The Pharma Innovation Journal 2023; SP-12(9): 405-408

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; SP-12(9): 405-408

www.thepharmajournal.com
Received: 17-06-2023
Accepted: 30-07-2023

Manoj Kumar Patel
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

PK Bhagat
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

AK Awasthi
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

RKS Tomar
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Archana Kerketta
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

PS Rathiya
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

NK Chaurre
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Corresponding Author:
Manoj Kumar Patel
Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India

Record the different insect-pests of potato along with their natural enemies at Mainpat Surguja (Chhattisgarh)

Manoj Kumar Patel, PK Bhagat, AK Awasthi, RKS Tomar, Archana Kerketta, PS Rathiya and NK Chaurre

Abstract
The field experiment was conducted at Potato and Temperate Fruits Research Station Mainpat, Surguja (C.G.) during *Rabi* season of 2022-23, to know the seasonal incidence of different insect-pests of potato along with their natural enemies. The incidence of Whitefly, *Bemisia tabaci* was first observed during 50th SMW *i.e.*, second week of December with 3.87 fly /plant then it gradually increased and the maximum number of flies was observed during 2nd SMW *i.e.*, second week of January with 4.00 fly /plant. The incidence of potato aphid, *Myzus persicae* was first observed during 49th SMW *i.e.*, maximum number of potato aphid, *Myzus persicae* was observed during 3rdSMW *i.e.*, third week of January with 14.13 aphid/plant. The tobacco caterpillar, *Spodoptera litura* revealed significant and negative correlation with maximum temperature (r= -0.635). The cutworm, *Agrotis ipsilon* revealed significant and negative correlation with morning relative humidity (r= -0.635). The major activity period of lady bird beetle was observed from fourth week of January, after that the infestation was declined.

Keywords: cutworm, field, incidence, January, potato, whitefly

Introduction
Potato is member of family Solanaceae and native of South America. Potato is actually underground modified swollen stem. After rice, wheat, and maize, the Potato (*Solanum tuberosum* L.) is one of the most significant food crops in the world.
Due to its superior value, the potato is regarded as the "King of Vegetables. It commands a prominent position among the crops. By area and duration, it produces the driest stuff. Each hundred Grammes of freshly harvested tuber includes significant energy digestible protein (1.6 g), glucose (22.6 g), micronutrients (0.6 g), dietary fibre (0.4 g), cholesterol (0.10 g), and vitamin C (25 mg) (Saini and Umrav, 2008) [10]. According to estimates, humans consume roughly 65% of the harvest's potatoes, 15% are 12.5% has been processed and uses as animal feed, 7.5% is preserved for "seed," and 7.5% is lost due to spoilage. (Horton and Sawyer, 1985) [5].
Potato is a cool season crop. Furthermore, humidity and rains are not beneficial to potato crops, which are frequently attacked by insects, nematodes, and disease. However, a number of biotic and abiotic variables interfere with the growth of this crop. The low output of this crop is primarily due to insect infestations (Mishra *et al*. 2001) [6]. Potato output suffers globally as a result of plant injury caused by different pests during various stages of growth of crops. According to estimates, several insect-pests and viruses in the potato crop have caused global losses of up to 10–16%. (Dhaliwal *et al*. 2010) [4]. One of the most significant insect-pests in potato is the aphid (*Myzus persicae* Sulzur), which is a global pest with a broad host diversity of many plant families. (Blackman and Eastop, 2000) [2].

Materials and Methods
Method of observation
The study was carried out at Potato and Temperate Fruits Research Station Mainpat Surguja (C.G.). During the second week of November, the Solanum tuberosum tubers were sown in a plot size of 10 m x 10 m with a planting distance of 60 cm x 20 cm using the suggested package of crop-raising practices.

- A conventional method was employed to record the aphid population on ten randomly selected plants from plant emergence through maturity. The aphid population was determined on the whole plant in the initial phases of the crop, and on 6 leafs in the later phases, including two from the top, middle, and bottom of each tagged plant. With the thumb and fingers gripping the petiole, the leaf was rotated until all of the underside was exposed. The number of aphids on the underside of each leaf was recorded.
- The number of whitefly species was visually recorded on the entire plant in the early stage, as well as on six leaves from the top, middle, and lower portions of each tagged plant. The leaf was gripped at the petiole by the thumb and forefinger and turned till the full backside of the leaf was clearly visible.
- The total number of thrips was recorded from the top most section of potato plants at every week on randomly chosen plants by shaking the plant on white paper attached on cardboard (20 cm x 20 cm).

Results and Discussion

Seasonal incidence of whitefly (*Bemisia tabaci*, Hemiptera: Aleyrodidae)

The whitefly appeared during 50thstandard meteorological week (SMW) *i.e.*, 10th-16th December (2nd week) with a mean density of 3.87 fly /plant. The population build up gradually and reached to its peak in the 2nd week of January (2ndSMW) with a mean population of 4.00 flies/plant, when the mean atmospheric temperature, rainfall and relative humidity were 16.70 °C, 0mm and 45.42 percent, respectively. Then, the density of whitefly declined and reached to its minimum levels of 2.40 flies/plant during 6th SMW *i.e.*, 5th February - 11th February.

According to the research, the whitefly has a substantial and positive link with the highest temperature (r= 0.673). The current finding is consistent with the findings of Amlari *et al*., 2021 [1], who conducted a field trial at Nagaland University's Experimental Farm School of Agricultural Sciences and Rural Development during the Rabi season of 2016-17 to study the effect of weather parameters on the incidence of major insect pests infesting potato crop.

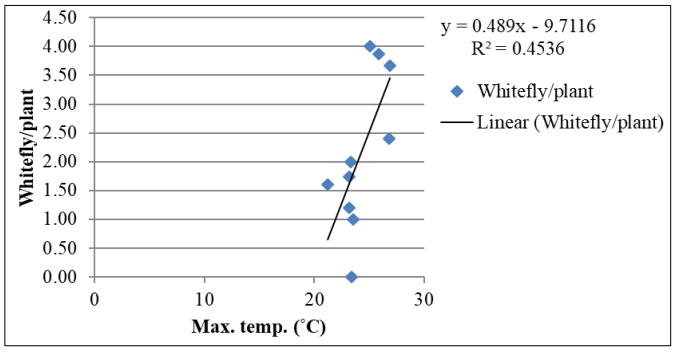

Fig 1: Regression equation between maximum temperature and population of Whitefly

Seasonal incidence of potato aphid (*Myzus persicae*, Hemiptera: Aphididae)

The potato aphid appeared during 49thstandard meteorological week (SMW) *i.e.*, 3rd-9th December (1stweek) with a mean population of 3.83 aphid /plant. The fly population gradually increased and reached to its peak in the third week of January (3rdSMW) with a mean population of 14.13 aphid /plant, when the mean atmospheric temperature, rainfall and relative humidity were 15.97 °C, 0mm and 66.85 percent, respectively. Then, the population declined and reached to its minimum levels of 3.83 aphid /plant during 6th SMW *i.e.*, 5th February -11th February.

The findings indicated that the potato aphid revealed significant and positive correlation with morning relative humidity (r= 0.680). The potato aphid also revealed significant and negative correlation with sunshine hours (r= -0.634). The present findings are similar with the findings of Rashid *et al.* 2013 [9], who also found significant positive correlation between relative humidity and insect pests population

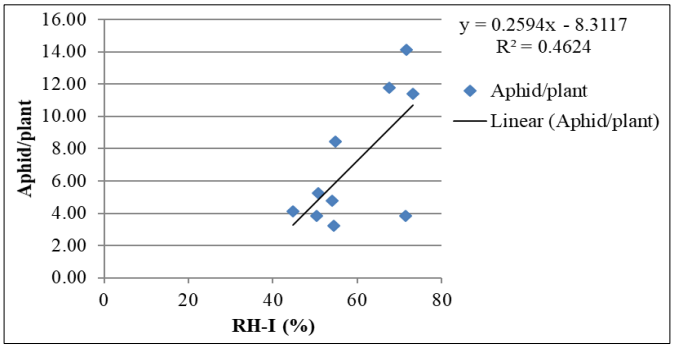

Fig 2: Regression equation between morning relative humidity and population of Potato aphid.

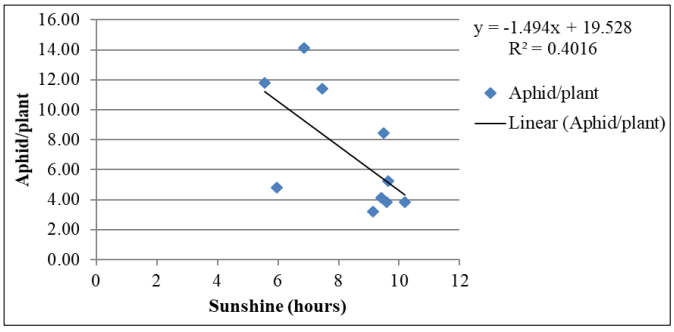

Fig 3: Regression equation between sunshine hours and population of Potato aphid

Seasonal incidence of potato thrips (*Thrips tabaci*, Thysanoptera: Thripidae)

The potato thrips appeared during 49thstandard meteorological week (SMW) *i.e.*, 3rd- 9th December (1stweek) with a mean population of 2.13 thrips /plant. The population build up gradually and reached to its peak in the third week of January (3rd SMW) with a mean population of 13.27 thrips /plant, when the mean atmospheric temperature, rainfall and relative humidity were 15.97 °C, 0mm and 66.85 percent, respectively. Then, the population declined and reached to its minimum levels of 3.17 thrips /plant during 6th SMW *i.e.*, 5th February -11th February.

The results showed that the population of potato thrips was strongly and positively linked with morning relative humidity (r= 0.635). The current findings are in partial accord with the findings of Sayeda and Tedilepb, 2013 [11] who found that maximum and lowest temperature and relative humidity had a substantial impact on the population densities of thrips, *thrips tabaci*. The current findings contradict the findings of Pathipati *et al*., 2014 [7], who found that lowest temperature, morning and evening relative humidity, and rainfall were all adversely connected with thrips population.

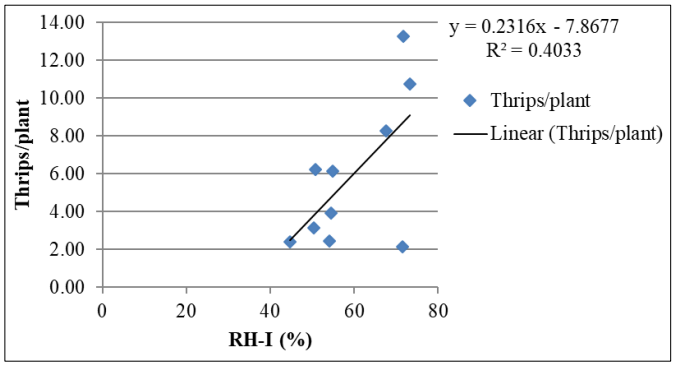

Fig 4: Regression equation between morning relative humidity and population of Potato thrips

Seasonal incidence of tobacco caterpillar (*Spodoptera litura,* Lepidoptera: Noctuidae)

The tobacco caterpillar appeared during 49thstandard meteorological week (SMW) *i.e.*, 3rd-9th December (1stweek) with a mean population of 0.30 larvae /plant. The population build up gradually and reached to its peak in the first week of January (3rd SMW) with a mean population of 4.80 larvae /plant, when the mean atmospheric temperature, rainfall and relative humidity were 13.92 °C, 0mm and 64.28 percent, respectively. Then, the population declined and reached to its minimum levels of 0.90 larvae /plant during 6th SMW *i.e.*, 5th February -11th February.

The results showed that the tobacco caterpillar had a substantial and negative relationship with maximum temperature (r= -0.635). Chaudhary (2009) [3] observed a similar discovery, namely the dispersonation of Spodoptera oblique (Walker) and Spodoptera litura (Fab.) from August to October. The current findings are also consistent with the findings of Punithavalli *et al*. (2011) [8], who observed that the tobacco caterpillar, *Spodoptera litura*, initially emerged in late July to early August and was present until late October.

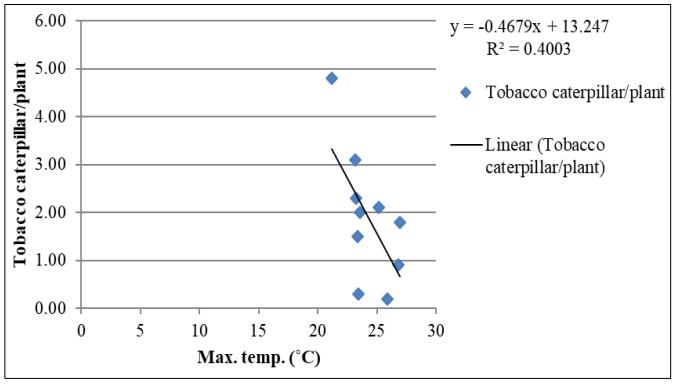

Fig 5: Regression equation between maximum temperature and population of Tobacco caterpillar.

Seasonal incidence of cutworm (*Agrotis ipsilon,* Lepidoptera: Noctuidae)

The cutworm appeared during 50th standard meteorological week (SMW) *i.e.*,10th-16th December (2ndweek) with a mean population of 3.00 larvae /plant. The population build up gradually and reached to its peak in the third week of December (51stSMW) with a mean population of 3.90 larvae /plant, when the mean atmospheric temperature, rainfall and relative humidity were 15.80 °C, 0 mm and 39.85 percent, respectively. Then, the population declined and reached to its minimum levels of 1.20 larvae /plant during 6th SMW *i.e.*, 5th February -11th February.

According to the data, the cutworm had a substantial and negative connection with morning relative humidity (r= -0.635). Sidhu *et al*., 2019 [13] reported a similar conclusion in their study of the prevalence and species diversity of cutworms (*Agrotis* spp.). It was discovered that the most damage in Mandi district was reported in Gohar village (28.33% plant kill and 2.67 larvae/m^2), and the maximum damage in Kullu district was recorded in Hawai village (22.33% plant kill and 2.33 larvae/m^2).

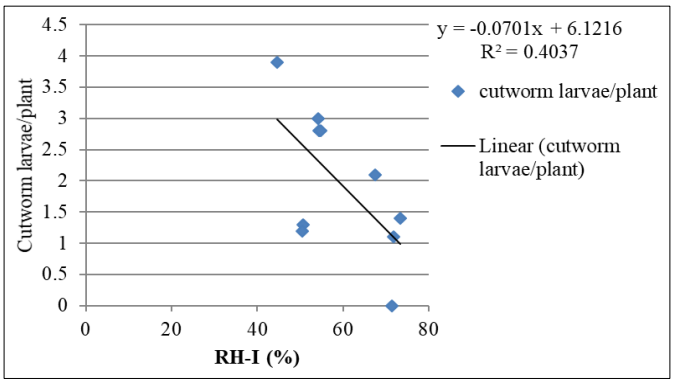

Fig 6: Regression equation between morning relative humidity and population of Cutworm

Seasonal incidence of lady bird beetle (*Coccinella spp.*)

The lady bird beetle appeared during 49thstandard meteorological week (SMW) *i.e.*, 3rd-9th December (1stweek) with a mean population of 0.10 beetle /plant. The population build up gradually and reached to its peak in the fourth week of January (4th SMW) with a mean population of 2.90 beetle /plant, when the mean atmospheric temperature, rainfall and relative humidity were 18.64 °C, 0 mm and 59.56 percent, respectively. Then, the population declined and reached to its minimum levels of 1.70 beetle /plant during 6th SMW *i.e.*, 5th February -11th February.

The data revealed that the lady bird beetle had a non-significant and negative connection with minimum temperature (r = -0.210) and evening relative humidity (r = -0.272). It, on the other hand, exhibited a non-significant and positive association with maximum temperature (r = 0.075), morning relative humidity (r = 0.040), and sunlight hours (r = 0.036). Amlari *et al*., 2021 [1] reported that *Menochilus sexmaculatus* was first discovered on potato during the 47th SMW. *Menochilus sexmaculatus* was active from the 47th to the 6th SMW

Table 1: Population fluctuation of insect-pests of potato crop during 2022

SMW	Period	No. of whitefly/ Plant	No. of aphid/Plant	No. of thrips /Plant	No. of tobacco caterpillar/ plant	No. of cutworm larvae/ plant	No. of coccinellid beetle/ plant	Weather parameters					
								Max. Temp. (^{0}C)	Min. Temp. (^{0}C)	RH-I (%)	RH-II (%)	Sunshine (hours)	Rainfall (mm)
49	3rd Dec- 9th Dec	0.00	3.83	2.13	0.30	0	0.10	23.4	8.28	71.42	54.28	9.6	0
50	10th Dec- 16th Dec	3.87	4.80	2.47	0.20	3	0.20	25.85	12.6	54.14	49.28	5.96	0
51	17th Dec-23rd Dec	1.00	4.13	2.40	2.00	3.9	0.90	23.54	8.05	44.71	35	9.42	0
52	24th Dec31st Dec	1.20	3.23	3.93	2.30	2.8	1.60	23.2	11.45	54.5	45	9.15	0
1	1st Jan- 7th Jan	1.60	11.77	8.27	4.80	2.1	2.50	21.2	6.65	67.57	61	5.57	0
2	8th Jan-14th Jan	4.00	8.43	6.13	2.10	2.8	2.70	25.11	8.28	54.85	36	9.5	0
3	15th Jan-21st Jan	1.73	14.13	13.27	3.10	1.1	1.00	23.17	8.77	71.71	62.28	6.85	0
4	22nd Jan-28th Jan	3.67	11.40	10.73	1.80	1.4	2.90	26.91	10.37	73.28	45.85	7.46	0
5	29th Jan-4th Feb	2.00	5.23	6.23	1.50	1.3	2.50	23.34	9.57	50.71	35	9.63	0
6	5th Feb-11th Feb	2.40	3.83	3.17	0.90	1.2	1.70	26.8	11.2	50.42	32	10.19	0

Table 2: Correlation coefficient of different insect-pests, natural enemies with abiotic factors

	Weather parameters					
	Max. Temp. (^{0}C)	Min. Temp. (^{0}C)	RH I (%)	RH II (%)	Sun Shine (hours)	Rain fall (mm)
Whitefly, (*Bemisia tabaci*)	0.673*	0.409	-0.089	-0.256	-0.272	0.000
Potato aphid, *(Myzus persicae*)	-0.159	-0.424	0.680*	0.595	-0.634*	0.000
Potato thrips, (*Thrips tabaci*)	-0.112	-0.275	0.635*	0.482	-0.476	0.000
Tobacco caterpillar, (*Spodoptera litura*)	-0.633*	-0.613	0.270	0.435	-0.450	0.000
Cutworm, *(Agrotis ipsilon*)	-0.028	0.094	-0.635	-0.321	-0.116	0.000
Lady bird beetle, (*Coccinella spp.*)	0.075	-0.210	0.040	-0.272	0.036	0.000

*Significant at 5% level of significance
**Significant at 1% level of significance

Conclusions

During the experiment it was concluded that the major activity period of whitefly, potato aphid and thrips was observed from December to January, after that the infestation was declined. The Whitefly, *Bemisia tabaci* revealed significant and positive correlation with maximum temperature (r= 0.673). The potato aphid, *Myzus persicae* revealed significant and positive correlation with morning relative humidity (r= 0.680) and significant and negative correlation with sunshine hours (r= -0.634). The potato thrips, *Thrips tabaci* revealed significant and positive correlation with morning relative humidity (r= 0.635). The tobacco caterpillar revealed significant and negative correlation with maximum temperature (r= -0.635). The cut worm. *Agrotis ipsilon* revealed significant and negative correlation with morning relative humidity (r= -0.635). The major activity period of lady bird beetle were observed from fourth week of January, after that the infestation was declined.

References

1. Amlari I, Neog P, Kikon N. Seasonal incidence of major insect pests of Potato (*Solanum tuberosum* L.) and their correlation with abiotic factors under foothill conditions of Nagaland. Int. J Curr. Microbiol. App. Sci. 2021;10(07):222-228.
2. Blackman RL, Eastop VF. Aphids on the world's crops: an identification and information guide (No. Ed. 2). John Wiley & Sons Ltd; c2000.
3. Chaudhary VK. Disperson of *Spilosoma obliqua* (Walker) and *Spodoptera litura* (Fab.) in soybean field. Pest Management and Eco. Zoology. 2009;17(2):133-139.
4. Dhaliwal GS, Jindal V, Dhawan AK. Insect Pest Problems and Crop Losses: Changing Trends. Indian Journal of Ecology. 2010;37(1):1-7.
5. Horton D, Sawyer RL. The potato as a world food crop, with special reference to developing areas. Potato physiology; c1985. p. 1-34.
6. Mishra AK, Singh RS, Pandey SK. Relative efficacy of chemicals and botanical insecticides against sweet potato weevil. Annals of Plant Protection Sciences (India). 2001;9:201-204.
7. Pathipati VL, Vijayalakshmi T, Naidu LN. Seasonal incidence of major insect-pests of chilli in relation to weather parameters in Andhra Pradesh. Pest Management in Horticultural Ecosystems. 2014;20(1):36-40.
8. Punithavalli M, Sharma AN, Balaji M, Kumar R. Survey on the population dynamics of *Spodoptera litura* (Fab.) in soybean by using sex pheromone. Directorate of soybean research, Indore; c2011.
9. Rashid MH, Khatun MJ, Mahfuz MS, Dash CK, Hussain MA. Seasonal fluctuation of insect-pests of Brinjal at agricultural research station. Int. J Expt. Agric. 2013;3(1):4-8.
10. Saini GS, Umrav VK. Modern Oleri and Floriculure production. Rama Publication House, Meerut. 2008, 82-83.
11. Sayeda AMM, Teilepb WMA. Role of natural enemies, climatic factors and performance genotypes on regulating pests and establishment of canola in Egypt. J Basic & Applied Zoo. 2013;66(1):18-26.
12. Shakur M, Ullah F, Naem M, Amin M, Saljoqi AUR, Zamin M. Effect of various insecticides for the control of potato cutworm (*Agrotis ipsilon*, Noctuidae: Lepidoptera) at Kalam Swat. Sarhad Journal of Agriculture. 2007;23(2):423-426.
13. Sidhu KS, Sharma SD, Sharma PK. Occurrence and biodiversity of cutworms (*Agrotis* spp.) in maize agro-ecosystem in sub-mountainous hill region of North-Western Himalayas, India. Journal of Entomology and Zoology Studies. 2019;7(5):36-38.