Mashi	10.31(3.28)	6.86(2.71)	0(0.70)	4.44(2.23)
Chaku	7.43(2.81)	3.55(2.011)	0(0.707)	3.01(1.44)
Langmanbi	10.11(3.25)	4.92(2.32)	1.16(1.21)	3.65(2.29)
Kakcheng Phou	8.38(2.97)	4.44(2.22)	0.61(1.05)	3.22(2.08)
Langzam	11.93(3.52)	5.96(2.54)	0(0.70)	4.78(2.25)
Bungpat	9.61(3.17)	5.55(2.45)	0(0.70)	3.39(2.11)
Mathi Boro Mono	10.32(3.28)	7.90(2.89)	0.71(1.1)	4.48(2.42)
Khaenoh	10.13(3.26)	5.99(2.54)	0(0.70)	3.87(2.17)
Chaugoi	7.9(2.89)	9.91(3.22)	0(0.70)	4.25(2.27)
Thoibi	9.29(3.12)	6.005(2.55)	0(0.70)	3.68(2.12)
Tatha(chiru)	6.19(2.58)	5.25(2.39)	0(0.70)	3.01(1.89)
Stao amniemte	6.32(2.61)	6.49(2.64)	0(0.70)	3.33(1.98)
Phourel Amubi	8.65(3.02)	4.93(2.33)	0.56(1.02)	3.27(2.12)
Heitup Phou	6.92(2.72)	4.08(2.14)	0(0.70)	2.95(1.85)
kikhu	8.18(2.94)	4.33(2.19)	0(0.70)	3.24(1.95)
Lang Phou	8.22(2.95)	6.34(2.61)	0(0.70)	3.32(2.09)
Kiebi Phou	7.57(2.84)	4.17(2.16)	1.18(1.29)	3.88(2.09)
Tareshang	6.48(2.64)	4.41(2.21)	0(0.70)	3.83(2.04)
Shangao	6.16(2.58)	4.00(2.12)	0(0.70)	2.78(1.74)
Ching Phou	7.47(2.82)	5.12(2.37)	0(0.70)	2.85(1.96)
Mingoli	5.68(2.48)	5.94(2.5)	0(0.70)	3.09(1.910)
Phouren Noining	8.68(3.02)	5.87(2.52)	0(0.70)	3.57(2.08)
Tei	8.645(3.02)	5.19(2.38)	1.11(1.26)	3.55(2.2)
Napi Phou	7.26(2.78)	6.13(2.57)	0(0.70)	3.15(2.02)
Chedo	9.83(3.21)	4.17(2.16)	0(0.70)	2.65(1.254)
Moirangphou Khoknaganbi	7.66(2.85)	6.03(2.55)	0(0.707)	3.26(2.03)
Bupui	8.6(3.0)	7.14(2.76)	0(0.70)	3.78(2.16)
Manui Kacharva	8.62(3.01)	4.16(2.15)	0(0.70)	3.19(1.96)
Phouren Phoujao	6.51(2.64)	4.54(2.24)	1.19(1.3)	3.17(2.06)
Phouren Khongnembi	6.50(2.64)	6.95(2.72)	0(0.70)	2.23(1.51)
Niirui	9.43(3.15)	5.22(2.32)	0(0.70)	3.52(2.08)
Thanjing Phou	7.12(2.76)	6.06(2.56)	0(0.70)	3.20(2.00)
KD-2-6-3 (Leimaphou)	9.28(3.12)	8.14(2.91)	4.33(2.14)	5.96(2.75)
S.E.D. (±)	0.22	0.24	0.12	0.23
CD (0.05%)	0.78	0.49	0.25	0.46

*Figures in parentheses are square root transformed values

Table 2: Percent infestation of Case worm of rice in certain rice cultivars of Manipur during *Rabi* 2017-18

Local rice accessions	Percent of damage leaves by case worm		Mean of Percent case worm damage
	30DAT	45DAT	
Naga Buh	4.24(2.17)	2.387(1.69)	08(3.781.(1.93)
Tathai	6.32(2.61)	2.70(1.80)	3.75(2.20)
Mashi Manui	10.33(3.29)	2.055(1.59)	4.60(2.44)
Aso	7.77(2.87)	3.72(2.05)	4.68(2.46)
Napduina	10.54(3.32)	5.14(2.37)	5.30(2.84)
Ago Manui (chakhao)	8.22(2.95)	2.7(1.78)	3.70(2.37)
Mileing manthoweam	6.76(2.69)	2.51(1.73)	4.70(2.21)
Moirangphou	7.20(2.77)	1.67(1.47)	3.57(2.12)
Heimang Phou	7.10(2.7)	3.26(1.93)	4.87(2.74)
Mashi	9.45(3.12)	1.53(1.42)	4.45(2.28)
Chaku	7.78(2.87)	1.91(1.55)	3.25(2.21)
Langmanbi	5.91(2.5)	3.24(1.9)	3.77(2.23)
Kakcheng Phou	6.44(2.63)	2.08(1.60)	3.35(2.12)
Langzam	7.76(2.82)	2.14(1.62)	4.12(2.24)
Bungpat	7.41(2.81)	0.41(0.95)	3.35(1.88)
Mathi Boro Mono	5.54(2.45)	0.77(1.12)	3.88(1.79)
Khaenoh	4.67(2.23)	2.88(1.83)	3.48(2.05)
Chaugoi	6.35(2.65)	1.63(1.45)	4.4(2.03)
Thoibi	5.47(2.44)	3.00(1.87)	3.63(2.15)
Tatha(chiru)	4.15(2.15)	0.90(1.186)	2.66(1.67)
Stao amniemte	7.63(2.855)	1.61(1.45)	3.81(2.15)
Phourel Amubi	5.51(2.45)	1.29(1.34)	3.11(1.89)
Heitup Phou	4.7(2.21)	2.58(1.75)	2.863(2.01)
Kikhu	5.06(2.35)	1.59(1.44)	2.84(1.90)
Lang Phou	4.368(2.24)	1.72(1.48)	3.15(1.84)
Kiebi Phou	4.66(2.23)	2.69(1.78)	3.30(2.02)
Tareshang	6.1(2.56)	5.16(2.37)	4.88(2.474)
Shangao	4.12(2.14)	1.61(1.45)	2.50(1.801)
Ching Phou	4.2(2.167)	1.56(1.43)	2.74(1.801)
Mingoli	5.02(2.34)	1.18(1.29)	3.04(1.822)
Phouren Noining	4.14(2.15)	1.98(1.57)	3.11(1.86)
Tei	4.49(2.21)	3.09(1.8)	3.48(2.06)
Napi Phou	4.85(2.31)	2.51(1.73)	3.32(2.023)
Chedo	4.62(2.26)	1.05(1.24)	2.69(1.753)
Moirangphou Khoknaganbi	4.46(2.26)	2.3(1.67)	3.21(1.95)
Bupui	3.82(2.07)	2.74(1.8)	3.49(1.93)
Manui Kacharva	6.50(2.64)	1.93(1.55)	3.15(2.10)
Phouren Phoujao	5.99(2.54)	1.67(1.47)	3.31(2.01)
Phouren Khongnembi	3.54(2.05)	2.01(1.58)	3.14(1.79)
Niirui	5.20(2.38)	1.71(1.48)	3.13(1.93)
Thanjing Phou	3.02(1.87)	1.58(1.4)	2.77(1.65)
KD-2-6-3 (Leimaphou)	5.94(2.56)	4.58(2.25)	5.79(2.39)
S.E.D. (±)	0.16	0.21	0.23
CD	0.31	0.43	0.47

*Figures in parentheses are square root transformed values

Table 3: Percent Brown plant hopper population in certain rice cultivars of Manipur during *Rabi* 2017-18

Local rice accessions	Percent brown plant hopper population		Mean of brown plant hopper population
	30DAT	45DAT	
Naga Buh	0(0)	0.30(0.30)	000.33 (1.9)
Tathai	0.20(0.20)	0.20(0.20)	0.31(0.20)
Mashi Manui	0.10(0.10)	0.50(0.52)	0.48(0.31)
Aso	0.60(0.64)	0.20(0.20)	0.52(0.42)
Napduina	0.30(0.303)	0.20(0.20)	0.22(0.25)
Ago Manui (chakhao)	0.40(0.41)	0.10(0.100)	0.52(0.25)
Mileing manthoweam	0.60(0.64)	0.30(0.30)	0.51(0.47)
Moirangphou	0.70(0.77)	0(0)	0.47(0.38)
Heimang Phou	0.60(0.64)	0.30(0.30)	0.48(0.47)
Mashi	0.50(0.52)	0.10(0.10)	0.24(0.311)
Chaku	0.10(0.10)	0.60(0.64)	0.35(0.371)
Langmanbi	0.60(0.64)	0.30(0.30)	0.54(0.47)
Kakcheng Phou	0.50(0.52)	0.40(0.41)	0.36(0.46)
Langzam	0.30(0.30)	0.20(0.20)	0.31(0.25)

Bungpat	0.20(0.2)	0.50(0.52)	0.53(0.36)
Mathi Boro Mono	0(0)	0.30(0.30)	0.15(0.22)
Khaenoh	0.20(0.20)	0.70(0.77)	0.45(0.48)
Chaugoi	0.60(0.64)	0.10(0.10)	0.29(0.37)
Thoibi	0.70(0.77)	0.50(0.52)	0.6(0.64)
Tatha(chiru)	0.50(0.59)	0.10(0.10)	0.42(0.31)
Stao amniemte	0.10(0.10)	0.20(0.20)	0.39(0.21)
Phourel Amubi	0(0)	0.30(0.30)	0.33(0.23)
Heitup Phou	0(0)	0.10(0.10)	0.11(0.15)
Kikhu	0.20(0.20)	0.60(0.64)	0.31(0.42)
Lang Phou	0.30(0.30)	0.20(0.20)	0.4(0.25)
Kiebi Phou	0.20(0.20)	0.40(0.41)	0.33(0.30)
Tareshang	0.10(0.10)	0.50(0.52)	0.54(0.31)
Shangao	0.40(0.4)	0.30(0.30)	0.59(0.35)
Ching Phou	0.20(0.20)	0.20(0.20)	0.32(0.20)
Mingoli	0.10(0.10)	0.30(0.30)	0.41(0.20)
Phouren Noining	0(0)	0.40(0.41)	0.44(0.20)
Tei	0.30(0.30)	0.20(0.20)	0.37(0.25)
Napi Phou	0.70(0.77)	0.60(0.64)	0.59(0.70)
Chedo	0(0)	0.40(0.41)	0.41(0.20)
Moirangphou Khoknaganbi	0(0)	0.40(0.41)	0.47(0.20)
Bupui	0(0)	0.30(0.30)	0.51(0.71)
Manui Kacharva	0.30(0.30)	0.50(0.52)	0.40(0.41)
Phouren Phoujao	0(0)	0.20(0.20)	0.10(0.10)
Phouren Khongnembi	0.20(0.20)	0.30(0.30)	0.37(0.25)
Niirui	0.20(0.201)	0.60(0.641)	0.4(0.42)
Thanjing Phou	0.30(0.30)	0.20(0.20)	0.37(0.2)
KD-2-6-3 (Leimaphou)	0.90(1.11)	0.70(0.77)	0.83(0.96)
S.E.D (±)	0.088	0.089	0.20
CD	0.175	0.177	0.42

*Figures in parentheses are Arcsin transformed values

Table 4: Percent green leaf hopper population of rice in certain rice cultivars of Manipur during *Rabi* 2017-18

Local rice accessions	Percent leaf green leaf hopper population		Mean of green leaf hopper population
	30DAT	45DAT	
Naga Buh	0.60(0.64)	0.30(0.3)	00.45 (0.47)
Tathai	0.30(0.30)	0.1(0.10)	0.20(0.20)
Mashi Manui	0.70(0.77)	0.50(0.5)	0.60(0.64)
Aso	0.90(1.1)	0.30(0.30)	0.60(0.712)
Napduina	0(0)	0.40(0.41)	0.20(0.20)
Ago Manui (chakhao)	0.80(0.9)	0.60(0.64)	0.70(0.785)
Mileing manthoweam	0.70(0.77)	0.40(0.41)	0.55(0.593)
Moirangphou	0.70(0.77)	0.40(0.41)	0.55(0.59)
Heimang Phou	0.50(0.52)	0.50(0.52)	0.50(0.52)
Mashi	0.20(0.20)	0.10(0.10)	0.15(0.15)
Chaku	0.30(0.30)	0.40(0.41)	0.35(0.35)
Langmanbi	0.50(0.52)	0.70(0.77)	0.60(0.64)
Kakcheng Phou	0.30(0.30)	0.30(0.30)	0.30(0.30)
Langzam	0.50(0.52)	0.20(0.20)	0.35(0.36)
Bungpat	0.90(1.1)	0.40(0.41)	0.65(0.76)
Mathi Boro Mono	0(0)	0.30(0.30)	0.15(0.15)
Khaenoh	0.60(0.64)	0.30(0.30)	0.45(0.47)
Chaugoi	0.30(0.30)	0.20(0.20)	0.25(0.25)
Thoibi	0.70(0.77)	0.50(0.52)	0.6(0.64)
Tatha(chiru)	0.40(0.41)	0.60(0.64)	0.50(0.52)
Stao amniemte	0.70(0.77)	0.40(0.41)	0.55(0.59)
Phourel Amubi	0.80(0.92)	0.10(0.10)	0.45(0.51)
Heitup Phou	0.80(0.92)	0.50(0.52)	0.65(0.72)
kikhu	0.30(0.30)	0.20(0.20)	0.25(0.253)
Lang Phou	0.60(0.64)	0.40(0.41)	0.50(0.52)
Kiebi Phou	0.40(0.41)	0.30(0.30)	0.35(0.35)
Tareshang	0.90(1.11)	0.50(0.52)	0.78(0.88)
Shangao	0.90(1.11)	0.60(0.641)	0.55(0.68)
Ching Phou	0.50(0.52)	0.30(0.304)	0.40(0.41)
Mingoli	0.70(0.77)	0.40(0.41)	0.55(0.59)
Phouren Noining	0.90(1.11)	0.30(0.30)	0.6(0.71)

Tei	0.60(0.64)	0.30(0.30)	0.45(0.17)
Napi Phou	0.80(0.92)	0.30(0.30)	0.55(0.61)
Chedo	0.90(1.11)	0.20(0.20)	0.55(0.66)
Moirangphou Khoknaganbi	0.60(0.64)	0.70(0.77)	0.65(0.709)
Bupui	0.50(0.52)	0.40(0.41)	0.45(0.46)
Manui Kacharva	0.40(0.41)	0.40(0.41)	0.4(0.41)
Phouren Phoujao	0.30(0.30)	0.30(0.30)	0.3(0.30)
Phouren Khongnembi	0.60(0.64)	0.30(0.30)	0.45(0.47)
Niirui	0.50(0.52)	0.30(0.30)	0.40(0.41)
Thanjing Phou	0.50(0.52)	0.40.41)	0.45(0.46)
KD-2-6-3 (Leimaphou)	0.80(0.92)	0.90(1.1)	0.85(1.02)
S.E.D (±)	0.14	0.10	0.18
CD	0.29	0.21	0.37

*Figures in parentheses are Arcsin transformed values

Average infestation of certain major insect pests of rice in some local rice genotypes of Manipur during *Rabi* 2017-18

According to table 1, the average of infestation of whorl maggot of three observations *i.e.* at 30, 45 and 60 DAT in terms of Percent leaf damage ranged from 2.23 to 5.64. The lower incidence was recorded in Phouren Khongnembi (2.65% damage leaves), Moirang Phou Khekngnbi (2.65% damage leaves), Shangao (2.78% damage leaves), Ching Phou (2.85% damage leaves) and Heitup Phou (2.95% damage leaves) in ascending order. The entries standard check (5.96% damage leaves) Mileing Manthowean (5.64% damage leaves), Mashi Manui (4.99% damage leaves), Langzam (4.78% damage leaves) and Napi Phou (4.72% damage leaves) recorded higher incidence in descending.

The rice case worm infestations were observed only in the early crop stage during the study period (Table 2). The incidence was recorded as Percent damage leaves. The entries Shangao (2.50% damage leaves), Tatha (2.66% damage leaves), Chedo (2.69% damage leaves), Ching Phou (2.74% damage leaves) and Thangjing Phou (2.77% damage leaves) recorded lowest incidence whereas standard check (5.79% damage leaves), Napduina (5.30% damage leaves), Tareshang (4.88% damage leaves), Heimangphou (4.87% damage leaves), and Mieling Manthowean (4.70% damage leaves).

The incidence of the two hoppers *viz.* BPH and GLH were low during the study period. No severe symptoms of BPH infestations were recorded and also no symptoms of hopper-transmitted diseases were also recorded. The average population of BPH among entries was recorded as lowest on Phouren Phoujao with 0.10 population per hill and highest in leimaphou with 0.83 population per hill (Table 3 and 4).

Conclusion

While screening it has been observed that out of 42 local rice accessions (including susceptible check). The maximum whorl maggot incidence observed in Leimapohu and Mileing manthowean with mean values of 5.96 and 5.64 Percent, respectively. The minimum whorl maggot was observed in Khaenoh and chingphou with mean values of 2.23 and 2.65 Percent, respectively. The results on the effect of test varieties on case worm indicated that the varieties, Leimaphou and Napduina showed the highest mean leaf damage of 5.79 and 5.30 Percent, respectively. The lowest infestation of case worm was observed at Shangao and Tatha, with a mean leaf damage of 2.50 and 2.66 Percent, respectively.

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