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Seasonal incidence of pests and natural enemies on soybean (*Glycine max L*)

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Abstract

The experiment on, "Seasonal incidence of pests and natural enemies on soybean (*Glycine max L*)" was undertaken at Agricultural farm of Krishi Vigyan Kendra, Dhule and College of Agriculture, Dhule during 2020 -2021. The experiment was planned out in Randomized Block Design with seven treatments and three replications. The variety used for study was JSS-335. It is evident from the data that, the occurrence of tobacco leaf eating caterpillar commenced from 32nd SMW (0.80 larvae/mrl), green semiooper (2.67 larvae/mrl), girdle beetle (1.80 grub/mrl), whitefly (1.40 adults & nymphs /3 leaves) and green lacewing (2.66 grub & adults/mrl) in 33th SMW, aphids (14.40/5cm) twigs in 34th SMW and jassids (1.40/3 leaves), lady bird beetle (4.33 grub & adults /mrl).

Keywords: Incidence, soybean, pests, natural enemies, temperature and humidity

Introduction

Seasonal abundance of soybean pest and natural enemies

The soybean plot selected for seasonal incidence of soybean pests and natural enemies on soybean was kept free from insecticide sprays. Weekly observations on seasonal incidence of tobacco leaf eating caterpillar (*Spodoptera litura* Fab.), aphids, jassids, white flies, thrips, girdle beetle and natural enemies was recorded from sowing to till maturity.

+ Pests:

Sucking pests

Aphids: No. of aphids from 5 cm terminal twigs of five randomly selected tagged plants were recorded.

Jassids: No. of jassids from three leaves (upper, middle, bottom part of the plants) were recorded from randomly selected five plants.

White flies: whiteflies were recorded from three leaves (upper, middle and bottom part of the plant).

Thrips: The population of thrips were recorded from 5 tender shoots of plant from the randomly selected five plants.

Defoliators

Tobacco leaf eating caterpillar and green semiooper: The population of tobacco leaf eating caterpillar and green semiooper were recorded separately. The average larval population per meter row length was recorded from randomly selected three locations of one meter row length, during early in the morning.

Stem girdle

Girdle beetle: Observation on girdle beetle was recorded on randomly selected 100 plants from unsprayed plot and from that healthy and affected plants were counted for calculating the percent infestation of girdle beetle.

Natural enemies

Observations on the predators viz., lady bird beetle, spider and green lacewing were recorded

from randomly selected three locations of one meter row length, during early in the morning.

Result and Discussion

1) Seasonal incidence of pests

Seasonal incidence of insect pests, predators, and the influence of thermo-hygro parameters viz. temperature (maximum and minimum), relative humidity (morning and evening), rainfall, rainy days, sunshine hrs, evaporation, and wind speed on population of pests and predators were assessed and presented in Table 1 and depicted in Fig 1.

Tobacco leaf eating caterpillar (*Spodoptera litura* (Fabricius))

The data on population of tobacco leaf eating caterpillar is presented in Table 1. It is evident from the data that, the occurrence of tobacco leaf eating caterpillar commenced from 32nd SMW and continued till 41st SMW which ranged from 0.80 to 14.23 larvae/mrl. The population was above ETL (4 larvae/mrl) during 34th SMW onwards. The incidence of tobacco leaf eating caterpillar was gradually increased from first week of August 2021 (0.80 larvae/mrl) to third week of September (14.23 larvae/mrl). The population was decreased in next one week from 14.23 larvae/mrl to 2.05 larvae/mrl, due to maturity of crop.

Green semilooper (*Chrysodeixis acuta*) Walker.

The data on population of green semilooper is presented in Table 1. It indicates that, green semilooper population was commenced from 33th SMW and continued till 40th SMW which ranged from 2.67 to 8.67 larvae/mrl and exist in the field with 8.67 larvae/mrl during 38th SMW. The population was above ETL (2 larvae/mrl) during 34th SMW onwards. The incidence of green semilooper was gradually increased from second week of August 2019 (2.67 larvae/mrl) to third week of September (8.67 larvae/mrl). The population was decreased in next two weeks from 8.67 larvae/mrl to 1.33 larvae/mrl, due to the maturity of crop.

Girdle beetle (*Oberiopsis obtusa*)

The data on per cent infestation of girdle beetle is presented in Table 1. It indicates that, per cent infestation of girdle beetle was commenced from 33th SMW and continued till 36th SMW which ranged from 1.80 to 3.60 per cent and exist in the field with 3.60 per cent during 34th SMW.

Aphids (*Aphis glycines* Matsumura)

The data on population of aphids are presented in Table 1. Data presented revealed that, the pest commenced from third week of August 14.40 aphids/5 cm twig/plant and gradually decreased up to fourth week of September (i.e., 8.40 aphids/5 cm twig/plant). There was a gradual decreased in population in third week of October and subsidized next two weeks, due to maturity of crop.

Whitefly (*Bemisia tabaci* Gennadius)

The data on population of whiteflies are presented in Table 1. Data revealed that, the pest commenced from second week of August (0.80 whiteflies/3 leaves/plant) and gradually increased up to first week of September (3.33 whiteflies/3 leaves/plant). There was a gradual decreased in population in second week of September and subsidized next four weeks, due to rainfall and maturity of crop.

Jassid (*Empoasca kerri* Pruthi)

The data on population of jassids are presented in Table 1 revealed that, the pest commenced from fourth week of August (1.40 jassids/3 leaves/plant) and gradually increased up to fourth week of September (8.60 jassids/3 leaves/plant). There was a gradual decreased in population in first week of October and subsidized next four week, due to rainfall and maturity of crop.

Seasonal incidence of natural enemies

Lady bird beetle

The data on population of natural enemies per meter row length are presented in Table 1. The population of lady bird beetle was noticed during fourth week of August then it gradually increased and reached (4.67/plant) in second week of September. The population of coccinellid beetle was directly dependent upon the incidence level of aphids and jassids in field,

Spider

The population of spider/web-spider was commenced from August first week and its peak population reached was about 4.33/mrl.

Green lacewing

The green lacewing population noticed in August second week noticed upto 2.66/mrl. Data from present findings revealed that, the incidence of tobacco leaf eating caterpillar and natural enemies like lady bird beetles, spider and green lacewing were recorded during kharif season 2021. The result of this finding is reported by various researchers as Singh and Singh (1990) ^[9], Chaturvedy *et al.*, (1998) ^[4], Patil *et al.*, (2012) ^[15], Netam *et al.*, (2013) ^[16], Yadav *et al.*, (2015) ^[11] and Sarvesh Kumar *et al.*, (2018) ^[9].

The present findings are in a conformation with that of Kumar *et al.*, (1998), who reported peak incidence of tobacco caterpillar in second week of September.

Ann L. Rypstra and Paul E. Carter (1995) ^[3] were studied and documented that, the web-spider community in a soybean agro-ecosystem over entire season in 1990 and 1991 and over period of peak spider abundance in August of 1993.

3) Correlation of weather parameters on pests and natural enemies on soybean

The data on average population of tobacco leaf eating caterpillar recorded under field conditions were correlated with meteorological parameters such as maximum and minimum temperature, relative humidity, rainfall, rainy days, sunshine, evaporation, wind speed and Pearson correlation coefficient values (r) were computed. These are displayed in Table 1.

The maximum and minimum temperature showed as positively non-significant correlation with tobacco leaf eating caterpillar (r=0.195, 0.254), green semilooper (r=0.159, 0.404), girdle beetle (r = 0.226, 0.372), aphid (r=0.136, 0.334), jassids (r=0.055, 0.085), whitefly (r=0.080, 0.303), spider (r=0.180, 0.426) and green lacewing (r=0.356, 0.389), while negatively non-significant with coccinellid beetles (r= -0.007) and the correlation along with minimum temperature was positively non-significant (r= 0.118).

Table 1: Seasonal incidence of the insect pests and natural enemies on soybean during Kharif 2021

SMW	Month/Date	No. of tobacco leaf eating caterpillar/mrl	No. of green semilooper/mrl	% of infestation of girdle beetle	No. of aphids/5 cm twings	No. of jassids/3 leaves	No. of whiteflies/3 leaves	No. of lady bird beetle /mrl	No. of spider/mrl	No. of green lacewing/mrl
31	30-05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32	Aug06-12	0.80	0.00	0.00	0.00	0.00	0.00	0.00	3.67	0.00
33	13-19	3.28	2.67	1.80	0.00	0.00	0.80	0.00	3.44	2.66
34	20-26	5.11	4.67	3.60	14.40	0.00	1.40	0.00	4.33	1.66
35	27-02	6.55	2.67	3.20	20.80	1.40	3.33	4.33	2.66	1.00
36	Sep 03-9	10.36	4.33	1.40	17.60	4.40	2.66	3.67	3.66	0.33
37	10-16	11.78	6.67	0.00	14.80	5.40	1.40	4.67	2.33	0.67
38	17-23	14.23	8.67	0.00	10.40	4.20	1.60	2.67	3.67	2.11
39	24-30	9.43	4.33	0.0	8.40	8.60	0.00	1.67	2.88	1.37
40	Oct 01-07	6.74	1.33	0.00	6.80	3.60	0.00	3.67	4.22	1.22
41	08-14	2.05	0.00	0.00	0.00	0.00	0.00	0.00	1.66	0.00
42	15-21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SMW= Standard Meteorological Week

(The tobacco leaf eating caterpillar population is of respective week while weather parameters are of previous week are shown in Appendix I)

Appendix I: Agricultural Research Station, Dhule Weather Data-2021

Month	SMW	Temperature		Humidity (%)		Rain Fall (mm)	No. of Rainy days	Sun shine hours	Evap (mm)	Wind speed (Kmp)
		Max	Min	7.30	14.30					
June	23	42.6	25.6	65.6	21.3	0.0	0.0	7.9	11.6	6.7
	24	40.9	25.2	61.8	26.3	5.0	2.0	7.4	9.0	7.5
	25	38.3	23.2	68.5	34.2	2.2	0.0	4.6	8.5	7.3
	26	35.0	22.7	79.8	59.5	23.2	3.0	4.0	3.7	4.7
July	27	32.4	22.3	81.9	65.4	24.7	4.0	0.6	3.0	4.6
	28	33.9	22.8	80.6	47.3	13.3	1.0	3.1	5.4	5.3
	29	37.5	22.1	74.3	43.2	69.1	2.0	7.3	8.0	5.8
	30	34.1	22.6	83.6	64.8	24.7	3.0	2.5	3.8	6.7
	31	29.7	22.2	84.7	82.4	65.4	7.0	0.3	1.5	5.2
August	32	28.4	21.3	91.1	76.1	98.4	5.0	2.8	1.4	4.8
	33	31.3	21.1	89.1	59.2	15.7	3.0	3.3	4.3	3.1
	34	32.7	22.3	83.8	61.8	9.3	1.0	3.6	2.9	4.0
	35	31.2	20.7	91.0	62.1	76.3	4.0	3.0	3.6	3.4
September	36	31.7	21.3	94.0	71.9	41.9	3.0	1.4	3.0	2.2
	37	29.4	21.0	90.3	74.0	38.6	5.0	0.8	2.3	3.9
	38	32.5	21.2	91.0	60.8	37.9	1.0	3.6	2.9	4.0
	39	31.6	20.4	93.2	70.8	36.8	2.0	3.2	2.8	3.2
October	40	32.6	20.1	90.0	54.0	35.2	1.0	7.4	3.6	2.6
	41	32.9	18.8	88.4	46.4	0	0.0	8.1	3.3	1.8
	42	32.1	17.6	88.1	49.6	16.7	2.0	4.8	3.0	1.7
	43	26.8	19.0	94.1	75.2	101.1	5.0	1.2	1.9	2.6
	44	30.4	19.0	93.0	56.0	58.4	3.0	5.7	3.5	1.8
Total rain fall & no. of rainy days						793.9	56			

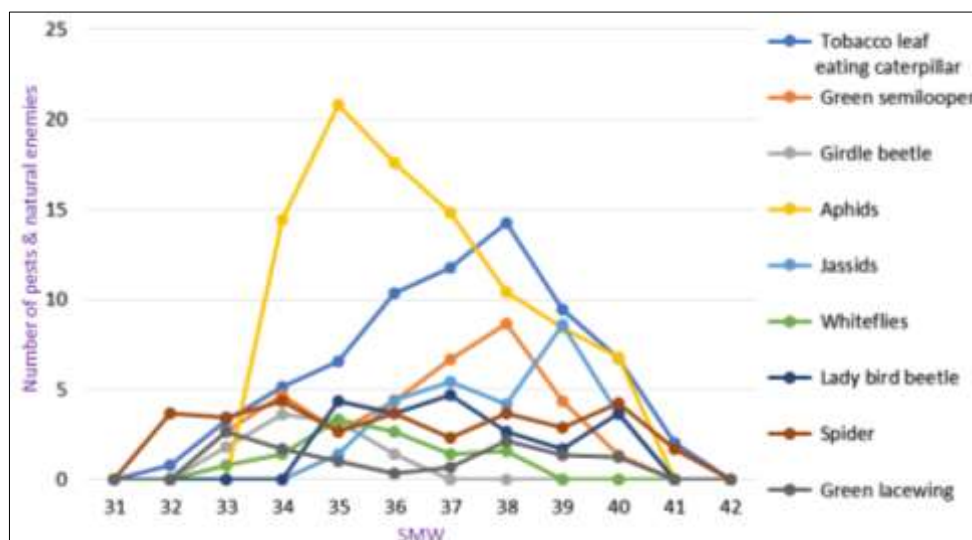


Fig 1: Seasonal incidence of insect pests and natural enemies on soybean during Kharif 2021-22

The relative humidity measures on morning and evening time per day. The correlation of morning and evening humidity were found as positively non-significant in case of incidence of tobacco leaf eating caterpillar ($r = 0.390, 0.069$), green semilooper ($r = 0.234, 0.138$), lady bird beetle ($r = 0.147, 0.075$), while in case of girdle beetle, morning humidity is negatively significant at 5% and evening humidity is negatively non-significant ($r = -0.785^*, 0.117$), regarding to whitefly ($r = -0.356, -0.009$), and green lacewing ($r = -0.053, -0.124$), morning and evening humidity were found as negatively non-significant. Morning humidity is found as negatively non-significant and evening is positively non-significant in case of aphid ($r = -0.221, 0.008$) and vice versa in case of spider ($r = 0.090, -0.071$), and jassids ($r = 0.648^*, 0.214$) population has shown significant at 5% with morning relative humidity and positively non-significant with evening relative humidity.

The Rainfall factor showed as negatively non-significant correlation with tobacco leaf eating caterpillar, green semilooper, girdle beetle, green lacewing and spiders ($r = -0.051, -0.141, -0.068$ & -0.303), while positively non-significant with aphids, jassids, coccinellid beetles ($r = 0.08, 0.124$ & 0.075) and the correlation along with rainy-day was positively non-significant for tobacco leaf eating caterpillar, green semilooper, whitefly and lady bird beetle ($r = 0.0170, 0.127, 0.062$ & 0.045), whereas girdle beetle, aphid, jassid, spider and green lacewing was non-negatively significant ($r = -0.222, -0.088, -0.027, -0.169$ & -0.062).

In case of sunshine hours, the incidence of tobacco leaf eating caterpillar, green semilooper, girdle beetle, aphid, jassid, whitefly and lady bird beetle showed negative non-significance ($r = -0.222, -0.326, -0.825, -0.340, -0.218, -0.370$ & -0.220), while coccinellid beetles, spider, and green lacewing ($r = 0.152$ & 0.122) showed positive non-significance. Correlation between incidence of tobacco leaf eating caterpillar, green semilooper, girdle beetle, aphid & whitefly, lady bird beetle, spiders, and green lacewing ($r = 0.187, 0.141, 0.466, 0.301, 0.261, 0.150, 0.444$ & 0.423) positively non-significant with evaporation and also recorded positively non-significant correlation with wind speed ($r = -0.477$).

Marabi *et al.* (2017) [17] reported that, the temperature and evaporation were found to be significantly positively

correlated with whitefly population during kharif season. Mangang *et al.* (2017) [18] reported similar findings at par with present results that evening relative humidity showed positive correlation, but morning relative humidity and sunshine hours showed negative correlation, statistically non-significant with peak aphid infestation.

Jagrati *et al.* (2016) [19] in their correlation studies revealed that, sunshine hours showed significant positive correlation with stem tunnelling.

Ahirwar *et al.*, (2015) [2] recorded the population of lady bird beetle on second week of August and population showed statistically non-significant positive correlation with temperatures, but negatively correlated with relative humidity which is partial conformity with the present findings.

Ahirwar *et al.*, (2014) [2] recorded the peak larval population of tobacco caterpillar (*Chrysodeixis acuta*) at 34th SWM when maximum and minimum temperature was 32 °C and 28.2 °C, respectively. There was no significant correlation exhibited between the larval population and weather parameters.

Kalyan and Ameta (2017) [5] revealed that, the maximum incidence of tobacco caterpillar in soybean crop was recorded during 41st SMW and 42nd SMW, respectively. The maximum temperature and sunshine hours showed a significant positive correlation with the larval population of tobacco caterpillar while, significant negative correlation with rainfall during both the years. Whereas maximum temperature had significant positive impact on population of tobacco caterpillar while rainfall had significant negative effect.

Ramesh babu *et al.*, (2017) [6] observed that, semilooper larval population was recorded late July/early August and their peak activity observed during 33-34, 33-36 and 37-39 standard weeks, in 2012, 2013 and 2014, respectively. Amongst the weather factors, morning relative humidity showed significant ($r = 0.954$) and positively higher influence on the larval population per mrl. Whereas evening humidity ($r = -0.644$) and sunshine hrs ($r = 0.367$) negatively and significantly influence on the larval population per mrl. The various weather parameters significantly caused 92 per cent variations in larval population per mrl. The findings of these researchers are in partial agreement as they did not study completely like present investigation. Further the climatic conditions may be varied place to place which affect the activities of insect pests.

Table 2: Correlation of pests and natural enemies' population on soybean with weather parameters

Pests and natural enemies	Correlation coefficient values (r)								
	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Rainy days	Sunshine (hrs.)	Evaporation (mm)	Winds peed (Kmph)
	Max	Min	Morg	Evng					
Tobacco leaf eating caterpillar	0.195	0.254	0.390	0.069	-0.051	0.017	-0.222	0.187	-0.477
Green semilooper	0.159	0.404	0.234	0.138	-0.141	0.127	-0.326	0.141	-0.477
Girdle beetle	0.226	0.372	-0.785**	-0.117	-0.068	-0.222	-0.825	0.466	-0.477
Aphids	0.136	0.334	-0.221	0.008	0.124	-0.088	-0.340	0.301	-0.477
Jassids	0.055	0.085	0.648*	0.214	0.017	-0.027	-0.218	-0.068	-0.477
Whitefly	0.080	0.303	-0.356	-0.009	0.178	0.062	-0.370	0.261	-0.477
Lady bird beetle	-0.007	0.118	0.147	0.075	0.231	0.045	-0.220	0.150	-0.477
Spider	0.180	0.426	0.090	-0.071	0.033	-0.169	0.152	0.444	-0.477
Green lacewing	0.356	0.389	-0.053	-0.124	-0.303	-0.062	0.122	0.423	-0.477

* - significant at 5% level ($p = 0.05$) = 0.648*, ** - significant at 1% level ($p = 0.01$) = -0.785**

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References

1. Ahirwar R, Devi P, Gupta R. Seasonal incidence of major insect-pest and their bio- Control against soybean crop. *Academic J pl protec.* 2014;10(12):402-406.
2. Ahirwar R, Devi P, Gupta R. Influence of ambient weather on the incidence of major insect pests and their bio-agents of soybean crop (*Glycine max* L. Merrill). *Internat. J of Pl. Protec.* 2015;8(2):234-240
3. Ann L Rypstra, Paul E Carter. Seasonal incidence of web-spider in soybean ecosystem. *The Journal of Arachnology.* 1995;23(3):135-144, (10 pages).
4. Chaturvedy S, Singh KJ, Singh OP, Dubey MP. Seasonal incidence and damage of major insect pest of soybean in Madhya Pradesh. *Crop Res.* 1998;15(2-3):260-264.
5. Kalyan RK, Ameta O P. Impact of abiotic factors on seasonal incidence of insect pests of soybean. *Legume Research an Internat. J.* 2017;40(4):762-767.
6. Ramesh Babu, Prahlad Kumar Meena, Ramgopal Dudwal. Population dynamics of major defoliators (Semiloopers and tobacco caterpillar) in soybean crop. *J of Legume Res.* 2017;40(1):183-186.
7. Balikai RA, Ingappa S. Effects of insecticides on aphid predators and sorghum plants. *Annals of Plant Protection Sciences.* 2003;11(2):371-373. Print ISSN: 0971-3573
8. Sarvesh Kumar Brahman, Awasthi AK, Shailendra Singh. Studies on insect-pests of soybean (*Glycine max*) with special reference to seasonal incidence of lepidopteran defoliators. *J Pharmacognosy and Phytochem.* 2018;7(1):1808-1811.
9. Singh OP, Singh KJ. Insect pests of soybean and their management. *Indian Farming.* 1990;39(100):9-14.
10. Van Den Berg H, Shepard BM. Damage incidence by *Etiella zinckenel* Soybean in East Java, Indonesia. *Int. J Pest Manag.* 1998;44(3):153-159.
11. Yadav PS, Banerjee Gupta MP, Yadav VK. Effect of Weather Factors on Seasonal Incidence of Insect-Pests of Soybean. *Technofame- A J of Multidisciplinary Adv. Res.* 2015;4(1):46-51.
12. Yadav SK, Agnihotri M, Bisht RS. Seasonal incidence of insect pests of black gram, *Vigna mungo* (Linn.) and its correlation with abiotic factors. *Agric. sci. digest.* 2015;35(2):146-148.
13. Yadav SS, Nayaka MK, Srivastava AK, Gupta MP, Tomar DS. Population dynamics of insect defoliators of soybean and correlation with weather parameters. *Annals of PI Protec. Sci.* 2013;22(1):190-239.
14. Yeotikar SG, More DG, Chav RD, Gaikwad BB. Correlation and regression between weather parameters and major insect pests of soybean. *J of Entomological Res.* 2015;39(3):227-230.
15. Patil PN, Sawant DV, Deshmukh RN. Physico-chemical parameters for testing of water-a review. *International journal of environmental sciences.* 2012 Jan 1;3(3):1194.
16. Netam HK, Gupta R, Soni S. Bioefficacy of insecticides as seed treatment against early sucking pests of soybean crop. *Journal of Plant Development Sciences Vol.* 2013;5(1):29-32.
17. Marabi RS, Das SB, Bhowmick AK, Pachori R, Vibha SH. Seasonal population dynamics of whitefly (*Bemisia tabaci* Gennadius) in soybean. *Journal of Entomology and Zoology Studies.* 2017;5(2):169-73.
18. Mangang KC, Das AJ, Deka SC. Comparative shelf life study of two different rice beers prepared using wild-type and established microbial starters. *Journal of the Institute of Brewing.* 2017 Oct;123(4):579-586.
19. Jagrati U, Saxena AK, Shrivastava SK. Effect of Weather Parameters and Parasitoid on Population Build up of Stem Fly *Melanagromyza sojae* (Zehntner) on Soybean at Jabalpur. *International Journal of Agriculture Sciences.* 2016;8(10):1122-1125.