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Yaspal Singh Nirala
Scientist (Entomology), All India Coordinated Research Project on Cashew, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar, Chhattisgarh, India

Vikash Ramteke
Scientist (Horticulture), All India Coordinated Research Project on Cashew, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar, Chhattisgarh, India

NC Mandawi
Scientist (Entomology), All India Coordinated Rice Improvement Programme, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar, Chhattisgarh, India

HC Nanda
Dean, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar, Chhattisgarh, India

Subhendu Roy
Technical Assistance, All India Coordinated Research Project on Cashew, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar, Chhattisgarh, India

Correspondence
Dr. Yaspal Singh Nirala
Scientist (Entomology), All India Coordinated Research Project on Cashew, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar, Chhattisgarh, India

Influence of weather factors on the incidence of pest complex of cashew

Yaspal Singh Nirala, Vikash Ramteke, NC Mandawi, HC Nanda and Subhendu Roy

Abstract
The field experiment was conducted in cashew plantation of village Sonarpal, Turenar and Dimrapal, District Bastar, Shaheed Gundadhur College of Agriculture and Research Station, Jagadalpur, Bastar (C.G.) during 2017-18. The results revealed that maximum incidence of pest were observed during new growth of flush and flower. The highly significant positive correlation (r = 0.622) was observed between TMB (shoot damage) and maximum temperature while, significant negative correlation (r = - 0.750) was recorded between relative humidity morning and TMB (shoot damage). The leaf eating caterpillar (damage %) showed significant negative correlation with minimum temperature (r = - 0.710) and evening relative humidity (r = - 0.577). The leaf folder (Damage %) showed negative correlation with maximum temperature (r = - 0.132), morning relative humidity (r = - 0.187) and evening relative humidity (r = - 0.099), similarly positive correlation with wind velocity (r = 0.103).

Keywords: Bastar, cashew, cashew insect pests and weather factors

Introduction
Cashew is one of the important commercial crops in India. The production and productivity of cashew is influenced by many factors, among them insect pest is one of the major. Around 180 species of insect and non-insect pests have been reported infesting cashew in India resulting in substantial yield losses (Sundararaju, 1993a) [1]. Various insect pests have been recorded on cashew (*Anacardium occidentale* L.) in India (Sundararaju, 1993b) [2]. Out of these the tea mosquito bug (*Helopeltis antonii*), stem and root borer (*Plocaederus ferrugineus*), inflorescence thrips (*Scirtothrips dorsalis*), apple and nut borer (*Nephopteryx* sp.) etc. are considered to be the major pests of cashew (Godase, *et al*., 2004) [3]. The tea mosquito bug (*Helopeltis antonii*) is the most important pest of cashew causing yield losses by damaging tender shoots, inflorescences and immature nuts at various stages of development (Devasahayam,1986) [4]. It is estimated that the average damage to tender shoots is to the extent of about 25 percent and to tender nuts it is 15 percent, whereas, when floral branches are infested it results in inflorescence blight which accounts for about 30 percent losses (Abraham, 1958) [5]. The tea mosquito bug alone has a potential to cause 40 to 50 percent yield losses in cashew and in severer out break the pest causes yield losses up to 100 percent (Annonymous, 1998) [6]. An insect population always fluctuates according to the dynamic condition of its environment. Both physical (abiotic) and biotic factors are believed to be the factors responsible for the change in a population. Four components of the environment that influenced animal or insect populations, namely weather conditions, food, other insects and organisms causing disease and a place in which to live (Andrewartha and Birch, 1954) [7]. Climatic factors such as rainfall and humidity have been known to greatly influence the population change of *Helopeltis* spp. (Karmawati *et al.*, 1999) [8]. Other factors include natural enemies (Peng *et al.*, 1999) [9], temperature (Pillai *et al.*, 1979) [10] and food supply (Swaine, 1959) [11]. Knowledge of the seasonal abundance and trends in the population build up of pest has become important for effective control schedules. This study reports the seasonal population fluctuation of insect pests of cashew and determines the influence of various environmental factors on its population in a cashew smallholding.

Material and Methods
The experiment was conducted in cashew plantation of village Sonarpal, Turenar and Dimrapal District Bastar, Shaheed Gundadhur College of Agriculture and Research Station,

Jagadalpur, Bastar (C.G.). For recording of per cent incidence of tea mosquito bug and other insect pests infestation, 52 leader shoots of cashew tree in four directions ((E,W,N,S) were randomly selected and tagged during observation. Observations were recorded according to AICRP on cashew proceedings (Anonymous, 2012) [12]. For tea mosquito bug, the extent of damage to the shoot and panicle was scored in 0-4 scale on the basis of the number and nature of necrotic lesion (Ambika, *et al*. 1979) [13]. Similarly for recording the per cent incidence of thrips (corky growth or presence of scabs) 100 nuts as well as apples per tree were selected randomly and recorded damage score in 0-4 scale (Godase, *et al*. 1990) [14].

Damage score for Tea mosquito bug

S.N.	Score	Details
1	0	No lesion/streak
2	1	Up to 3 necrotic lesions/streaks on shoot/panicle
3	2	4-6 coalescing or non- coalescing lesion/streak on shoot/panicle
4	3	Above 6 coalescing or non- coalescing lesions on shoot/panicle
5	4	Lesions/streak confluent – complete drying of affected shoot/panicle on shoot/panicle

Damage score for Thrips

S.N.	Score	Details
1	0	No Damage
2	1	1-25 per cent nut or apple surface damaged (up to 1/4 of the damaged surface area)
3	2	26-50 per cent nut or apple surface damaged (up to 1/2 of the damaged surface area)
4	3	51-75 per cent nut or apple surface damaged (up to 3/4 of the damaged surface area)
5	4	76-100 per cent nut or apple surface damaged (more than 3/4 of the damaged surface area)

Results and Discussion

Seasonal occurrence of cashew stem and root borer, leaf eating caterpillar, leaf folder, leaf miner and leaf thrips were recorded during throughout the year while, tea mosquito bug (TMB) during December to June with varied level of infestation and population. Maximum incidence of pests was observed during new growth of flush and flower. The data table 1 influence of abiotic factors on the activity of pest complex of cashew at Jagdalpur revealed that the significant positive correlation (r = 0.622) was observed between TMB (shoot damage) and maximum temperature while, significant negative correlation (r = -0.750) was recorded between morning relative humidity and TMB (shoot damage). Non significant positive correlation was observed between minimum temperature (r = 0.304), wind velocity (r = 0.510) and TMB (shoot damage). Similarly, Non significant positive correlation was observed between evening humidity (r = -0.155) and rainfall (r = 0.188) with TMB (shoot damage). TMB (panicle damage) showed the significant positive correlation with evening relative humidity (r = 0.887) and non significant positive correlation with minimum temperature (r = 0.548), morning relative humidity (r = 0.308), rainfall (r = 0.932) and wind velocity (r = 0.245) while, non significant negative correlation (r = 0.076) with maximum temperature.

The leaf eating caterpillar showed significant negative correlation with minimum temperature (r = - 0.710), wind velocity (r = - 0.553) and evening relative humidity (r = -0.577) and non significant negative correlation with minimum temperature (r = - 0.534), rainfall (r = - 0.467) while, non significant positive correlation with morning relative humidity (r = 0.534). The leaf folder (Damage %) showed non-significant negative correlation with maximum temperature (r = - 0.132), morning relative humidity (r = - 0.187) and evening relative humidity (r = -0.099) while non-significant positive correlation with wind velocity (r = 0.103) and minimum temperature (r = 0.132). Leaf minor (Damage %) showed significant negatively correlation with minimum temperature (r = -0.696) and non-significant negative correlation with other parameter whereas, significant positive correlation (r = 0.637) with morning relative humidity. Population of thrips leaf damage score showed significant negative correlation with minimum temperature (r = - 0.641), morning relative humidity (r = - 0.700) and evening relative humidity (r = -0.649).

Previous observations by Karmawati *et al.* (1999) [8] showed that relative humidity and the presence of predators influenced *H. antonii* population with R2 = 0.35. A study by Pillai *et al* (1979) [10] in India suggested that the population build up of *H. antonii* was negatively correlated with minimum temperature, minimum relative humidity and rainfall but was positively correlated with sunshine. Earlier, Siswanto *et al*., (2008) [15] reported that the *H. antonii* population began to increase at the end of the rainy season and was high during periods of low and intermittent rainfall. No insects were found during high rainfall. Number of shoots and inflorescences of cashew significantly influenced the number of *H. antonii* population. This trend of population abundance was not directly associated with rainfall, but rainfall influenced the physiology of shoot flushes and inflorescence production. Results of correlation and regression analysis showed that rainfall is not significantly correlated to *H. antonii* population and does not significantly contribute to the number of *H. antonii* population on cashew. The analysis between rainfall and number of shoots and inflorescence revealed that these parameters were negatively correlated. This indicated that rainfall did not directly influence the number of *H. antonii* population, but appears to influence the number of shoots and inflorescence.

Conclusion

Leaf miner, leaf folder, leaf caterpillar and TMB showed significant negative correlation with maximum temperature and rainfall while significant positive correlation with morning relative humidity. So, if morning humidity increases then farmer take precautionary measure.

Table 1: Influence of abiotic factors on the activity of pest complex of cashew at Jagdalpur

Weather Parameters	Shoot TMB (Damage score)	Panicle TMB (Damage score)	Leaf folder (Damage %)	Leaf caterpillar (Damage %)	Leaf miner (Damage %)	Thrips (D.L. score)
Maximum Temperature (ºC)	0.622**	-0.076	-0.132	-0.534	-0.167	0.250
Minimum Temperature (ºC)	0.304	0.548	0.028	-0.710*	-0.696*	-0.641*
Morning Relative humidity (%)	-0.750*	0.308	-0.187	0.346	0.637*	-0.700*
Evening Relative humidity (%)	-0.155	0.887*	-0.099	-0.577*	-0.300	-0.649*
Rainfall (mm)	-0.188	0.932	0.048	-0.467	-0.300	0.033
Wind velocity (km)	0.510	0.245	0.103	-0.553*	-0.567	-0.422

* Significant at 5% level, **Significant at 1 % level

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