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STUDIES ON THE QUALITATIVE COMPOSITION OF INSECT PESTS AND POPULATION DYNAMICS OF BUD FLY (*DASYNEURA LINI* BARNES) ON LINSEED (*LINUM USITATISSIMUM* L.)

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ABSTRACT

The Experiments were conducted at Instructional Farm, JNKVV-College of Agriculture, Rewa, Madhya Pradesh during *Rabi* season 2020-21. The incidence and activity of insect pests in linseed (JLS-79) during *Rabi* season, a number of major and minor pests were located and identified thriving on the linseed crop in Rewa district of Madhya Pradesh. Linseed bud fly (*Dasyneura lini* Barnes) and leaf miner (*Phytomyza horticola*) belong to order Diptera whereas; Jasad (*Amrasca kerri* pruthi), Aphid (*Aphis craccivora* Koch) and green sting bug (*Nazara viridula* Linn.) belong to order Hemiptera. Among Lepidoptera order, Foliage caterpillar (*Spodoptera litura* Hub.), Capsule borer (*Helicoverpa armigera* Hub.), semilooper (*Plusia orichacea* Fab.) and Bihar hairy caterpillar (*Spilosoma oblique* Walk.) and other Grasshopper (*Oxya velox* F.) and Termite (*Micrptermes* sp.) belong to order Orthoptera and Isoptera. And the natural enemies in linseed crop under agro climatic condition of Rewa district few predators of sucking pests and caterpillars lepidopterous pest like lacewing (*Chrysoperla carnea* Stephen), lady bird beetle (*Chilomenes sexamaculata* Fabricius), spiders (*Lynx* sp.) and rove beetle (*Aleochara bilineata*) belonging to orders Neuroptera, Coleoptera, Oxyopidae, and coleoptera. The first incidence of linseed bud fly population was noticed in 2nd SMW with the initial infestation noted as 3.85%, which increased gradually and attained the peak infestation of 35.66% in 8th SMW. After wards, population declined and an infestation of 27.93% was noted in 10th SMW, after which crop was harvested. The correlation studies delineates that the bud fly population was negatively and significantly regulated by maximum relative humidity ($r = -0.66$), whereas minimum temperature, minimum R.H. and rainfall had non-significant correlation with the bud fly population. Further, correlation co-efficient between maximum temperature and bud fly population ($r = 0.52$) was positively significant at 5%, but non-significant at 1%. The population of rove beetle was first noted in 48th SMW and thrived till harvest, whereas lady bird beetle, green lace wing and spider was first sought in 49th SMW. The population of spider vanished somewhat early *i.e.*, in 4th SMW, while the lady bird beetle and green lace wing thrived till 8th SMW.

Key words: Bud fly, Linseed, Insects, Natural enemies, Abiotic factors.

Introduction

Linseed (*Linum usitatissimum* L.) is an important *Rabi* oilseed crop in India. it's grown for its fiber (fiber flax), seed oil (oil flax, seed flax) and for both purposes. It is highly nutritious and a complete source of protein (having all 8 essential amino acids), complex carbohydrates, vitamins and minerals. In addition; having

42.16 g fat, 18.29 g protein and 27.39 g dietary fibers (Anonymous, 2016). Linseed oil fatty acids emulsifying agents (Khoe *et al.*, 1973) a very small fraction of it is used for edible purpose. The oil cake is a nutritious feed for milch cattle and is also used as manure. Linseed is considered to be useful in the treatment of anxiety; benign prostrates hyperplasia, vaginitis and weight loss,

Table 1: Meteorological data during the *Rabi* 2020-2021.

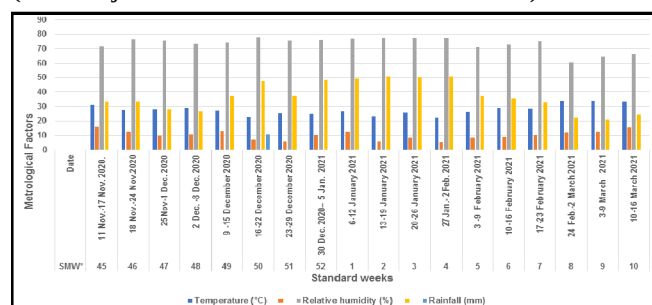
SMW	Date	Temperature (°C)		Relative humidity (%)		Rainfall (mm)
		Maximum	Minimum	(Morning)	(Evening)	
45	11 Nov.-17 Nov. 2020.	31.14	15.77	71.56	33.00	00.00
46	18 Nov.-24 Nov.2020	27.71	12.6	76.71	33.00	00.00
47	25Nov-1 Dec. 2020	28.20	10.08	75.71	28.00	00.00
48	2 Dec. -8 Dec. 2020	28.94	10.62	73.28	26.85	00.00
49	9 -15 December 2020	27.05	13.05	74.14	37.28	00.00
50	16-22 December 2020	22.51	7.05	78.14	47.71	10.6
51	23-29 December 2020	25.55	5.74	75.71	37.28	00.00
52	30 Dec. 2020– 5 Jan. 2021	25.34	10.28	76.28	48.42	00.00
1	6-12 January 2021	26.72	12.45	77.28	49.42	00.00
2	13-19 January 2021	23.10	5.8	77.71	51.14	00.00
3	20-26 January 2021	25.91	8.02	77.71	50.42	00.00
4	27Jan.- 2Feb. 2021	22.31	5.07	77.57	51.00	00.00
5	3 -9 February 2021	26.38	8.57	71.42	37.28	00.00
6	10-16 February 2021	29.00	9.20	73.14	35.85	00.00
7	17-23 February 2021	28.57	10.35	75.28	32.71	00.00
8	24 Feb.-2 March 2021	33.88	12.22	60.85	22.28	00.00
9	3-9 March 2021	34.01	12.38	64.42	20.71	00.00
10	10-16 March 2021	33.61	15.25	66.00	24.14	00.00

* SMW = Standard Meteorological Week.

hyperlipidemia, (Nestel *et al.*, 1997).

Linseed cultivation is done on an area of 4.26 lakh hectares in India, 24.09 lakh hectares in Madhya Pradesh and 13.1 ha in Rewa district (Anonymous, 2009). Area of linseed crop in Rewa district is increasing day by day due to its high demand in the market. The productivity of crop at national, state and district level have been reported as 392 kg/ha, 930kg/ha, 235 kg/ha, respectively. (Anonymous, 2015). It is conspicuous from it that crop productivity is quite low in the district which is probably mainly due to biotic stress, in particular, losses caused by insect pests.

Linseed crop is attacked by a number of major and minor insect pests at various phases of its growth. Linseed bud fly (*Dasyneura lini*), semilooper (*Plusia orichalsia* Feb.), thrips (*Caliothrips indicus* Bagnall), and linseed caterpillar (*Spodoptera exigua* Hub.). Among the pests, bud fly (*Dasyneura lini* Barnes) is the key pest and responsible for 88 % or more yield loss to the crop. (Mukherji *et al.*, 1999 and Malik *et al.*, 2000).

**Fig. 1:** Meteorological data during the *Rabi* 2020-2021.

Materials and Methods

Experiments pertaining to the research work were conducted at Instructional Farm, JNKVV-College of Agriculture, Rewa), Madhya Pradesh during *Rabi* 2020-21.

The crop was sown in an area of 5 m × 5 m following the recommended practice of linseed crop and kept free from any insecticide application until harvesting. The infestation of the pest was recorded on the 5 plants (randomly selected) at 5 locations of the experiment plot for the sucking pest while an area of 1sq. meter was considered for counting the infesting insects of another group having biting and chewing type mouth parts. The observation continued up to end of the crop at weekly interval. The data on the incidence of insects was tabulated in the following table covering their scientific name, systematic position, time of incidence (Beginning & end) and the severity on the basis of visual observation.

Results and Discussion

Insect pests and their natural enemies on linseed crop

The incidence and activity of insect pests in linseed (JLS-79) during *Rabi* 2020-2021, a number of major and minor pests were located and identified thriving on the linseed crop in Rewa district of Madhya Pradesh (Table 1, 2 & 3 and Fig. 1).

These pests were categorized five order they belong to Dipterous, Hemipterous, Lepidopterous, Orthopterous and Isopterous pests. Out of observed insects, Linseed bud fly and Leaf miner belong to order Diptera, whereas

Table 2: Insect pests reported from linseed crop during *Rabi* 2020-2021.

S. No	Insect Incidence Recorded	Scientific Name	Order: Family	Damaging stage	Time of incidence		Severity (Based on visual observations)
					Beginning	End	
Dipterous pests							
1.	Linseed bud fly	<i>Dasyneura lini</i> Barnes	Diptera: Cecidomyiidae	Maggots feeding upon flower buds	2 nd SMW	Till harvest (10 th SMW)	Highly severe
2.	Leaf Miner	<i>Phytomyza horticola</i>	Diptera: Agromyzidae	Maggots mining in leaves	47 th SMW	51 st SMW	Minor status
Hemipterous pests							
1.	Jassid	<i>Amrasca kerri</i> Pruthi	Hemiptera: Cicadellidae	Nymph and adults sucking sap from young leaves	48 th SMW	3 rd SMW	Minor status
2.	Aphid	<i>Aphis craccivora</i> Koch.	Hemiptera: Aphididae	Nymphs and adults sucking sap from plant terminals	51 st SMW	5 th SMW	Minor status
3.	Green stink bug	<i>Nezara viridula</i> Linn.	Hemiptera: Pentatomidae	Nymph and adults sucking sap from leaves and flower buds	51 st SMW	6 th SMW	Minor status
Lepidopterous pests							
1.	Foliage caterpillar	<i>Spodoptera litura</i> Hub.	Lepidoptera: Noctuidae	Larvae feeding on leaves	4 th SMW	9 th SMW	Minor status
2.	Capsule borer	<i>Helicoverpa armigera</i> Hub.	Lepidoptera: Noctuidae	Larvae feeding on leaves and boring capsule	52 nd SMW	9 th SMW	Minor status
3.	Semilooper	<i>Plusia orichacea</i> Fab.	Lepidoptera: Noctuidae	Larvae feeding on leaves	48 th SMW	6 th SMW	Minor status
4.	Bihar hairy caterpillar	<i>Spilosoma oblique</i> Walk.	Lepidoptera: Noctuidae	Larvae feeding on leaves	48 th SMW	2 nd SMW	Minor status
Orthopterous pest							
1.	Grasshopper	<i>Oxya velox</i> F.	Orthoptera: Acrididae	Nymph and adults feeding on foliage	51 st SMW	10 th SMW	Minor status
Isopterous Pest							
1.	Termite	<i>Micrptermes</i> sp.	Isoptera: Termitidae	Termites damaging the root of crop	6 th SMW	10 th SMW	Minor status

Hemipterous pests viz. green stink bug, aphids and jassid were seen damaging the crop canopy by sucking the sap from the plant. Further, foliage caterpillar, capsule borer, semilooper and Bihar hairy caterpillar were the recorded lepidopterous pests from the canopy of linseed. Termite belonging to order Isoptera was also seen in some pockets of linseed field. Linseed bud fly (*Dasyneura lini* Barnes) and leaf miner (*Phytomyza horticola*) belong to order Diptera whereas; Jassid (*Amrasca kerri* pruthi), Aphid (*Aphis craccivora* Koch) and green sting bug (*Nazara viridula* linn.) belong to order Hemiptera. Among Lepidoptera order, Foliage caterpillar (*Spodoptera litura* Hub.), Capsule borer (*Helicoverpa armigera* Hub.),

semilooper (*Plusia orichacea* Fab.) and Bihar hairy caterpillar (*Spilosoma oblique* Walk.) and other Grasshopper (*Oxya velox* F.) and Termite (*Micrptermes* sp.) belong to order Orthoptera and Isoptera. The present findings are in compliance with the findings of Prasad and Prasad (2004) studied the pest status on linseed crop at Ranchi and reported eleven insect pests there upon with *Dasyneura lini* (Barnes) as a key pest followed by capsule borer, *Spodoptera exigua* which fed on green capsules. Borah *et al.*, (2005) studied the pest status on linseed crop in Assam and reported *Dasyneura lini* and *Caliothrips indicus* as major pests, *Empoasca kerri* and *Helicoverpa armigera* as moderately important pests

Table 3: Natural enemies reported from linseed crop during *Rabi* 2020-2021.

S. No	Insect Incidence Recorded	Scientific Name	Order: Family	Host/ Prey	Time of incidence	
					Beginning	End
1.	Lady bird beetle	<i>Coccinella septumpunctata</i> Feb.	Coleoptera: Coccinellidae	Sucking pests	49 th SMW	8 th SMW
2.	Spider	<i>Oxyopesstticus</i> .	Araneae: Oxyopidae	Jassid	49 th SMW	4 th SMW
3.	Rove beetle	<i>Bledius latiusculus</i> Kraatz	Coleoptera: Staphylinidae	Larvae and maggots	48 th SMW	10 th SMW
4.	Green lace wing	<i>Chrysoperla carnea</i> Stephen	Neuroptera: Chrysopidae	Sucking pests	49 th SMW	8 th SMW

whereas others were of minor importance. Kumar *et al.*, (2008) reported the bud fly as major pest and leaf miner, semilooper, gram pod borer and Bihar hairy caterpillar as the minor pest of the crop on the basis of population count and severity of infestation. Humayun *et al.*, (2013) studied on seven insect species, viz., linseed bud fly (*Dasyneura lini* B.), thrips (*Caliothrips indicus* B.), jassids (*Empoasca kerri*), linseed caterpillar, semilooper, gram pod borer and 13 green stink bug which were noticed causing damage at various growth stages of linseed crop on the variety Neelum. Kumar *et al.*, (2008) reported the bud fly as major pest and leaf miner, semilooper, gram pod borer and Bihar hairy caterpillar as the minor pest of the crop on the basis of population count and severity of infestation.

As regards to the natural enemies in linseed crop under agro climatic condition of new district few predators of sucking pests and caterpillars lepidopterous pest like lacewing (*Chrysoperla carnea* Stephen), lady bird beetle (*Chilomenes sexmaculata* Fabricius), spiders (*Lynx* sp.) and rove beetle (*Aleochara bilineata*) belonging to orders Neuroptera, Coleoptera, Oxyopidae, and coleoptera respectively have been recorded this findings are in line with the findings of Malik *et al.*, (1997), reported *Coccinella septempunctata* and *Menochilus sexmaculatus* [*Cheilomenes sexmaculata*] larvae and adults as predators of *Dasyneura lini* larvae. Patel and Thakur (2005), Katlam *et al.*, (2012), Gupta and Katlam (2013) and Kunal *et al.*, (2019) who reported chrysoperla, lady

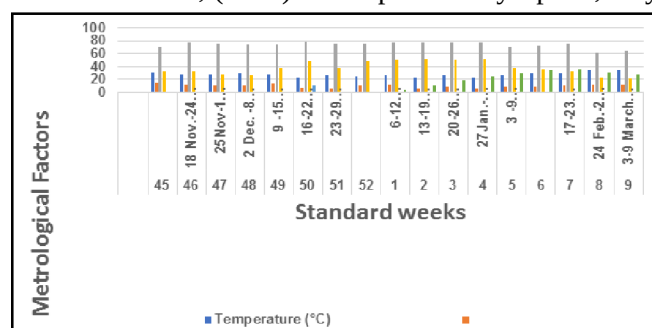
bird beetle, lynx spider and row beetle natural enemies of sucking and lepidopterous pests of linseed crop.

Population dynamics of linseed bud fly during *Rabi* 2020-2021

The first incidence of linseed bud fly population was noticed in 2nd SMW with the initial infestation noted as 3.85%, which increased gradually and attained the peak infestation of 35.66% in 8th SMW. After wards, population declined and an infestation of 27.93% was noted in 10th SMW, after which crop was harvested (Table 4 & Fig. 2).

Table 4: Mean population and correlation coefficient between abiotic factors and linseed bud fly population.

Mean population and correlation coefficient between abiotic factors and linseed bud fly population						
SMW	Temperature (°C)		Relative humidity (%)		Rain-fall (mm)	Mean linseed bud fly infestation (%)
	Max.	Min.	Max.	Min.		
45	31.14	15.77	71.56	33.00	0.00	0.00
46	27.71	12.60	76.71	33.00	0.00	0.00
47	28.20	10.08	75.71	28.00	0.00	0.00
48	28.94	10.62	73.28	26.85	0.00	0.00
49	27.05	13.05	74.14	37.28	0.00	0.00
50	22.51	7.05	78.14	47.71	10.60	0.00
51	25.55	5.74	75.71	37.28	0.00	0.00
52	25.34	10.28	76.28	48.42	0.00	0.00
1	26.72	12.45	77.28	49.42	0.00	0.00
2	23.10	5.80	77.71	51.14	0.00	3.85
3	25.91	8.02	77.71	50.42	0.00	10.25
4	22.31	5.07	77.57	51.00	0.00	18.75
5	26.38	8.57	71.42	37.28	0.00	24.71
6	29.00	9.20	73.14	35.85	0.00	29.63
7	28.57	10.35	75.28	32.71	0.00	33.39
8	33.88	12.22	60.85	22.28	0.00	35.66
9	34.01	12.38	64.42	20.71	0.00	30.75
10	33.61	15.25	66.00	24.14	0.00	27.93
Mean	27.77	10.25	73.50	37.03	0.59	11.94
r value	0.52*	0.09	-0.66**	-0.43	-0.21	-
* = Non-significant at 1%; ** = Significant						

**Fig. 2:** Mean population and correlation coefficient between abiotic factors and linseed bud fly population.

The correlation studies delineates that the bud fly population was negatively and significantly regulated by maximum relative humidity ($r = -0.66$), whereas minimum temperature, minimum R.H. and rainfall had non-significant correlation with the bud fly population. Further, correlation co-efficient between maximum temperature and bud fly population ($r = 0.52$) was positively significant at 5%, but non-significant at 1%. Malik *et al.*, (2011) studied the population dynamics and management of the linseed bud fly, *Dasyneura lini*. They state that bud fly infestation was started in the middle of the January with initial infestation level of 1.5 & 2.3 per cent, respectively with highest peaked incidence in mid-February during both years. Ekka *et al.*, (2017) studied the seasonal incidence of linseed bud fly, *Dasyneura lini* Barnes in Linseed ecosystem. The population of linseed bud fly was recorded during 12th and 10th standard meteorological week of year 2015-16 and 2016-17, respectively.

Conclusion

These pests were categorized in five order they belong to Dipterous, Hemipterous, Lepidopterous, Orthopterous and Isopterous pests. Out of observed insects, Linseed bud fly and Leaf miner belong to order Diptera, whereas Hemipterous pests *viz.* green stink bug, aphids and jassid were seen damaging the crop canopy by sucking the sap from the plant. Further, foliage caterpillar, capsule borer, semilooper and Bihar hairy caterpillar were the noted lepidopterous pests from the canopy of linseed. Termite belonging to order Isoptera was also seen in some pockets of linseed field. As regards to the natural enemies in linseed crop under agro climatic condition of new district few predators of sucking pests and caterpillars lepidopterous pest like lacewing (*Chrysoperla carnea* Stephen), lady bird beetle (*Chilomenes sexamaculata* Fabricius), spiders (*Lynx* sp.) and rove beetle (*Aleochara bilineata*) belonging to orders Neuroptera, Coleoptera, Oxyopidae, and coleoptera respectively have been recorded. The first incidence of linseed bud fly population was noticed in 2nd SMW with the initial infestation noted as 3.85%, which increased gradually and attained the peak infestation of 35.66% in 8th SMW. The correlation studies delineates that the bud fly population was negatively and significantly regulated by maximum relative humidity ($r = -0.66$), whereas minimum temperature, minimum RH and rainfall had non-significant correlation with the bud fly population.

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