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Seasonal incidence of major insect pests infesting vegetable pigeonpea

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Abstract
A field experiment was conducted at vegetable farm section, College of Horticulture, Bagalkot, Karnataka in *Kharif* season during 2018-19 and 2019-20 with intended to study the seasonal incidence of major insect pests of vegetable pigeonpea (*Cajanus cajan* L.). All together, 24 insect species belonging to seven orders such as Lepidoptera, Diptera, Hemiptera, Coleoptera, Orthoptera, Thysanoptera and Hymenoptera were recorded during the course of study. Out of which, blue butterfly, *Lampides boeticus*, gram pod borer, *Helicoverpa armigera*, pod fly, *Melanagromyza obtusa*, green sting bug, *Nezara viridula* and tur pod bug, *Clavigrella gibbosa* were found to be the major pests on vegetable pigeonpea with a highest population of 4.60/ plant and 4.90/plant, 6.8/plant and 5.8/plant, 2.7/pod and 3.20/pod, 13.0/plant and 16.4/plant, 9.2/plant and 8.40/plant during 2018-19 and 2019-20, respectively. Correlation studies revealed that the influence of weather factors on insect pests varied over the cropping seasons. However, only blue butterfly, pod fly and tur pod bug were significantly correlated with weather factors such as, rainfall influenced the population of blue butterfly, whereas minimum temperature, afternoon relative humidity and rainfall affected pod fly and minimum temperature for tur pod bug.

Keywords: Seasonal incidence, *Kharif*, insect pests, vegetable pigeonpea, *Cajanus cajan*

Introduction
Cajanus cajan (L.), commonly known as pigeonpea, red gram, arhar, tur is an important pulse crop of Karnataka contributing about 18 per cent and 12 per cent to total area and production in India, respectively (Anon, 2013) [3]. In terms of nutrition security, Pigeonpea is well balanced and a superior source of dietary proteins. Thus, immature pods or green seeds are consumed frequently as a raw vegetable in various parts of Karnataka.
Among several constraints in the production of vegetable pigeonpea, insect pests are the major ones. More than 250 insects are known to damage pigeonpea at various growth stages (Lal and Singh 1998) [9]. Among pod borers, gram pod borer, *Helicoverpa armigera* Hubner is a serious threat across pigeonpea growing areas in India; nevertheless, the pod fly, *Melanagromyza obtusa* (Malloch) has been emerging as a serious pest in central and south India (Ali and Gupta, 2012) [1]. However, the minor pest blue butterfly, *Lampides boeticus* (Linnaeus) attains the pest's status during the favorable climatic condition (Singh *et al*., 1988). Among pod sucking bugs, tur pod bug, *Clavigrella gibbosa* (Spinola) hampers quality grain production (Gopali *et al*., 2010) [6]. The seasonal incidence of these major insect pests of dal pigeonpea has been well documented by many researchers. However, no systematic work has been carried out to understand the seasonal occurrence of major insect pests concerning weather parameters of vegetable pigeonpea, which in turn facilitates in developing effective management practices at right time. Hence, an attempt has been made at College of Horticulture, Bagalkot to study the seasonal incidence of major insect pests of vegetable pigeonpea during 2018-19 and 2019-20.

Material and Methods
A field experiment was conducted at vegetable form section, College of Horticulture, Bagalkot to study the seasonal incidence of major insect pests of vegetable pigeonpea (*Cajanus cajan* L.) during *Kharif* 2018-19 and 2019-20. A popular vegetable pigeonpea variety "ICP 7035" was dibbled on sides of furrows in a total area of 15 m × 15 m during 1st fortnight of June with a spacing of 120 × 60 cm during both the year of study. The crop was raised according to the package of practice followed by University of Agricultural Sciences, Dharwad except for plant protection measures. In order to know the seasonal occurrence of major insect pests,

observations were recorded on 10 randomly selected and tagged plants at fifteen days intervals after one month of sowing to harvest of green pods. The average meteorological data of standard meteorological weeks (SMW) pertaining to maximum temperature, minimum temperature, morning relative humidity, afternoon relative humidity and total rainfall was collected from Agro Meteorological Observatory of Main Horticultural Research and Extension center (MHREC), UHS, Bgalkote during the entire period of investigation. Correlation studies were carried out to study the influence of weather factors on the incidence of major insect pests and the regression analysis was done to establish a relationship between biotic and abiotic factors.

Results and Discussion

During the course of study, 24 insect species belonging to seven orders such as Lepidoptera, Diptera, Hemiptera, Coleoptera, Orthoptera, Thysanoptera and Hymenoptera were recorded on vegetable pigeonpea. Among them blue butterfly, *Lampides boeticus*, gram pod borer, *Helicoverpa armigera*, pod fly, *Melanagromyza obtusa*, green sting bug, *Nezara viridula* and tur pod bug, *Clavigrella gibbosa* were observed to be major insect pests during various crop growth stages.

Incidence of Major insect pests

Green stink bug appeared first on vegetable pigeonpea followed by gram pod borer, blue butterfly, tur pod bug and pod fly during 36th and 37th SMW, 41st and 42nd SMW, 42nd and 42nd SMW, 2nd and 3rd SMW, 1sr and 1sr SMW, during 2018-19 (Fig. 1) and 2019-20 (Fig. 2), respectively. The peak incidence of these insect pests was observed between November to January, which coincided with green pod development to maturity of green pods during both the cropping seasons. The maximum mean population of 13.00 and 16.4 sting bugs/plant, 6.8 and 5.8 gram pod borer larvae/plant, 4.6 and 4.9 blue butterfly larvae/plant, 9.2 and 8.40 tur pod bugs/plant and 2.7 and 3.2 pod fly maggot/pod was observed during 2018-19 and 2019-20, respectively. The present findings are in conformity with Pandey and Das (2014) [11] who reported that the incidence of green stink bug was observed from 1st week of September (36th SMW) and was available upto 1st week of February (5th SMW). Further, findings by Jat *et al.* (2017) [8] confirmed the present investigation on gram pod borer who stated that the infestation started with the onset of bud initiation. While, Ambhure *et al.* (2014) [2] and Patidar *et al.* (2019) [12] observed the incidence from the flowering stage and they remained active up to the maturity of the crop. Srilaxmi and Paul (2010) from Gulbarga observed that the blue butterfly population from September to December. However, maximum population was observed when the crop was at flowering and podding stage and their observations strengthened the present study. Tur pod bug results are in line with Jakhar *et al.* (2017) [7] who reported the peak activity of tur pod bug between 50th SMW to 1st SMW during four consecutive cropping seasons and later on the population declined. Bhadani and Patel (2019) [4] observed pod fly in higher number during winter and the population start building rapidly in December and January with a peak infestation (3.2 maggot per pod) during 1st and 2nd week of January, which was similar to the present findings.

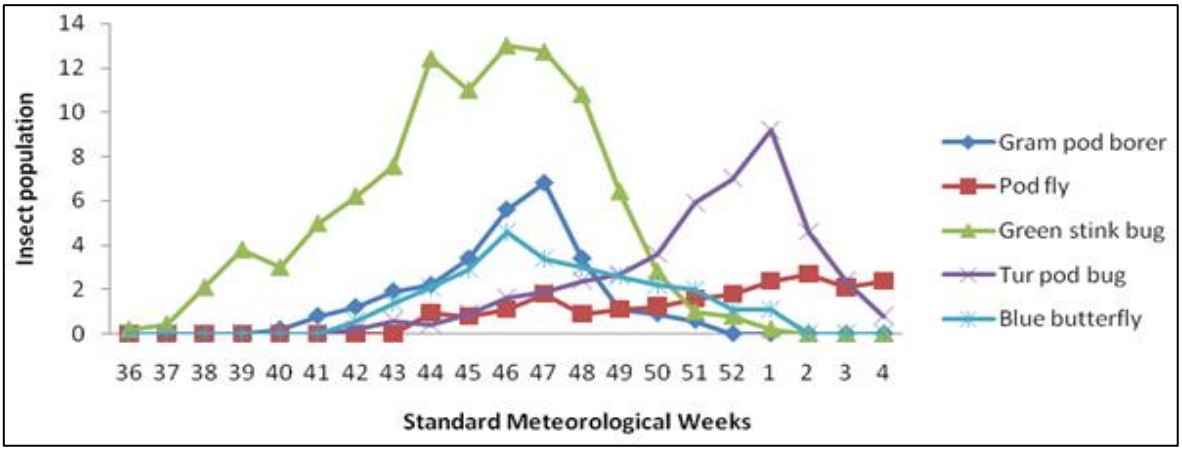

Fig 1: Seasonal incidence of major insect pests of vegetable pigeonpea during 2018-19

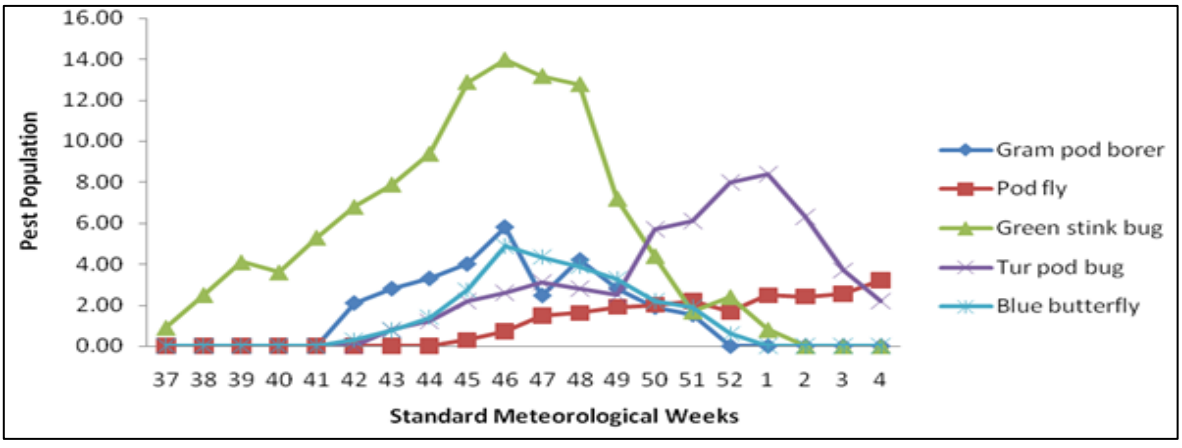

Fig 2: Seasonal incidence of major insect pests of vegetable pigeonpea during 2019-20

Influence of weather parameters on insect pest incidence

The correlation studies clearly indicated the influence of weather factors on the incidence of insect pests during the study. Only tur pod bug was significantly correlated whereas three species including blue butterfly, pod fly and tur pod bug were significantly correlated during 2018-19 and 2019-20 with weather parameter, respectively (Table 1).

A significant negative effect (r=-0.513 and r=-0.545) of minimum temperature on tur pod bug during 2018-19 and 2019-20, respectively indicated the decline in tur pod bug population with unit increase in minimum temperature. This is substantiated by the work of Nebapure *et al.* (2018) [10] who reported a significant negative correlation with minimum temperature.

A high degree of negative significant correlation was noticed between Morning relative humidity (r=-0.665), rainfall (r=-0.671) and blue butterfly population during 2019-20, indicating the decline in larval population with unit increase in morning relative humidity and rainfall. Shantibala *et al.* (2004) [13] reported a significant negative correlation (r=-0.686 and r=-0.704) between average relative humidity and blue butterfly during two consecutive years. However, no significant correlation was observed even though maximum relative humidity and rainfall was negatively correlated during 2018-19. This can be justified that the maximum relative humidity prevailed during the population build up of blue butterfly was lower and it was optimum and ranged between 42 to 71 per cent during 2018-19 whereas it was very high and ranged between 78 to 90 per cent during 2019-20. The same authors recorded a negative non significant correlation of rainfall with blue butterfly and this finding was in line with the study conducted during 2018-19. However, a significant negative correlation was observed during 2019-20 and it may be due to the heavy rainfall (138 mm) during initial stages of population build up compared to 2018-19 (4.6 mm).

A significant negative correlation was noticed between minimum temperature (r=-0.873), minimum relative humidity (r=-0.799), rainfall (r=-0.606) and pod fly population during 2019-20 indicated the decline in maggot population with a unit increase in all the above weather parameters. Yadav *et al.* (2011) [15] stated that minimum temperature between 8.1-17 °C and average relative humidity around 60-70 per cent was conducive for buildup of the *M. obtusa* population and rainfall had adverse effect on the population of maggot. However, higher minimum temperatures (18-21^{0}C) coincided with higher average relative humidity (> 70%) during 2019-20 reduced the pod fly population.

Table 1: Correlation between incidence of insect pests and weather parameters

Insect pests	Year	Correlation coefficient (r)				
		Temperature (^{0}C)		Relative Humidity (%)		Rainfall (mm)
		Max.	Min.	Max	Min	
Gram pod borer	2018-19	0.166^{NS}	0.006^{NS}	-0.398^{NS}	-0.244^{NS}	-0.215^{NS}
	2019-20	0.007^{NS}	0.313^{NS}	-0.081^{NS}	0.103^{NS}	-0.111^{NS}
Blue butterfly	2018-19	-0.535^{NS}	0.057^{NS}	0.561^{NS}	0.462^{NS}	-0.458^{NS}
	2019-20	0.119^{NS}	-0.402^{NS}	-0.665^{*}	-0.571^{NS}	-0.671^{*}
Pod fly	2018-19	-0.164^{NS}	-0.462^{NS}	0.246^{NS}	-0.383^{NS}	-0.470^{NS}
	2019-20	0.493^{NS}	-0.873^{**}	-0.410^{NS}	-0.799^{**}	-0.606^{*}
Green sting bug	2018-19	-0.403^{NS}	0.049^{NS}	-0.063^{NS}	0.211^{NS}	-0.122^{NS}
	2019-20	-0.284^{NS}	0.019^{NS}	-0.011^{NS}	0.069^{NS}	-0.159^{NS}
Tur pod bug	2018-19	0.105^{NS}	-0.513^{*}	0.003^{NS}	-0.413^{NS}	-0.286^{NS}
	2019-20	0.182^{NS}	-0.545^{*}	0.202^{NS}	-0.473^{NS}	-0.442^{NS}

* Significant at 5%, ** Significant at 1 %, without asterisk: Non significant

Conclusion

The present study on seasonal incidence of major insect pests infesting vegetable pigeonpea holds a potential opportunity towards developing a reliable management strategy by understanding the vulnerability of pests to various climatic conditions since they play a key role in regulating pest density.

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