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Seasonal incidence of gram pod borer *Helicoverpa armigera* (Hubner) in chickpea in Guntur district of Andhra Pradesh

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ABSTRACT

Field experiments on seasonal incidence of gram pod borer *Helicoverpa armigera* (Hub.) in chickpea were conducted during 2011-13 *rabi* crop seasons at Regional Agricultural Research Station, Lam, Guntur. The incidence of the pod borer commenced during the flowering period of the crop and reached its peak larval population of 10 per 10 plants at 11th and 4th meteorological standard week and its incidence was according to phenology of the crop irrespective of date of sowing. It showed significant positive correlation with minimum and maximum temperature while relative humidity and rainfall showed negative impact on larval population.

Keywords: *Chickpea, Gram Pod borer, Guntur, Helicoverpa armigera and Seasonal incidence*

Chickpea (*Cicer arietinum* L.) is an annual legume crop of *Fabaceae* family. Chickpea is grown in *rabi* season. Chickpea is considered to be unique because of its high level of protein content that accounts for almost 40% of its weight (Merga and Haji, 2019). Chickpea seeds are used for food and feed purposes, not only for excellent nutritional value but also for rich bioactive compound contents, such as phenolics and flavonoids (Magalhaes *et al*., 2017). As an annual grain legume, it is important not only for its highly nutritive value but also for its ability to maintain soil fertility by fixing atmospheric nitrogen (Dutta *et al*., 2022).

Chickpea is an important source of protein for millions of people in the developing countries, particularly in South Asia, who are largely vegetarian either by choice or because of economic reasons. In addition to having high protein content (20-22%), chickpea is rich in fiber, minerals (phosphorus, calcium, magnesium, iron and zinc) and â-carotene (Jukanti *et al*., 2012). It is consumed as a dry pulse after cooking, germinating, soaking or as a green vegetable. It is also used for the preparation of various sweets and spicy dishes where either the split grains or flour (besan) are used besides dhal (Kumar *et al*., 2019) Chickpea *Cicer arietinum L*. is one of the major rabi pulse crops cultivated in about 6.80 la. ha. with a production and productivity of 7.62 lakh ton. and 1119 kg/ha during 2012-2013 respectively in Andhra Pradesh. Due to the introduction of Bt cotton in Andhra Pradesh in 2002 and its large scale adoption by the farmers, the activity of gram caterpillar *H. armigera* came down. This triggered the farmers of Guntur and Prakasam districts to go for the chickpea cultivation in large areas and as a result they recorded highest productivity per hectare. However, seasonal incidence studies need to be conducted to continually monitor the pest level as this insect pest has the capacity to build up its population year by year and may reach the higher levels after some years. Hence the present studies were conducted to facilitate forewarning the farmers to take up the plant protection measures at right time.

MATRIAL AND METHODS

Field experiments were conducted to study the seasonal incidence of gram pod borer in rainfed chickpea at Regional Agricultural Research Station, Lam, Guntur during 2011-2013 *rabi* seasons with JG 11 variety. A plot size of 1000 sq. m was used to conduct the research. 30x10cm. spacing was followed. Number of larvae per 25 randomly selected plants at weekly intervals was noted. No. of damaged pods and total number of pods on whole plant basis was also recorded at weekly intervals starting from the pod formation stage. Sex pheromone traps for three insect pests of *H. armigera, Spodoptera litura*

and S. exigua were also maintained through out crop season. The number of male moths caught were counted and removed daily. Total number of moths per standard week was worked out to monitor the the peak moth emergence period.

RESULTS AND DISCUSSION

On the perusal of the data presented in Table 1 it is evident that gram pod borer *H. armigera* larva reached the peak incidence at 11th standard week (12-18 March) while the per cent pod damage at 12th standard week(19-25 March) when the crop is at flowering and pod formation stage. Similarly during 2012-13 Table 2 the pod borer reached the peak at 4th standard week (29 January to 4 th February) when the crop is at flowering and pod formation stage. Bal Mukund *et al* (2012) and Reddy *et al* (2009) similarly reported single peak in the larval population of *H. armigera* in the 4th week of March 2012 (12th meteorological standard week) at Allahabad and Varanasi respectively. Where as Singh and Ali (2006) and Shinde *et al* (2013) recorded two peaks in the larval population of *H. armigera* first from 46th to 50th standard week while the second from 5th to 14th standard week. Neverthless studies at Lam farm, it clearly indicated that *H. armigera* is slowly building up its population from 2002 when the bt cotton introduced in Andhra Pradesh and adopted widely by its farmers and it may obtain two peaks in larval population in future. From the sex pheromone trap catches it is evident that though *S. litura* catches were received its damage was not noticed on the crop indicating that they are migratory moths.

On the perusal of correlations data presented in table 3 it is evident that the larval population showed a positive correlation with minimum (r = 0.800 during 2011-12) and maximum temperatures (r = 0.855 and 0.154 during 2011-12 and 2012-13 respectively). Whereas the minimum temperature during 2012-13 showed negative correlation (r = -0.497). As regards relative humidity it showed the negative correlation with morning RH (r = -0.315 during 2011- 12) and evening RH (r = -0.591 and -0.356 during 2011-12 and 2012-13 respectively). Whereas morning relative humidity during 2012-13 showed positive correlation (r = 0.297). Rainfall showed negative correlation with larval population in both the years (r = -0.305 and -0.194 during 2011-12 and 2012-13 respectively). These findings emphasize the role of climatic factors in influencing *H. armigera* infestation on chickpea crop. Similar results were obtained by Bal Mukund *et al* (2012) in Varanasi area wherein the larval

Table 1. Pheromone trap catches and pest incidence in chickpea during 2011-12 crop season

Std. week	Month	*H. armigera* moth catch	*S. litura moth catch*	*S. exigua moth catch*	Larval counts Per			% pod damage
					H.a	*S.lit.*	*S.exg.*	
49	4-10 December	0	0	0	0	0	0	0
50	11-17 D	0	0	0	0	0	0	0
51	18-24 D	0	0	0	0	0	0	0
52	25-31 D	0	0	0	0	0	0	0
1	01-07-2026 January	0	0	0	0	0	0	0
2	8-14J	0	0	0	0	0	0	0
3	15-21J	0	0	0	0	0	0	0
4	22-28J	0	38	1	0	0	0	0
5	29 J – 4 F	0	65	0	0	0	0	0
6	5 – 11F	0	24	1	0	0	0	0
7	12 – 18F	11	67	19	1	1	6.3	0
8	19 – 25F	4	171	9	1.8	1	7.5	3.4
9	26-4M	1	79	9	8.1	3.6	7.2	7.2
10	5-11M	4	46	8	9	2	7	8.56
11	12-18M	7	37	7	10	0	2	10.69
12	19-25M	12	49	3	7	0	3	19.2
13	25M - 1A	7	74	4				

Table 2. Pheromone trap catches and pest incidence in chickpea during 2012-13 crop season

Std. week	Month	H. armigera moth catch	S. litura moth catch	S. exigua moth catch	Larval counts Per 10 plants			% pod damage
					H.a	S.lit.	S.exg.	
48	4-10 December	9	235	2	0	0	0	
49	11-17 D	3	11	0	0.1	0.1	6	
50	18-24 D	3	18	1	0	0.6	7	
51	25-31 D	1	34	0	0	0	0.5	
52	01-07-2026 January	1	17	0	0	0	0	
1	8-14J	1	1	0	1	0	1	2.5
2	15-21J	1	82	1	5	0	1	3.6
3	22-28J	1	74	2	9	0	0	8.6
4	29 J – 4 F	1	13	0	10	0	0	11.1
5	5 – 11F	2	7	0	7	0	0	8.3
6	12 – 18F	1	3	0	1	0	0	1.2
7	19 – 25F				0.1	0	0	0

population of *H.armigera* showed significantly positive correlation with both minimum and maximum temperature and the correlation coefficient was 0.62 and 0.64 respectively. The correlation coefficient of morning and afternoon relative humidity was negative (-0.76 and -0.73). The rainfall and larval population showed negative correlation coefficient (-0.09) but it was non significant. Correlation studies by Sharma and Rana (2018) revealed that the gram pod borer population showed positive non significant correlation with maximum temperature (r = 0.34 and r = 0.39), rainfall (r = 0.23 and r = 0.45) and significant positive correlation with minimum temperature (r = 0.59 and r = 0.56) during the year 2013-14 and 2014-15 respectively at sub mountainous region of Punjab..

Table 3. Correlation coefficient of larval population with abiotic factors

Abiotic factors Larval population	Temperature 0c		Per cent Relative humidity		Rainfall(mm)
	Minimum	Maximum	Morning	Evening	
2011-12	0.8	0.855	-0.315	-0.591	-0.305
2012-13	-0.497	0.154	0.297	-0.356	-0.194

The per cent pod damage showed a positive correlation with minimum temperature (r=0.802 and 0.154) during 2011-12 and 2012-13 respectively and maximum (r = 0.783 during 2011-12) (Table 4). Whereas the maximum temperature during 2012-13 showed negative correlation (r = -0.417). As regards relative humidity it showed the negative correlation with morning RH (r = -0.189 during 2011-12) and evening RH (r = -0.538 and -0.239 during 2011- 12 and 2012-13 respectively). Whereas morning relative humidity during 2012-13 showed positive correlation (r = 0.388). Rainfall showed negative correlation with per cent pod damage in both the years (r = -0.275 and -0.239 during 2011-12 and 2012-13 respectively). Matti *et al* (2017) reported that the maximum temperature (r= -0.774**) at 4 weeks lead time (prior) is consistently negatively associated with per cent pod damage in case of crop sown during last week of September month.

Table 4 Correlation coefficient of per cent pod damage with abiotic factors

Abiotic factors Per cent pod damage	Temperature 0c		Per cent Relative		Rainfall(mm)
	Minimum	Maximum	Morning	Evening	
2011-12	0.802	0.783	-0.189	-0.538	-0.275
2012-13	0.154	-0.417	0.388	-0.239	-0.239

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