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Insect visitors of cowpea and mungbean agro-ecosystem under sub Himalayan foot hills of Eastern India

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Abstract

The present investigation were carried out of field studies for two consecutive seasons, winter and summer seasons of 2015 to 2016, at the instructional farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal. Five cultivars of cowpea and nine cultivars of mungbean were used and the experiment was laid down in a randomized block design and replicated thrice. Population of insect pests was recorded at weekly interval throughout the crop growing period starting from 1st appearance of the pests. The activity of major insect pests on cowpea initiated after one month of seed germination. Crop stage of one and half month age found to be most vulnerable to pests. On both the season a peak aphid population was found during flowering stage of the crop. Highest population of predator was found during 50th standard week on cowpea (0.5 plant⁻¹) and mungbean (0.8 plant⁻¹). Population of insect visitors was recorded from all the varieties of cowpea during winter and summer seasons. During winter season and summer aphid and podfly population (per leaf or pod) was found highest on EC-101967 of cowpea. Highest population of pod sucking bug was found from the variety IC-549343 and pod borer infestation was recorded from the variety EC-101967 both during winter (5.33%) and summer (7.67%). On winter crop highest population of both predator (1.96 plant⁻¹) and pollinator (2 plant⁻¹) was recorded from EC-101943. Among the varieties of mungbean, aphid, pod fly (plant⁻¹), number of mined, number of pollinators and pod borer population was found maximum in Sublobata-02 and predators was in TM-99-50 (6.00).

Keywords: Cowpea, mungbean, insect, population

1. Introduction

Pulse crop plays an important role in Indian agriculture because it is rich in proteins and sustains the productivity of a cropping system. Cowpea and mungbean, are two multipurpose crops grown in India for fodder, vegetable, green manure and pulse. Cowpea is known as vegetable meat due to high amount of protein in the grain with better biological value on dry weight basis. The grain contains 26.61% protein, 3.99% lipid, 56.24% carbohydrates, 8.60% moisture, 3.84% ash, 1.38% crude fibre, 1.51% gross energy and 54.85% nitrogen free extract [1]. Green gram or mung is an excellent source of high quality protein, it contains about 25 % protein. These two pulses may be grown as an intercrop or sole crop. Both Cowpea and Mung are usually preferred by farmers because of their role in increasing soil fertility through nitrogen fixation [2] and production of nutritious fodder for livestock. As many as 21 insect pests of different groups have been recorded damaging the mungbean and cowpea crop from germination to maturity. The avoidable yield losses due to insect pests have been recorded in the range of 66 to 100 per cent in cowpea [3]. Insects damaging the reproductive parts cause the maximum reduction in grain yield. The relative importance of different species varies with location, season, and time of flowering of different cultivars. Report from northern region of West Bengal on insect pests of cowpea and mung is however scanty, this situation calls for systematic studies on insect visitors of cowpea and mung. Hence, the present study was conducted with a view to record the insect visitor complex of cowpea and mung in different seasons and their abundance in this zone.

2. Materials and Methods

Field studies were carried out for two consecutive seasons, winter and summer seasons of 2015 to 2016, at the instructional farm of Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar, West Bengal.

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The soil nature was sandy loam with medium content of available P and K and high in N and raw humus and pH ranged between 4.8 and 5.7. This region falls under the Sub-Himalayan foothills known as *Terai* Zone. Five cultivars of cowpea and nine cultivars of mungbean were sown in 3 x 4 m plot with a spacing of 40 x 10 cm, during second week of November, 2015 and second week of March, 2016. The suggested fertilizer dose (NPK = 20:50:50 kg/ha) were applied and the crops were raised under proper recommended agronomic practices without adopting any plant protection measures. The experiment was laid down in a randomized block design and replicated thrice. Population of insect pests was recorded at weekly interval throughout the crop growing period starting from 1st appearance of the pests. All the plants from each plot were taken for recording the observations except guard rows. Only fresh damage was considered for account of records. Observation on predator and pollinators were recorded on five randomly selected plants per plot. Data thus obtained was analyzed statically for better interpretation of results.

3. Results and Discussion

From this zone aphid, leaf miner, pod borer, pod fly, blister beetles, and pod sucking bugs were recorded as the pests of cowpea and mungbean in field condition.

3.1 Population dynamics of aphid

Aphid starts to colonize in field during 48th standard week on Cowpea, when the plants were in 2 - 4 leaf stage. First and highest peak (4.75 leaf⁻¹) of population was noticed during 51st standard week, during that period the age of plants was one month old. Then the population decline rapidly, during 1st standard week of next year upto 1.5 aphids per leaf because of heavy cold. The next peak of population was noticed during 4th standard week. During flowering stage of both the seasons (i.e. 9th and 20th standard week) the population of aphid was reach upto a peak of 3 aphids per flower. On second crop during one month age a peak was found as 4 aphids per leaf at 15th standard week. A lower population of aphid prevailed throughout the cropping period. On first cropping season of mung the highest population of aphid was found on 51st standard week (4 aphids per leaf) and on second crop the highest population was found at 14th standard week (3.4 aphids per leaf). On both the season a peak population was found during flowering stage of the crop. This is in accordance with the earlier report of Sardana and Verma (1986) [4] suggested that negative correlation between aphid population on cowpea and maximum temperature as well as sunshine hours. Faleiro *et al.* (1990) [5] and Patel (2000) [6] also stated that temperature had negative influence on population of *A. craccivora* on cowpea.

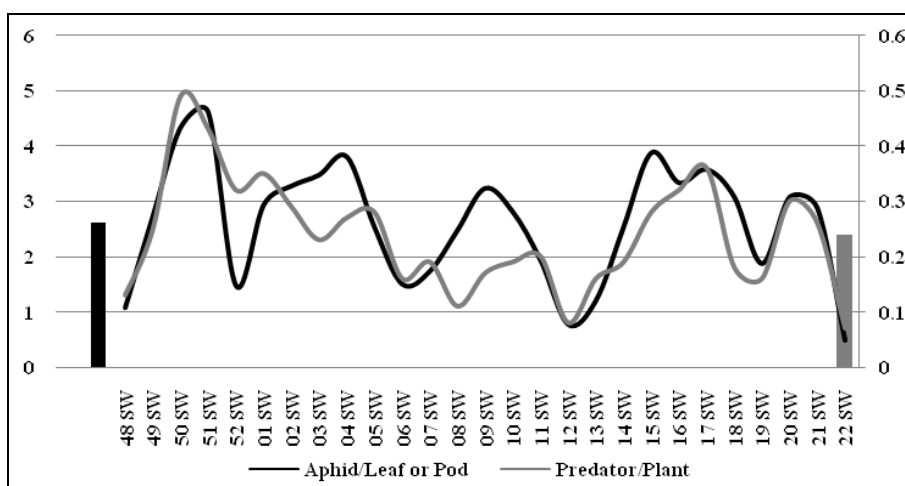


Fig 1: Population dynamics of aphid and predators on cowpea

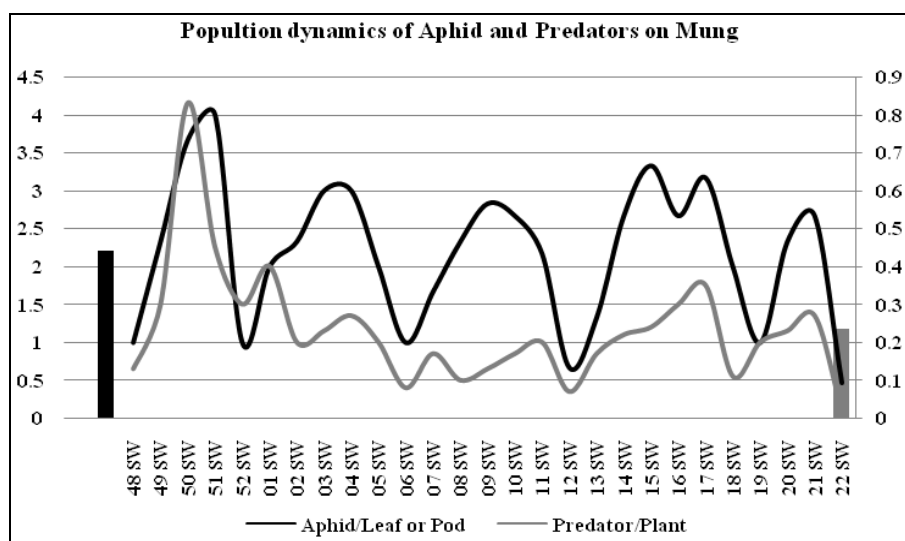


Fig 2: Population dynamics of aphid and predators on mung

3.2 Population dynamics of predator

Due to low population of both aphid and predator there found no promising relationship among the aphids and predators. Throughout the cropping period there found a low population of predators, mainly Coccinellid beetles was prevailed. Highest population of predator was found 0.5 per plant on Cowpea during 50th standard week and on Mung it was 0.8 per plant.

3.3 Evaluation of Cowpea varieties

Population of insect visitors was recorded from all the varieties during winter and summer seasons. During winter season aphid population (per leaf or pod) was found highest on EC-101967 (4.08) and significantly lowest was found on Kashi Kanchan (1.94). During summer season highest number of aphid was recorded from EC-101967 (6.20) and significantly lowest was recorded from Kashi Kanchan (4.00). During both the seasons there found no significant variation of pod fly population among the varieties. During winter season highest podfly population was found on EC-101967 (2.50) and lowest was recorded from Kashi Kanchan (1.80). During summer season highest pod fly population was found on EC-101967 (3.60) and significantly lowest was found from Kashi Kanchan (2.30). Highest population of pod sucking bug was found from the variety IC-549343 during both winter (3 plant⁻¹) and summer (4.33 plant⁻¹) and significantly lowest population was found from EC-101943 both during winter season (1.67 plant⁻¹) and summer season (2.67 plant⁻¹). During winter highest number of mined leaf was recorded from EC-101967 (3.67 plant⁻¹) and significantly lowest was recorded from IC-549343 (2.83 plant⁻¹). On summer crop highest mined leaves were found on EC-121829 (4.35 plant⁻¹) and significantly lowest mined leaves were found on IC-549343 (3.33 plant⁻¹). Infestation of pod borer was recorded on the basis of symptoms developed on pod. Highest pod borer infestation was recorded from the variety EC-101967 both during winter (5.33%) and summer (7.67%). Significantly lowest pod borer infestation was recorded from EC-101967 (2.67%) during winter and during summer from Kashi Kanchan (4.33%). Other insect visitors' population was also recorded from the plots. There was no significant variation among the varieties in case of both predators and pollinators. On winter crop highest population of both predator (1.96 plant⁻¹) and pollinator (2 plant⁻¹) was recorded from EC-101943. During summer the population of those insect was recorded highest from the same variety. Predator (2.33 plant⁻¹) and pollinator (3.67 plant⁻¹) population was found higher during summer than winter season.

3.4 Evaluation of Mung bean varieties

Altogether nine Mung bean varieties were evaluated during winter and summer seasons as *Rabi and pre-Kharif* crop. Among the varieties studied, aphid population (per leaf or pod) was found highest on Sublobata - 02 both during winter (6.10) and summer (6.00). Significantly lowest population of aphid during winter was recorded from the variety, TM-9-30 (2.00) and during summer from the variety TM-99-21 (2.00). Highest population of pod fly (plant⁻¹) was found on the variety Sublobata-02 both during winter (2.33) and summer (3.00). Significantly lowest population was recorded from the variety Basanti during winter (0.67) as well as summer (1.33). No significant variation was found in case of pod sucking bug (plant⁻¹) population. During winter season highest bug population was found on the variety TM-99-50 (0.83) and lowest was on Meha (0.23). However, during summer season highest (1.67) population of pod sucking bug was recorded from both Midnapur local and Basanti and lowest population was recorded from Meha (1.23). Account of leaf miner was recorded on the basis of symptom. Number of mined leaf found highest during summer season than winter in all varieties. Highest number of mined leaves was found from the variety Sublobata-02 both during winter (2.67) and summer (3.00). Significantly lowest mined leaves were found on TM-99-50 (1.00) during winter and on Pant Mung-5 (1.50) during summer. Infestation of pod borer on Mung was found highest on the variety Sublobata-02 both during winter (5.00%) and summer (4.00%). Significantly lowest percent of infested pod was recorded from the variety TM-99-50 (2.67%). Lowest (2.33%) pod borer infestation was recorded during winter from two varieties namely TM-99-50 and TM-99-30. During both the seasons highest number of pollinators was found from the variety Sublobata-02 (during summer 2.00 plant⁻¹ and during winter 1.67 plant⁻¹). Significantly lowest number of pollinators was recorded from the variety Midnapur local both during winter (0.33 plant⁻¹) as well as during summer (1.00 plant⁻¹). Among the varieties no significant variation was found in case of predator population both during summer and winter. During winter season highest number of predators was found from the variety TM-99-50 (0.83 plant⁻¹) and lowest was recorded from the variety Meha (0.23 plant⁻¹). Highest population of predators was recorded during summer from the variety TM-99-30 (0.80 plant⁻¹) and lowest from the variety Meha (0.40 plant⁻¹). These results are established with the findings of Tank and Korat (2007)^[7] recognized negative correlation between *Cheilomenes sexmaculata* (Fab.) on cowpea and minimum as well as maximum temperature.

Table 1: Evaluation of Cowpea varieties against insect complex

Variety	Winter season							Summer season						
	Aphid/Leaf or Pod	Pod fly / plant	Pod sucking bug / Plant	Mined Leaf /Plant	Pod borer infestation (%)	Pollinator /Plant	Predator /Plant	Aphid/Leaf or Pod	Pod fly / plant	Pod sucking bug / Plant	Mined Leaf /Plant	Pod borer infestation (%)	Pollinator /Plant	Predator /Plant
EC-101967	4.08	2.50	2.67	3.67	5.33	1.67	1.20	6.20	3.60	3.70	4.00	7.67	2.33	1.67
EC-101943	3.28	2.19	1.67	3.17	2.67	2.00	1.96	5.20	3.20	2.67	4.21	4.67	3.67	2.33
EC-121829	2.60	1.92	2.33	3.17	3.33	1.67	1.10	4.30	2.62	3.40	4.35	6.67	2.40	2.10
IC-549343	2.39	1.88	3.00	2.83	3.67	1.67	1.05	4.15	2.38	4.33	3.33	6.33	2.50	1.50
Kashi Kanchan	1.94	1.80	2.00	3.33	3.33	0.67	0.90	4.00	2.30	3.10	3.67	4.33	1.33	1.33
Mean	2.86	2.06	2.33	3.23	3.67	1.54	1.24	4.77	2.82	3.44	3.91	5.93	2.45	1.79
LSD (p = 0.05)	0.007	0.005	0.049	0.005	0.006	N/A	0.005	0.054	0.007	0.002	0.007	0.009	0.049	0.058

Table 2: Evaluation of Mungbean varieties against insect complex

Variety	Winter season							Summer season						
	Aphid/Leaf or Pod	Pod fly / plant	Pod sucking bug / Plant	Mined Leaf /Plant	Pollinator /Plant	Pod borer infestation (%)	Predator /Plant	Aphid/Leaf or Pod	Pod fly / plant	Pod sucking bug / Plant	Mined Leaf /Plant	Pollinator /Plant	Pod borer infestation (%)	Predator /Plant
Sublobata-02	6.10	2.33	0.33	2.67	1.67	5.00	0.33	6.00	3.00	1.33	3.00	2.00	4.00	0.50
Meha	4.67	1.33	0.23	1.33	1.33	3.67	0.23	3.67	1.67	1.23	2.33	1.50	2.67	0.40
Malda-98-31	2.87	2.17	0.50	0.67	1.00	3.67	0.50	2.67	2.33	1.50	2.00	1.67	2.67	0.50
TM-99-50	3.33	2.17	0.83	1.00	1.00	2.67	0.83	2.33	2.67	1.33	2.00	1.67	2.33	0.67
TM-99-21	2.40	1.67	0.55	1.50	0.67	4.67	0.55	2.00	2.67	1.50	2.50	1.67	3.67	0.70
TM-99-30	2.00	1.67	0.50	1.67	1.33	3.67	0.50	2.33	2.33	1.50	2.67	1.33	2.33	0.80
Midnapur Local	3.33	2.33	0.50	1.33	0.33	4.00	0.50	2.33	2.67	1.67	2.67	1.00	3.00	0.60
Pant Mung -5	2.67	0.83	0.50	1.00	1.00	3.17	0.50	3.00	1.67	1.50	1.50	1.33	3.33	0.60
Basanti	2.67	0.67	0.45	1.67	1.33	2.33	0.45	2.67	1.33	1.67	2.33	1.67	2.67	0.50
Mean	3.34	1.69	0.49	1.46	1.04	3.65	0.49	3.00	2.26	1.50	2.33	1.54	2.96	0.59
LSD (p = 0.05)	0.034	0.004	0.003	0.003	0.003	0.003	0.003	0.004	0.005	0.004	0.004	0.003	0.033	0.008

4. Conclusion

From the above results it can be concluded that the activity of major insect pests on cowpea initiated after one month of seed germination. Crop stage of one and half month age found to be most vulnerable to pests. From this zone aphid, leaf miner, pod borer, pod fly, blister beetles, and pod sucking bugs were recorded as the pests of cowpea and mungbean in field condition. On both the season a peak population of aphids was found during flowering stage of the crop. A lower population of both aphid and predator were found throughout the cropping period. Highest pod borer infestation was recorded in EC-101967 and population of both predator and pollinator was found in EC-101943.

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