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Seasonal incidence of natural enemies predominance in the rice ecosystem

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Abstract

The field experiments were carried out during *kharif* 2020 and 2021 at the Agriculture Research Station, Sakoli, Dist. Bhandara (Maharashtra) under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola. The findings of this study showed a considerable impact of climatic variables on the biology of natural enemies such as green mirid bug, brown mirid bug, spiders and coccinellids beetle. In *kharif* 2020, the highest abundance of green mirid bugs and brown mirid bugs were seen at a 45th SMW (4.13 nos./hill and 10.26 nos./hill). The maximum abundance of spider and lady bird beetle was observed at 40th SMW (0.40 nos./hill) and 38th SMW (0.70 nos./hill). In *kharif* 2021 highest abundance of green mirid bug and brown mirid bug were seen at 43rd SMW of (2.53 nos./hill) and 46th SMW (7.73 nos./hill). The highest population of spiders and coccinellid beetles was recorded at 46th SMW with a population of 0.63 nos./hill and 0.63 nos./hill, respectively.

Keywords: Brown mirid bug, coccinellid beetle, green mirid bug, natural enemy rice, spiders

Introduction

Rice (*Oryza sativa* L.) is one of the most important cereals among the field crops, feeding more than 50% population of the world. It is an important staple food for most of the population. Many insect pests infested it. Many chemical and botanical insecticides exist to manage these pests, but many natural enemies are already present in the field that our farmer neglects. They also play an important role in the management of the pest of any crop. Terrestrial arthropods include rice pests, their natural enemies and non-rice pest insects that visit rice ecosystems for other concerns (Thongphak *et al.* 2012) [6]. In a rice ecosystem having natural enemies complexes such as mirid bugs, spiders, ladybird beetle, dragonfly and damselfly, naturally occurring biological control has a potential role to play in the management of insect pests in rice fields (Mukherjee and Khan 2017) [4]. Climate change, especially temperature increase, affects insect physiology, behaviour, development, species distribution, and abundance, evidenced by changes in the population of natural enemies in the field. Natural enemies play an important role in scheduling the proper management practices. So, it is important to study the abundance of natural enemies to develop the best management strategies and find their highest abundance regarding the pest population in the field.

Materials and Methods

The field experiments were carried out at the research farm of Agriculture Research Station, Sakoli, Dist. Bhandara (MS) under Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, during the *kharif* season of 2020 and 2021. The field layout was done before planting. In the experimental plot of 400 m², seeds of PKV HMT were treated with a 3% brine solution before being sown on raised beds. Puddling of soil was performed by tractor after it had been covered with water for one to two days for proper water absorption and to soften the soil. Using nylon string, measuring tape, and wooden pegs, seedlings were transplanted according to experimental design. 2-3 PKV HMT seedlings per hill in puddled soil were transplanted at 20 x 15 cm of spacing apart. The total number of natural enemies was recorded by counting the number of natural enemies per hill. Data on natural enemies in ten hills was recorded and reported ten days after each application.

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Results and Discussion

Seasonal abundance of natural enemies during *kharif* 2020

The data presented in Table 1 and depicted in Fig 1 revealed that the population of green mirid bug and brown mirid bug were observed from 38th SMW *i.e.* fourth week of September and the highest activity were seen at 45th SMW *i.e.* second week of November, with the population of 4.13 nos./hill and 10.26 nos./hill, respectively. Whereas, the population of spider and lady bird beetle was observed from 35th SMW *i.e.* first week of August (0.06 nos./hill and 0.13 nos./hill) and maximum abundance (0.40 nos./hill) occurred at 40th SMW *i.e.* first week of October and 38th SMW (0.70 nos./hill) *i.e.* fourth week of September.

Table 1: Seasonal incidence of pests of rice during *kharif* 2020

Date	MW	Natural enemies (No./hill)			
		Mirid Bug		Spider	Lady Bird Beetles
		Green Mirid Bug	Brown Mirid Bug		
2.7.2020	26	0.00	0.00	0.00	0.00
7.7.2020	27	0.00	0.00	0.00	0.00
14.7.2020	28	0.00	0.00	0.00	0.00
21.7.2020	29	0.00	0.00	0.00	0.00
27.7.2020	30	0.00	0.00	0.00	0.00
1.8.2020	31	0.00	0.00	0.00	0.00
11.8.2020	32	0.00	0.00	0.00	0.00
17.8.2020	33	0.00	0.00	0.00	0.00
24.8.2020	34	0.00	0.00	0.00	0.00
1.9.2020	35	0.00	0.00	0.06	0.13
7.9.2020	36	0.00	0.00	0.20	0.16
14.9.2020	37	0.00	0.00	0.36	0.13
21.9.2020	38	0.50	0.33	0.33	0.70
29.9.2020	39	0.81	1.16	0.40	0.23
6.10.2020	40	3.00	3.97	0.40	0.23
12.10.2020	41	2.87	4.70	0.23	0.40
19.10.2020	42	2.50	4.00	0.43	0.30
27.10.2020	43	2.53	5.00	0.43	0.33
2.11.2020	44	3.03	6.80	0.40	0.36
9.11.2020	45	4.13	10.26	0.40	0.43
17.11.2020	46	3.50	8.63	0.30	0.50
24.11.2020	47	3.20	8.63	0.30	0.36

Seasonal abundance of natural enemies during *kharif* 2021

The data presented in Table 2 and depicted in Fig 2 revealed that the population of green mirid bug and brown mirid bug were observed from 39th SMW *i.e.* last week of September, and the highest activity was seen at 43rd SMW *i.e.* second week of November, with the population, of 2.53 nos./hill and at 46th SMW *i.e.* the third week of November with the population of 7.73 nos./hill. The population of spiders was recorded from 32nd SMW *i.e.* the second week of August (0.02 nos./hill), and maximum abundance (0.63 nos./hill) occurred at 46th SMW *i.e.* the third week of November. While the abundance of lady bird beetle was observed from 33rd SMW (0.03 nos./hill) *i.e.* the third week of August and the maximum population (0.63 nos./hill) was seen at 46th SMW *i.e.* the third week of November.

Pooled seasonal abundance of natural enemies during *kharif* 2020 and *kharif* 2021

The data presented in Table 3 and depicted in Fig 3 revealed that the population of green mirid bug and brown mirid bug were observed from 38th SMW *i.e.* the third week of September and the highest activity was seen at 45th SMW *i.e.*

second week of November, with the population of 3.27 nos./hill and at 46th SMW *i.e.* third week of November with the population of 8.58 nos./hill. The population of spiders was seen from 32nd SMW *i.e.* the second week of August (0.02 nos./hill), and maximum abundance (0.40 nos./hill) occurred at 43rd SMW *i.e.* last week of October. The abundance of lady bird beetle was observed from 33rd SMW (0.02 nos./hill) *i.e.* the third week of August and the maximum population (0.57 nos./hill) was seen at 46th SMW *i.e.* the third week of November.

Table 2: Seasonal Incidence of pests of rice during *kharif* 2021

Date	MW	Natural enemies (No./hill)			
		Mirid Bug		Spider	Lady Bird Beetles
		Green Mirid Bug	Brown Mirid Bug		
17.2021	26	0	0	0	0
7.7.2021	27	0	0	0	0
14.7.2021	28	0	0	0	0
22.7.2021	29	0	0	0	0
26.7.2021	30	0	0	0	0
2.8.2021	31	0	0	0	0
9.8.2021	32	0	0	0.03	0
17.8.2021	33	0	0	0.33	0.03
23.8.2021	34	0	0	0.06	0.06
30.8.2021	35	0	0	0.4	0.23
6.9.2021	36	0	0	0.3	0.14
15.9.2021	37	0	0	0.2	0.1
22.9.2021	38	0	0	0.46	0.26
28.9.2021	39	1.33	2.86	0.3	0.16
5.10.2021	40	1.4	2.87	0.36	0.26
12.10.2021	41	1.46	2.83	0.3	0.33
21.10.2021	42	2	4.17	0.2	0.16
26.10.2021	43	2.53	6.43	0.36	0.3
1.11.2021	44	2.07	7.67	0.23	0.26
8.11.2021	45	2.4	6.9	0.23	0.4
15.11.2021	46	1.37	7.73	0.23	0.63

Table 3: Pooled seasonal incidence of pests of rice during *kharif* 2020 and 2021

Date	MW	Natural Enemies			
		Green Mirid Bug	Brown Mirid bug	Spider	Lady Bird Beetles
1.7.2021	26	0.00	0.00	0.00	0.00
7.7.2021	27	0.00	0.00	0.00	0.00
14.7.2021	28	0.00	0.00	0.00	0.00
22.7.2021	29	0.00	0.00	0.00	0.00
26.7.2021	30	0.00	0.00	0.00	0.00
2.8.2021	31	0.00	0.00	0.00	0.00
9.8.2021	32	0.00	0.00	0.02	0.00
17.8.2021	33	0.00	0.00	0.17	0.02
23.8.2021	34	0.00	0.00	0.03	0.03
30.8.2021	35	0.00	0.00	0.23	0.18
6.9.2021	36	0.00	0.00	0.25	0.15
15.9.2021	37	0.00	0.00	0.28	0.12
22.9.2021	38	0.25	0.17	0.40	0.48
28.9.2021	39	1.07	2.01	0.35	0.20
5.10.2021	40	2.20	3.42	0.38	0.25
12.10.2021	41	2.17	3.77	0.27	0.37
21.10.2021	42	2.25	4.09	0.32	0.23
26.10.2021	43	2.53	5.72	0.40	0.32
1.11.2021	44	2.55	7.24	0.32	0.31
8.11.2021	45	3.27	8.58	0.32	0.42
15.11.2021	46	2.44	8.18	0.27	0.57
21.11.2021	47	1.60	4.32	0.25	0.18

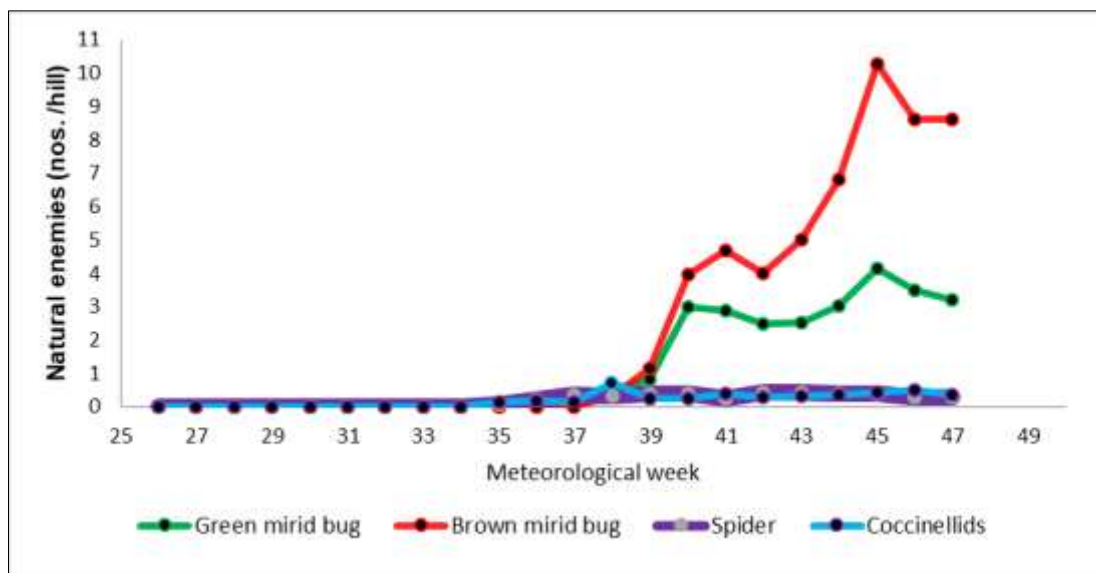


Fig 1: Seasonal incidence of natural enemies during *kharif* 2020

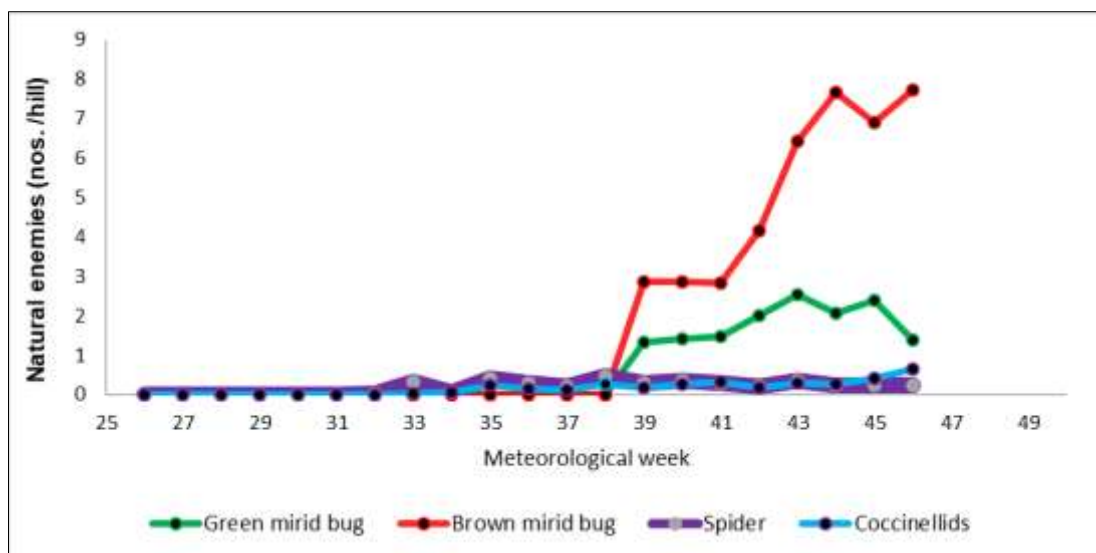


Fig 2: Seasonal incidence of natural enemies during *kharif* 2021

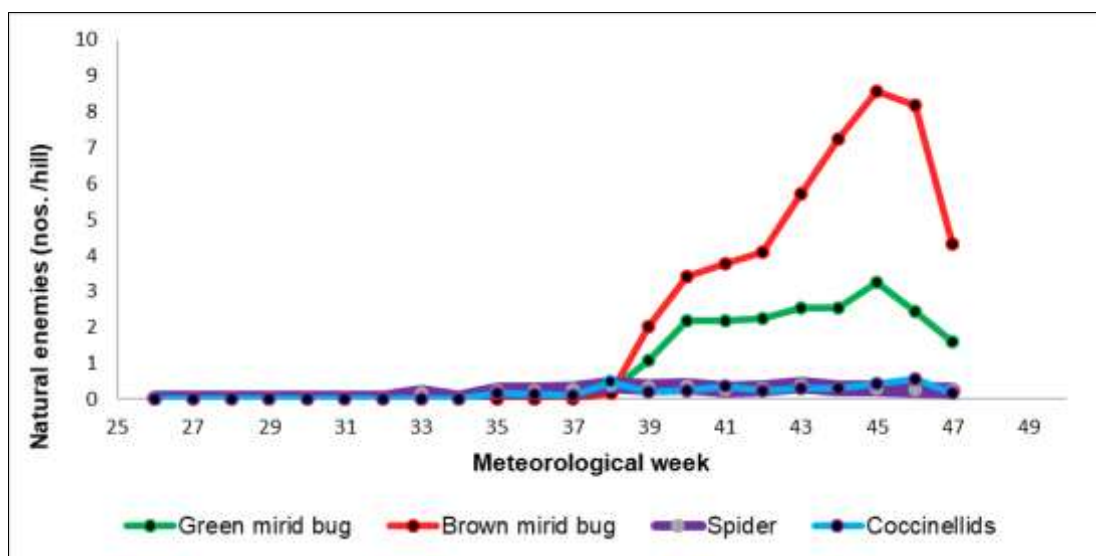


Fig 3: Seasonal incidence of natural enemies during *kharif* 2020 and *kharif* 2021

The findings of our study are similar to those reported by Lua (1985) ^[3] that the mirids population occurred throughout the growing rice. Vijaykumar and Patil (2004) ^[7], found that the spider population was directly related to growth stages of the rice plants. Kharat (2006) ^[2] revealed that the population of spiders increased from 32nd SMW. Khan (2006) ^[1] stated that abundant natural enemies are very reliable for suppressing pest populations. Likewise, Samrit et al. (2019) ^[5] found natural enemies such as mirid bugs, spiders and lady bird beetle during the entire growing period of rice. These studies support the present finding.

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