Environment & Ecology 35 (3D) : 2525—2529, July—September 2017
Website : environmentandecology.com ISSN 0970-0420

Seasonal Incidence of Major Insect Pests of Long Duration Pigeonpea Agro-Ecosystem

Indrasen, Ram Keval, Vijay Kumar Mishra

Received 17 November 2016; Accepted 20 December 2016; Published online 7 January 2017

Abstract The present study was aimed at observing the incidence pattern of pod fly, pod bug and gram pod borer in pigeonpea ecosystem. The experiment was conducted at Agricultural Research Farm, Banaras Hindu University, Varanasi during the *kharif* season of the year 2015. The short duration pigeonpea was infested with the number of insect pests at various stages of crop growth. Out of which the incidence pattern of pod fly *M. obtusa*, pod bug *C. gibbosa* and gram pod borer, *H. armigera* was studied. The first appearance of pod fly *M. obtusa* was noticed in the 6th standard week with a mean population of 3.66 maggot/plant whose maggot population peaked in 11th standard weeks with a mean population of 10.66 maggot/plant during 2015. The first occurrence of pod bug *C. gibbosa* was recorded in 5th standard weeks with a mean population of 4.66 Nymph/plant which attained the peak during 10th standard weeks with a mean population was 7.33 Nymph/plant. Similarly The first occurrence of pod borer *H. armigera* was recorded in 4th standard weeks with a mean population of 2.33 larvae/plant which attained the peak during 11th standard weeks with a mean population was 7.66 larvae/plant. The incidence of all the insect pests although declined after attainment of their respective peak, but pod bug were noticed in the field till the harvest of the crop. To undertake an effective IPM strategy in pigeonpea crop, location specific information on occurrence and seasonal dynamics of insect pests is indispensible.

Keywords Pigeonpea, Agro-ecosystem, Seasonal incidence.

Indrasen, R. Keval, V. K. Mishra*
Department of Entomology and Agricultural Zoology,
Institute of Agricultural Sciences, Banaras Hindu University,
Varanasi 221005, India
e-mail: premvijaybhu@ gmail.com
*Correspondence

Introduction

Pigeonpea [*Cajanus cajan* (L.) Millsp.] is also known as red gram, arhar, tur in vernacular is the most important delicious pulse of the entire country. After gram, arhar is the second most important pulse crop of India, which contributes about 90% of the world's pigeonpea production. Pigeonpea is one of the most important pulse crop, to be cultivated in 25 countries of the world on 5.8 million ha with 4.4 million tonnes of production, whereas in Asia it is grown in 5.07 million ha and producing 3.07 million tonnes in 2011 [1]. In India, pigeonpea cultivated in 4.07 million ha area with a production of 3.27 million tonnes [2]. Economic loss due to biotic stress factors has been estimated to be $US 8.48 billion [3]. The productivity of pigeonpea has not increased considerably during last decade in India. Yield of this crop remained stagnant for the past 3 to 4 decades, largely due to damage inflicted by insect pests [4, 5]. Climate changs may lead to shift in production areas of the pigeonpea as

well as changes in geographical distribution, incidence and intensity of pests and diseases. Gram pod borer, *Helicoverpa armigera* (Hubner) has been a major pest in most parts of the country; however, the pod fly, *Melanogromyza obtuse* (Malloch) is emerging as a serious pest of pigeonpea in Central and South India. Similarly, spotted pod borer, *Maruca vitrata* (F.) has now become a major pest of short duration pigeonpea both in North and Central India [6]. Leaf webber, *Grapholita critica* Meyr. and flower feeder or blister beetle, *Mylabris pustulata* Thunberg are also gaining importance. Pod borer complex comprising of gram borer, pod fly, spotted pod borer,plume moth, *Exelastis atomosa* Wals., pod sucking bug, *Clavigralla gibbosa* Spinola and blue butterfly, *Lampides boeticus* L. significantly reduces the crop yield to an extent of 60 to 90% [7, 8]. Therefore an appropriate IPM strategy needs to be developed based on location – specific knowledge of pest dynamics that yield the valuable information regarding weak links in life cycle.

Materials and Methods

The present field experiment was conducted at Entomological trial, Agricultural Research Farm, Banaras Hindu University (BHU), Varanasi during the *kharif* season of the year 2015. Pigeonpea variety BAHAR, which is commonly cultivated in this area, was grown in plots of 5 rows, 4 meters following row to row and plant to plant spacing of 75 cm and 10 cm respectively. The crop was grown following the normal agronomic practices in randomized block design with three replication and seven treatments. The meteorological observations during the investigation period were recorded from the meteorological observation of the Institute of Agricultural Sciences, BHU, Varanasi India.

Incidence pattern of pod fly, pod bug and pod borer on long duration pigeonpea

For recording the seasonal incidence of pod fly and pod bug, five plants were selected ran-domly from each replication and the immature as well as the mature stages of insect-pests present on them were counted at weekly intervals, starting from first week of the October 2015 till the maturing of the crop. The insects on which the data was recorded were; *M. obtusa, C. gibbosa* and *H. armigera*. The number of insect count recorded from all the five replications for BAHAR genotype was averaged separately on standard week basis.

Table 1. Incidence of major insect pests in long duration pigeonpea at Varanasi during *kharif* 2015.

Standard week	Month date	Pod fly (*Melanagromyza obtuse)* [Maggot/plant]	Pod bug (*Clavigrella gibbosa*) [Bugs/plant	Gram pod borer (*Helicoverpa armigera)* [larvae/plant]
2	13/01/2015	0.00	0.00	0.00
3	19/01/2015	0.00	0.00	1.00
4	25/01/2015	1.66	3.33	2.33
5	02/02/2015	6.66	4.66	4.33
6	08/02/2015	3.66	3.33	2.66
7	14/02/2015	3.66	5.66	6.66
8	20/02/2015	6.66	4.00	4.33
9	28/02/2015	5.66	5.66	6.00
10	06/03/2015	8.00	7.33	5.33
11	13/03/2015	10.66	6.66	7.66
12	19/03/2015	3.33	6.66	4.33
13	26/03/2015	2.66	3.00	2.66
14	02/04/2015	1.33	2.00	2.33
15	10/04/2015	1.33	2.66	1.66
16	17/04/2015	1.33	1.66	2.00
17	24/04/2015	0.66	1.33	1.00
18	30/04/2015	0.00	0.00	0.00
19	03/05/2015	0.00	0.00	0.00

Statistical analysis

All the data recorded were sub-jected to statistical analysis as per the randomized block design procedure. The data of the years were subjected to the ANOVA analysis of variance. The mean of the larval population and pod damage of both the years were calculated and correlated with the meteorological data.

Results and Discussion

Incidence pattern of pod fly

The first incidence of pod fly (*Melanagromyza obtusa* Malloch) was noticed during 4th standard week. The maggots were recorded from 2nd to 19th standard week. During the 2nd and 3rd standard week pod fly population level was found to be zero in field condition. The mean population of pod fly peak level was

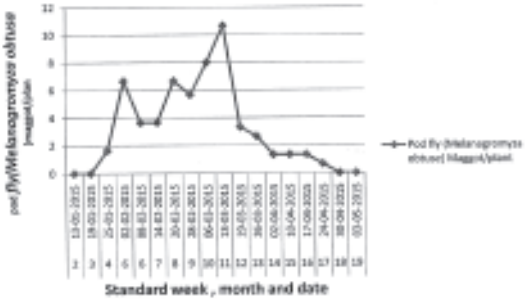

Fig. 1. Seasonal incidence of pod fly (*Melanagromyza obtusa* Malloch) on long duration pigeonpea during *kharif* 2015.

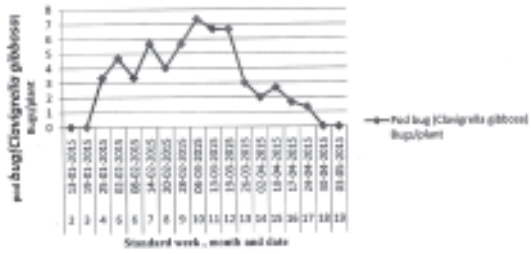

Fig. 2. Seasonal incidence of pod bug (*Clavigrella gibbosa* Spinola) no long duration pigeonpea during *kharif* 2015.

on 11th standard week (10.66) followed by 10th standard week (8.00). The lowest mean population of pod fly observe in field condition notice on 17th standard week (1.66).The remain mean population are show from 6th to 19th standard week in a sequence manner, in 6th standard week mean population (3.66) >7th standard week (3.66)> 8th standard week (6.66) >9th standard week>12th standard week (5.66)>13th standard week (3.33) >14th standard week (2.66) >15th standard week (1.33) > 16th standard week (1.33)>17th standard week (1.33) > 18th standard week (0.66) >19th standard week (0.00) Table 1 and Fig. 1. The first spray of newer insecticide in 6th standard week and second spray in 11th standard week respectively. A similar type of result was also recorded by Yadava et al. [9] examined the seasonal incidence of pod fly, *M. obtusa* on pigeonpea and revealed that maximum incidence of *M. obtusa* in terms of maggots were first observed in 40th SMW (Standard Metrological Week). when the crop was 90 to 100 days old. Higher number of maggots occurred from 44-48 SMW, with peak (8.00 maggots/25) being in 47th week. Number of maggots (0.61 maggots/25 pods) was very low in the last week of November 2003. Thus the pest remains active for nearly two months from first week of October to last week of November. Similar trends of result was also found by Subharanani and Singh [10] reported that the pod fly incidence was noticed from the second week of January (2.0 to 2.8%), with a peak of 15.6% in the first and 13.7% in the second year, during the third week of January. Srujana and Keval [11] also reported that the highest mean population of Pod fly, *M. obtusa* was observed in 9th standard week i.e., 7.0 maggots, followed by 12th standard week 6.8 maggots and lowest population 0.8 maggots, recorded in the 1st standard week during *kharif* season of the year 2011-12.

Incidence pattern of pod bug

The first incidence pod bug *(Clavigrella gibbosa)* are notice 4th standard week (3.33). The observation of mean population recorded from 4th to 19th standard week the peak mean population of pod bug notice in 10th standard week (7.33) followed by 11th standard week (6.66), the lowest mean population recorded in (3.33), the mean population 2nd and 3rd standard week recorded zero level. The mean population of pod bug is given below in the sequence of 5th standard week (4.66) > 6th standard week (3.33) > 7th standard week (5.66) > 8th standard week (4.00) > 9th standard week (5.66) >12th standard week (4.66) > 13th standard week (3.00) > 14th standard week (2.00) > 15th standard week (2.33) >16th standard week (1.66) > 17th standard week (1.33) and next standard week the population level still down to zero level, (Table 1 and Fig. 2) respectively. A similar type of result was also recorded by Srujana and Keval [11] found that the highest mean population peak of pod bug, *C. gibbosa* was recorded on 9th standard week 6.4 bugs, followed by 8th standard week 5.8 bugs and lowest population of 0.2 adults was recorded in the 1st standard week during *kharif* season of the year 2011-12. Singh and Singh [12] reported that the pod bug activity appeared from 20th standard week, increased subsequently and reached at peak level of population density during

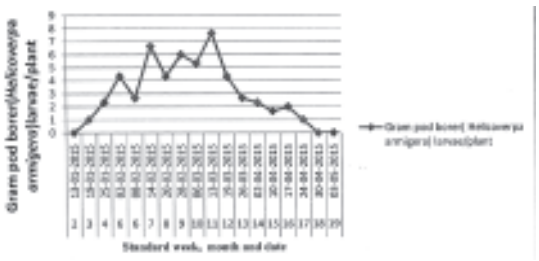

Fig. 3. Seasonal incidence of gram pod borer (*Helicoverpa armigera* Hübner) on long duration pigeonpea during *kharif* 2015.

25th standard week during both the years i.e. zaid, 2009-10 and 2010-11 with varying population densities. According to [13] from South Africa, pod sucking bugs entered in cowpea fields at 8 weeks after sowing (52nd standard week) and remained on the crop till harvesting. They attained peak infestation level at 12 weeks after sowing (4th standard week). Sujithra and Chander. [14] also reported that the seasonal incidence of pod bug, *C.gibbosa* on pigeonpea and revealed that maximum incidence during 2011, pod bugs were noticed from 36th to 44th SMW (standard metrological week) and their population reached maximum of 3.47 bugs/plant during 38th to 40th SMW. Similarly, during 2012, it was found to be 3 bugs/plant during 38 th SMW. The study revealed that the activity of insect pests started during 36th standard week and continued until 46th SMW with 38th and 39th SMW being most crucial.

Gram pod borrer, *Helicoverpa armigera* (Hübner)

The first incidence of Gram pod borer *H. armigera* larvae was observed in the 3rd standard weeks of the year 2015 (Fig. 3). The *Helicoverpa armigera* larvae were recorded from 4th to 17th standard weeks. The peak population of larvae recorded in 11th standard week (7.66) followed by 7th standard week (6.66) and the lowest population of gram pod borer recorded in 17th standard week. The mean population level of 2nd standard week is zero level. (Table 1 and Fig. 3).The remain mean population mean level of gram pod borer in given below 4th standard week (2.33) >5th standard week (4.33) > 6th standard week (2.66) >8th standard week (4.33) >9th standard week (6.00) > 10th standard week (5.33) >12th standard week (4.33) > 13th standard week (2.66) > 14th standard week (2.33) >15th standard week (1.66) >16th standard week (2.00).> 17th standard week (1.00) and next standard week the mean population level still down to zero level respectively. The present observation about the larval incidence of *H. armigera* are in line with the earlier findings [15–17]. Yadav et al. [18] reported that abundance of *H. armigera* during 47th 51st standard week which is in corroboration with the present finding.

References

1. FAO (2013) Food and Agriculture Organization of the United Nations (2013). FAO statistical database. http://faostat.fao.org (19th July 2013, date last accessed).
2. Anonymous (2011) All India area, production and yield of pigeonpea. Agricultural statistics. Min Agric Govt India, New Delhi.
3. Arora S, Iquebal V, Rai MA, Kumar D (2013) PIPEMicroDB: Microsatellite Database and primer generation tool for pigeonpea genome. Database, 2013 Article ID bas054, doi: 10.1093/database/bas054. (http://database.oxfordjournals.org).
4. Sharma OP, Gopali JB, Yelshetty S, Bambawale OM, Garg DK, Bhosle BB (2010) Pests of pigeonpea and their management, NCIPM, LBS Building, IARI Campus, New Delhi, India.
5. Basandrai AK, Basandrai D, Duraimurugan P, Srinivasan T (2011) Breeding for biotic stresses. In : Pratap A, Kumar J (eds), Biology and breeding of food legumes, CAB International, Oxfordshire, UK, pp 220—240.
6. Ali M, Gupta S (2012) Carrying capacity of Indian agriculture : Pulse crops. Curr Sci 102 : 874—881.
7. Lal C, Sharma SK, Chahota RK (1992) Oviposition response of pod fly (*Melanagromyza obtusa*) on resistant pigeonpea *(Cajanus cajan)* selections. Ind J Agric Sci 64 : 658—660.
8. Durairaj C (2006) Evaluation of certain neem formulations and insecticides against pigeonpea podfly. Ind J Pulses Res 19 : 269—270.
9. Yadava CP, Lal SS, Ahmad R, Sachan JN (1991) Influence of abiotic factors on relative abundance of pobborers of chickpea *(Cicer arietinum).* Ind J Agric Sci 61 : 512—515.
10. Subharanani S, Singh TK (2009) Population dynamics of pod borer complex in pigeonpea in relation to abiotic factors. Ind J Entomol 71 : 215—218.
11. Srujana Y, Keval Ram (2014) Periodic occurrence and association of pod fly and pod bug on long duration pigeonpea (bahar) with weather parameters. J Exp Zool Ind 17 : 595—597.
12. Singh G, Singh NN (2014) Occurrence of insect-pests infesting cowpea (*Vigna unguiculata* walpers) and their natural enemy complex in associations with weather

variables. Leg Res 37 : 658—664.
13. Niba AS (2011) Arthropod assemblage dynamics on cowpea, *Vigna ungulculata* (L.) Walp. in subtropical agro ecosystem, South Africa. Afri J Agric Res 6 : 1009—1015.
14. Sujithra M, Chander Subhash (2014) Seasonal inci-dence and damage of major insect pests of pigeonpea, *Cajanus cajan* (L.). Ind J Entomol 76 : 202—206.
15. Deshmuk AY, Khan MI, Sarode SV, Ughade, Jayashri (2003) Population build up of pod borer in mid-late pigeonpea. *Cajanus cajan* (L.) Millspaugh. PKV Res L 27 : 96—100.
16. Gotarkar SB (2004) Life table study of *Helicoverpa armigera* (Hubner) on pigeonpea. MSc thesis. Dr PDKV, Akola.
17. Wadaskar RM, Mane PN, Patil AN (2010) Seasonal incidence, host preference and host shift over of *Helicoverpa armigera* (Hubner) in pulses based cropping system PKV Res J 34 : 261—269
18. Yadav SK, Ahuja DB, Dhandapani A (2011) Seasonal activity of pod fly, *Melanagromyza obtusa* (Malloch.) (Diptera : Agromyzidae) and effect of abiotic factors on its incidence in pigeonpea. Ind J Entomol 73 : 162—165.