Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(6): 2018-2021

Received: 22-09-2020
Accepted: 27-10-2020

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Insect pests and natural enemies' succession in pigeon pea ecosystem

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Abstract
An experiment was conducted during *Kharif*, 2019-2020 at Agricultural Research Station, Darsi, Prakasam (Andhra Pradesh) to observe the "Succession of insect pest complex and their natural enemies in pigeon pea [*Cajanus Cajan* (L) Millsp.]". Result revealed that 10 species of insects (7 pest and 3 natural enemies) were observed in pigeon pea *i.e.* Jassids *Empoasca fabae* Harris, Cow bug *Otinotus oneratus* W., Pod bug *Clavigralla gibbosa* Spinola, *Riptortus* sp., Green stink bug *Nezara viridula* Linn, Pod fly *Melanagromyza obtusa* (Malloch), Leaf Webber *Grapholita critica* (Meyr), Blister beetle, *Zonabris sp*., Gram pod borer *Helicoverpa armigera* (Hub.), plume moth *Exelastis atomosa* (W.), Spider, *Hogna lenta*, Lady bird beetle, *Coccinella septempunctata* (Linn.) and Green lace wing, *Chrysoperla* sp. Incidence of jassids was observed from 32nd (vegetative stage) to 52nd SMW (flowering stage) of the crop. Similarly, the incidence of leaf webber was observed from 32nd to 48th SMW. Insect pests feeding on floral parts *viz.*, blister beetle, gram pod borer and bean pod borer was noticed during 45th to 2nd week of January. Pod fly incidence was recorded during pod filling stage of the crop i.e. from 50th to 3rd SMW. Population of natural enemies lady bird beetle and green lace wing was observed from vegetative stage to pod formation stage. Whereas, population of spiders observed from 32nd to 3rd SMW.

Keywords: Pigeon pea, insect pests, incidence, natural enemies, succession

Introduction
Pigeon pea (*Cajanus Cajan* (L.) Mill sp.), commonly known as red gram or arhar or tur, is one of the most important pulse crops produced in India. The center of origin of pigeon pea is believed to be Asia. Pigeon pea is a protein rich staple food supplying 22 percent proteins to human diet almost three times that of cereals. It is mainly consumed in the form of split pulse as Dal; an essential supplement of cereal based vegetarian diet. It is particularly rich in lysine, riboflavin, thiamine, niacin and iron (Singh and Yadav, 2005) [17]. It is the preferred pulse crop in dry land areas where it is intercropped or grown in mixed cropping systems with cereals or other short duration annuals without significantly reducing the yield (Joshi *et al.*, 2001) [22]. India is a major pigeon pea producer in the world which occupies an area of 96.00 lakh ha with production of 88.32 lakh tones. The highest productivity of 6120 kg per ha was observed in Israel followed by Yemen, Canada and Egypt and in India it was 920 kg per ha. (Tiwari and Shivhare, 2016) [20].

Though India is the largest producer of pigeon pea, the productivity has always been a great concern and the constraints of the lowest productivity in India is influenced by biotic and abiotic factors and majority of which are biotic factors which includes insect pests complex and diseases leading to decrease in the productivity of pigeon pea considerably during last decade. The damage caused by insect pests is one of the major reasons of low productivity. More than 250 insect pests are reported to affect pulses in India.

The major insect pests during vegetative stage are thrips, whitefly, leafhopper, black aphid, Bihar hairy caterpillar, stem fly which cause appreciable damage (Singh and Kumar, 2003) [18]. Annually about 2.0 to 2.4 million tons of pulses with approximate monetary value of Rs. 6000 crores are lost due to the damage caused by insect pests (Reddy, 2009) [15]. The estimates of avoidable losses due to pod borer complex, mainly pod fly and *H. armigera* were 43.5 and 30.2%, respectively (Anonymous, 2012) [2]. The present study was done to observe the succession of insect pest complex and their natural enemies in pigeon pea during the season.

Materials and Methods
Field experiment on insect pests and natural enemies' succession in pigeon pea ecosystem was

conducted during *Kharif*, 2019-20 at Agricultural Research Station, Darsi, Prakasam (Andhra Pradesh). The district lies between 14^0-57^I and 16 -17^I Northern latitude and 78^0-43^I and 80-25^I Eastern longitude. The station is situated at an altitude of 118 ft MSL and about 100 km from Bay of Bengal. The soils of the area are red sandy loams and shallow in depth. Sub soil is composed of gravel and with hard crust at some places, with very poor water holding capacity. The soils are neutral in reaction, low in organic carbon (0.1 to 0.21), available phosphorous and potassium. A total of 430.5 mm rainfall was received in 44 rainy days during the period from June, 2019 to March, 2020 as against the normal rainfall of 807.6 mm with a deviation of -46.6. Rainfall status during 2019-20 was deficient at ARS, Darsi. The experiment was laid in 1000 sq m area with variety LRG-52 with the spacing of 180 cm (row to row) x 20 cm (plant to plant). The crop was sown in 28th standard meteorological week (SMW) i.e. second week of July, 2019. All the agronomical package of practice was fallowed as per the recommendations of this university except plant protection measures.

Observations on different insects were recorded on 15 randomly selected plants once in a standard meteorological week (SMW). It was initiated after germination and was taken up to the maturity of the crop. Observations of jassids (nymph + adult) were recorded on six leaves per plant *viz.*, each from 2 upper, middle and lower leaves per plant. Observations on leaf webber, spider, green stink bug (nymph + adult), pod bug (nymph + adult), pod borer larvae and plume moth(larvae + pupae) were recorded on per plant basis, while pod fly maggot were recorded on randomly selected 10 pods per 5 plants. Sweep nets were used for population monitoring of weak and active insect fliers and the methodology was adopted as proposed by Kumar and Nath (2007) [7]. The data observed on different insect pests and their natural enemies of pigeon pea was analyzed statistically as per Panse and Sukhatme (1985) [11] accordingly.

Results and Discussion

Incidence of Jassids was observed from early vegetative stage of the crop to pod development stage. Incidence of jassids recorded highest during 36th to 39th SMW which ranged from 1.3 to 4.7 per three leaves and no incidence was observed during harvesting stage of the crop. It is evident that the pest was present on the crop during the vegetative stage and remained available up to the second week of December *i.e.* maturity stage of the crop. Similar findings have been reported by Pandey (2013) [10], Pawar *et al.*, (2014) [12] and Shinde and Patel (2014) [16]. They also reported that jassids infested pigeon pea during the vegetative stage and remained available up to the reproductive stage of the crop (Table 1).

First appearance of the leaf webber was observed when the crop age was about 25 days *i.e.*, vegetative stage. Incidence of leaf webber was observed continued from vegetative and remained available up to the last week of October i.e. during the flower bud initiation stage of the crop. Highest incidence of leaf webber (4.0 to 5.3) was observed in between 45th to 48th SMW and incidence reduced thereafter. Whereas, ash weevil incidence was also recorded from the early vegetative stage of the crop to flower bud initiation stage of the crop and highest was during 40 to 44th SMW. The results are in line with Ambhure (2012) [1], and Shinde and Patel (2014) [16] who reported that leaf webber infested pigeon pea during the vegetative and remained available up to the reproductive stage of the crop (Table 1).

First appearance of cow bug was observed when the crop age was about 50 day's *i.e.* vegetative stage. It is evident that the pest was present on the crop during the vegetative stage and remained available up to the second week of November *i.e.* reproductive stage of the crop (100 days). The present findings confirm the findings of Mahalle (2008) [9] and Ambhure (2012) [1] who revealed that that cow bug infested pigeonpea during the vegetative stage and remained available up to the reproductive stage of the crop (Table 1).

Occurrence of green stink bug in pigeon pea ecosystem was noticed from 36th SMW to 48th SMW with an incidence ranged from 1.3 to 1.7 per plant (36th to 39th SMW) which was lowest and highest during the standard meteorological weeks from 45th to 48th SMW (0.7 to 2.3 per plant). The present findings confirm the findings of Landge (2009) [8] who reported the incidence of stink bugs from 37th SMW to 52nd SMW (Table 1).

Incidence of gram pod borer (larval population) was noticed initially during 40 to 44th SMW with 4.9 to 5.2 larvae per ten plants at vegetative stage. Peak incidence was observed during the flowering stage of the crop with 6.4 to 8.8 larvae per ten plants (45 to 48th SMW) and thereafter incidence reduced. The larval population of gram pod borer was highest during the pod development stage. The present findings confirms the findings of Singh *et al.*, (2001) [23], Yelshetty *et al.*, (2005) [21], Joshi and Shrivastava (2006) [5], Balikai and Yelshetty (2008) [3], Rana *et al.*, (2008) [13], Srilaxmi and Paul (2010) [19] and Shinde and Patel (2014) [16]. They also reported that pod borer infested pigeon pea from vegetative stage and remained available up to the maturity stage of the crop (Table 1).

Plume moth incidence was observed starting from 45th SMW i.e. November first and second week during the season with a incidence range of 2.3 to 4.0 per plant and there after the incidence decreased 1.0 to 2.3 larvae per plant (49th to 52nd SMW). Similarly the incidence of bean pod borer recorded during the month of November (45th to 48th SMW) with incidence ranged from 4.2 to 8.2 per plant and highest (8.0 to 14.3 per plant) during the month of December (49th to 52nd SMW). These findings are similar with the results of Chavan *et al.* (2018) [4] who reported that the infestation *M. vitrata* commenced during the 41st SMW and continues till the 45th SMW and the infestation of *E. atomosa* commenced during the 43rd SMW and continues till the 52nd SMW. The population of blister was only recorded during the flowering stage of the crop in the third week of November (2.7 to 4.3 adults per plant) (Table 1).

Pod bug and pod fly was observed during the pod development stage of the crop. Pod bug during the month of December ranged from 4.3 to 5.7 adults/grubs/per pod and during the month of January (1 to 3rd SMW) the population was 2.7 to 4.3 per pod. Whereas, the incidence of pod fly was observed during the 49th to 52nd SMW with a range of 5.5 to 10.50 per ten pods and during the month of January (1st to 3rd SMW) the population of pod fly ranged from 8.7 to 10.5 per ten pods. The findings of present investigation is in close conformity with the earlier worker Rathore *et al.* (2016) [14] who reported that the infestation *M. obtusa* commenced during the 41st SMW and continues till the 52nd SMW. Whereas, Vikram (2015) [24] reported that pod bug infest pigeonpea from vegetative stage and remained available up to the maturity stage of the crop. Population of natural enemies *viz.*, spiders, lady bird beetles and green lace wings noticed from initial vegetative stage of the crop to harvesting of the crop. The present findings are in conformity with the findings Kumar and Nath (2007) [7] (Table 1).

Table 1: Insect pests and natural enemy's succession in pigeon pea ecosystem at ARS, Darsi during *Kharif*, 2019-20

Std. Met. week	Common Name	Scientific Name	Incidence range (Number per plant/3leaves/pod/ flower)
32 to 35	Jassids	*Cyrtacanthacris sp.*	0.70 to 4.0
	Leaf webber	*Grapholita critica* (Meyr)	2.70 to 3.40
	Ash weevil	*Myllocerus sp.*	4.7 to 6.0
	Spider	*Telamonia dimidiata*	0 to 1.3
	Lady bird beetle	*Coccinella septempunctata* Linn.	0.00
	Green lace wing	*Chrysoperla sp.*	0.00
36 to 39	Jassids	*Cyrtacanthacris sp.*	1.3 to 4.7
	Leaf webber	*Grapholita critica* (Meyr)	2.7 to 5.3
	Cow bug	*Otinotus oneratus W.*	8.7 to 12.3
	Ash weevil	*Myllocerus sp.*	5.3 to 9.3
	Green stink bug	*Nezara viridula* Linn.	1.3 to 1.7
	Spider	*Telamonia dimidiata*	2.0 to 4.0
	Lady bird beetle	*Coccinella septempunctata* Linn.	0.7 to 2.7
	Green lace wing	*Chrysoperla sp.*	1.7 to 2.3
40 to 44	Jassids	*Cyrtacanthacris sp.*	2.7 to 6.0
	Leaf webber	*Grapholita critica* (Meyr)	2.8 to 4.0
	Cow bug	*Otinotus oneratus W.*	4.7 to 6.3
	Ash weevil	*Myllocerus sp.*	2.7 to 7.3
	Green stink bug	*Nezara viridula* Linn.	1.0 to 1.7
	Gram pod borer	*Helicoverpa armigera*	4.9 to 5.2
	Plume moth	*Exelastis atomosa* Walsingham	0.00
	Spider	*Telamonia dimidiata*	4.0 to 6.7
	Lady bird beetle	*Coccinella septempunctata* Linn.	1.3 to 3.0
	Green lace wing	*Chrysoperla sp.*	1.7 to 2.7
45 to 48	Jassids	*Cyrtacanthacris sp.*	1.3 to 4.7
	Leaf webber	*Grapholita critica* (Meyr)	4.0 to 5.3
	Cow bug	*Otinotus oneratus W.*	3.7 to 5.3
	Ash weevil	*Myllocerus sp.*	2.7 to 6.0
	Green stink bug	*Nezara viridula* Linn.	0.7 to 2.3
	Gram pod borer	*Helicoverpa armigera*	6.4 to 8.8
	Plume moth	*Exelastis atomosa* Walsingham	2.3 to 4.0
	Bean pod borer	*Maruca vitrata*	4.2 to 8.2
	Blister beetle	*Zonabris sp.*	2.7 to 4.3
	Spider	*Telamonia dimidiata*	4.7 to 10.00
49 to 52	Jassids	*Cyrtacanthacris sp.*	0.70 to 3.30
	Leaf webber	*Grapholita critica* (Meyr)	1.3 to 4.0
	Gram pod borer	*Helicoverpa armigera*	4.7 to 6.4
	Plume moth	*Exelastis atomosa* Walsingham	1.0 to 2.3
	Bean pod borer	*Maruca vitrata*	8.0 to 14.3
	Pod bug	*Clavigralla gibbosa* Spinola	4.3 to 5.7
	Pod fly	*Telamonia dimidiata*	5.5 to 10.50
	Spider	*Telamonia dimidiata*	7.3 to 10.0
1 to 3	Gram pod borer	*Helicoverpa armigera*	2.3 to 4.0
	Bean pod borer	*Maruca vitrata*	4.7 to 9.3
	Pod fly	*Melanagromyza obtusa* Malloch	8.7 to 10.5
	Pod bug	*Clavigralla gibbosa* Spinola	2.7 to 4.3
	Spider	*Telamonia dimidiata*	8.3 to 10.0

References

1. Ambhure Ganpatrao, Krishna. Influence of crop biodiversity on pigeonpea insect pests and their natural enemies. M. Sc. (Ag) thesis submitted to JNKVV Jabalpur; c2012.
2. Anonymous. Annual Report National Centre for Integrated Pest Management, LBS Building, Pusa Campus, New Delhi-110012; c2012. p. 1-113. ipmnet@bol.net.in: www.ncipm.org.in.
3. Balikai RA, Yelshetty S. Insect pest scenario of pigeon pea in Northern Karnataka. Legume Reserch. 2008;31(2):149- 151.
4. Chavan AP, Chavan KA, Latake SB, Kute NS, Mhase LB, Rangari PS. Incidence and damage severity of pod borers complex in pigeon pea. International Journal of Agriculture Sciences. 2018;10(18):7141-7144.
5. Joshi N, Srivastava CP. Yield maximization in pigeon pea through crop protection measures. Indian Farming. 2006;76(3):4-7.
6. Kumar A, Nath P. Influence of weather factors on population of insect pests in pigeon pea at vegetative stage and flowering stage. Presented in the "5th National Symposium on Biocontrol Agents for Sustainable Management of Pests" held at G.B. Pant University of Agriculture and Technology, Pantnagar, Uttaranchal December 18-20; c2003. p. 137.
7. Kumar A, Nath P. Diversity of natural enemies of insect pest in medium- late pigeon pea. Env. And Eco. 2007;25(2):394-398.
8. Landge Kumar S. Studies on pest complex of pigeon pea *Cajanus Cajan* (L.) and their management under late sown condition. M.Sc. (Ag). Thesis submitted to JNKVV Jabalpur; c2009. p. 1-164.
9. Mahalle SC. Studies on pest complex of pigeon pea

Cajanus Cajan (L.) and management of pod borer complex. M.Sc. (Ag) thesis submitted to JNKVV Jabalpur; c2008.
10. Pandey SA. Studies on pod infesting insect pest complex of pigeon pea *Cajanus Cajan* L. (Millsp.) and their control with insecticides and biopesticides. M.Sc. (Ag) thesis submitted to JNKVV Jabalpur; c2013.
11. Panse VG, Sukhatme PN. Statistical methods for agricultural workers. IARI, New Delhi; c1985.
12. Pawar UA, Chintkuntalawar PS, Ugale TB. Studies on succession of insect pest complex and their natural enemies in pigeon pea [*Cajanus Cajan* (L.) Millsp.]. International Journal of Plant Protection. 2014;7(2):318-324.
13. Rana NS, Rana DK, Gupta A, Shukla BC, Sharma RN. Study of population dynamics of insect pests of pigeonpea. Presented in the "National Conference of Pest Management Strategies for Food Security" held at College of Agriculture, I.G.K.V. Raipur, (C.G) from May 2-3; c2008. p. 33.
14. Rathore HK, Vyas AK, Ahir KC, Arti S, Pankaj K. Population dynamics of major insect pests and their correlation with weather parameters in pigeonpea (*Cajanus Cajan* [L.] Millsp.). An International Quarterly Journal of Life Science. 2016;12(1):01-04.
15. Reddy AA. Pulses production technology: Status and way forward. Econ. Political Weekly. 2009;44:73-80.
16. Shinde YA, Patel BR. Succession of insect pests and their natural enemies on pigeon pea. Insect Environment. 2014;19(4):253-256.
17. Singh SS, Yadav SK. Bio efficacy of modern insecticides, biopesticides and their combination against pod borers in pigeon pea. Indian Journal of Entomology. 2005;67(2):133-136.
18. Singh AK, Kumar S. Effect of meteorological parameters on population buildup of defoliations on cowpea. Annals of Plant Protection Sciences. 2003;11:156-158.
19. Srilaxmi K, Paul R. Diversity of insect pests of pigeon pea (*Cajanus Cajan* (L.) Millsp) and their succession in relation to crop phenology in Gulbarga, Karnataka. International Journal of Environmental Sciences. 2010;4(4):j273-276.
20. Tiwari K, Shivhare AK. Pulse in India Retrospect and prospects; c2016. http://dpd.dacnet.nic.in,
21. Yelshetty S, Patil BV, Lingappa S. Role of insectivorous birds in the management of pigeon pea pod borer, *Helicoverpa armigera* (Hubner). Indian Journal of Pulses Research. 2005;18(2):226-229.
22. Joshi JB. Computational flow modelling and design of bubble column reactors. Chemical engineering science. 2001 Nov 1;56(21-22):5893-933.
23. Singh J, Singh N. Studies on the morphological, thermal and rheological properties of starch separated from some Indian potato cultivars. Food chemistry. 2001 Oct 1;75(1):67-77.
24. Vikram P, Swamy BP, Dixit S, Singh R, Singh BP, Miro B, *et al*. Drought susceptibility of modern rice varieties: an effect of linkage of drought tolerance with undesirable traits. Scientific reports. 2015 Oct 13;5(1):1-8.