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## Roving survey for defoliator pest complex of sunflower in North Karnataka

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### Abstract

The roving survey was undertaken in and around Haveri and Koppal districts covering major sunflower growing taluks at seedling (0-25 days after sowing), vegetative (25-45 days after sowing) and reproductive stages (45 days after sowing to till harvest) of the crop during *Rabi* 2018-19 to assess the status of defoliator complex of sunflower and their natural enemies in farmer's fields. Results indicated that among the these both districts, the highest defoliators like Bihar hairy caterpillar, Green semilooper and Tobacco caterpillars were recorded in Haveri as compared to Koppal districts at vegetative (25-45 days after sowing). Among these defoliators Bihar hairy caterpillars has found highest number. We also recorded population of predators *i.e.*, Coccinellids and Spiders. The maximum population of predators were recorded in Haveri district as compared to Koppal district.

**Keywords:** Roving survey, defoliators in sunflower

### Introduction

Sunflower (*Helianthus annuus* L.) is a globally significant oilseed crop known for its striking golden-yellow flowers and valuable oil-rich seeds. This versatile plant has gained recognition for its numerous applications, from culinary uses to industrial processes. Sunflowers are not only visually appealing but also hold great economic importance. In this introduction, we will delve into the present area, production, and productivity of sunflowers on a global scale and specifically in India. Furthermore, we will discuss the challenges posed by defoliators, pests that feed on the leaves of sunflower plants, which can significantly affect crop yields (Andrew *et al.*, 2013) <sup>[1]</sup>.

Globally the Sunflower crop is cultivated on a vast scale around the world, with major producers including countries like Russia, Ukraine, Argentina, and the United States. As of my last knowledge update in September 2021, the global sunflower production stood at approximately 56 million metric tons annually, covering millions of hectares of farmland. This substantial production is indicative of the crop's prominence in the global agricultural landscape. And in Indian Sunflower crop too, plays a vital role in the production of sunflowers. The country has seen a gradual increase in sunflower cultivation due to the growing demand for sunflower oil, which is considered a healthier alternative to other cooking oils (Anonymous, 2021) <sup>[2]</sup>.

Sunflower is predominantly cultivated in states like Karnataka, Andhra Pradesh, and Telangana. As of my last knowledge update, India was producing around 1.5 million metric tons of sunflower annually, demonstrating a steady growth in production. This is reflective of the crop's adaptability to diverse agro-climatic conditions in the country. The productivity is an essential aspect of any crop, and sunflower is no exception. In terms of yield, sunflower exhibits relatively high productivity, with global average yields reaching approximately 1,000 kg per hectare, (Anonymous, 2021) <sup>[2]</sup>.

However, it's important to note that productivity can vary significantly from region to region based on factors such as climate, insect pests, diseases, soil quality, and agricultural practices. Among these factors defoliators and challenges on Sunflower crops face several challenges, one of which is the presence of defoliators, (Rajamohan, 1976 and Rogers, 1992) <sup>[3, 4]</sup>. Defoliators are insects that feed on the leaves of sunflower plants, thereby reducing the plant's ability to photosynthesize and ultimately lowering crop yields. Common defoliators in sunflower cultivation include pests like, cabbage semilooper, *Thysanoplusia orichalcea* Fabricius, tobacco cutworm, *Spodoptera litura* Fab., Bihar hairy caterpillar, *Spilarctia obliqua* Walker and the grasshoppers, *Attractomorpha crenulata* Fab. and *Cyrtacanthacris ranacea* (Stoll)], the weevils, *Mylokerus discolor* Fab., *M. dentifer* Fab., *M. viridanus* Fab. and *Ptochus ovulum*

Fab. and the beetles, *Monolepta signata* Fab. *Aulocophora foveicollis* Lucas (Rajanna, 1995; Bilapate and Chakravarthy, 1999 and Jagadish *et al.*, 2005) [5, 6, 7]. The damage caused by these defoliators can be detrimental if not properly managed, as it affects the overall health and yield of the crop. While the loss of seed yield per hectare due to defoliators in a rainfed sunflower crop was up to 58.06 per cent (Suhās *et al.*, 1996) [8]. In this context, it is important for sunflower farmers to employ integrated pest management strategies to protect their crops from defoliators and ensure the sustainability of sunflower cultivation. In summary, the sunflower crop holds a significant place in both global and Indian agriculture, with impressive production figures and high productivity. However, it is not without its challenges, and defoliators are among the issues that need attention to ensure the continued success of sunflower cultivation. Considering the seriousness of the defoliator insect pests, the present investigation was undertaken to understand about the present status of these insect pests incidences, recorded by roving survey in the following districts.

### Material and Methods

The present investigation on roving survey of defoliator insect pests of sunflower crop was carried out during *Rabi*, 2018-2019 in Haveri and Koppal districts, covering major sunflower growing taluks and villages. The details of villages and taluks covered during the survey are presented in the Table 1 and Figure 1.

The survey for the incidence of defoliator insect pests of sunflower and their natural enemies in the districts covering Haveri and Koppal was undertaken from seedling stage to till harvesting of the crop in three taluks (Haveri, Renebennur, Byadagi) of Haveri district and three taluks (Koppal, Kushtagi, Yelburga) of Koppal district during *Rabi* 2018. From each taluk two villages were selected and from each village two farmers fields were selected, from each field ten plants were randomly observed for occurrence of defoliators. Observations were recorded at different crop growth stages *viz.*, seedling (0-25 days after sowing), vegetative (25-45 days after sowing) and reproductive stage (45 days after sowing to till harvest) respectively.

**Table 1:** Details of Roving survey conducted in Haveri and Koppal districts

District	Taluk	Villages
Haveri	Haveri	Guttal
		Belavigi
	Renebennur	Hullihalli
		Kakol
	Byadagi	Byadagi
		Motebennur
Koppal	Koppal	Koppal
		Tanakanakalla
	Kushtagi	Nelajeri
		Bevur
	Yelburga	Kustagi
		Dotihal

### Observations recorded

Number of defoliator insect pests per plant was recorded during seedling, vegetative and reproductive stage from 10 randomly selected plants. Natural enemy population was also recorded on whole plant basis during survey from the same field. Survey was carried out thrice at different crop stages *i.e.*, seedling (0-25 days after sowing), vegetative (25-45 days

after sowing) and reproductive stage (45 days after sowing to till harvest) during *rabi* 2018.

### Result and Discussion

The roving survey was undertaken in and around Haveri and Koppal districts covering major sunflower growing taluks at seedling, vegetative and reproductive stages of the crop during *rabi* 2018-19 to assess the status of defoliator complex of sunflower and their natural enemies in farmer's fields.

#### Seedling stage (0-25 days after sowing)

##### At Haveri district

**Bihar hairy caterpillar (*Spilarctia obliqua*):** Irrespective of the villages and taluks surveyed at Haveri district, the incidence of *Spilarctia obliqua* was not at all noticed, during survey conducted at seedling stage of the crop, (Table 2).

**Green semilooper (*Thysanoplusia orichalcea*):** Among the various taluks of Haveri district, Byadagi taluk (0.52 larvae/plant) recorded the highest mean larval population followed by Haveri taluka (0.47 larvae/plant) and Ranebennur taluka (0.12 larvae/plant) (Table 2).

**Tobacco caterpillar (*Spodoptera litura*):** At seedling stage, the crop was totally free from *Spodoptera litura* incidence in all selected taluks of Haveri district during the period of survey (Table 2).

**Population of predators:** Among the different villages of selected taluks in Haveri district the predators *viz.*, coccinellids and spiders were recorded at seedling stage. In various taluks of Haveri district, the maximum mean population of coccinellids and spiders per plant was recorded in Haveri taluk (0.50 coccinellids/plant) and Haveri taluk (0.28 spiders/plant), respectively. However, the lowest mean population of coccinellids and spiders per plant was noticed in Ranebennur taluk (0.23 coccinellids/plant) and Byadagi taluk (0.19 spiders/plant) (Table 2).

##### At Koppal districts

**Bihar hairy caterpillar (*Spilarctia obliqua*):** During the survey at seedling stage of crop not a single larva of Bihar hairy caterpillar per plant was observed in selected villages of different taluks of Koppal district (Table 2).

**Green semilooper (*Thysanoplusia orichalcea*):** Among the various taluks surveyed in Koppal district the maximum mean population of green semilooper per plant was recorded in Yalaburga taluk (0.37 larvae/plant), followed by Koppal taluk (0.30 larvae/plant) and Kustagi taluk (0.12 larvae/plant) (Table 2).

**Tobacco caterpillar (*Spodoptera litura*):** Incidence of *S. litura* could not be observed in different villages and taluks of Koppal district during the survey taken up in *rabi*, 2018 (Table 3).

**Population of predators:** In various taluks of Koppal district the maximum mean population of coccinellids (0.45 coccinellids/plant) and spider (0.22 spiders/plant) per plant was recorded in Yalaburga taluk and lowest mean population was noticed in Kustagi taluk (0.17 coccinellids/plant) whereas spiders was recorded in Kustagi taluk (0.05 spiders/plant) (Table 2) during the *rabi*, 2018.

**Vegetative stages (25-45 days after sowing)****At Haveri districts**

**Bihar hairy caterpillar (*Spilarctia obliqua*):** Among the various talukas surveyed in Haveri district, the maximum mean population of Bihar hairy caterpillar per plant was recorded in Haveri taluk (11.12 larvae/plant), followed by Byadagi taluk (10.80 larvae/plant) and Ranebennur taluk (9.77 larvae/plant) (Table 3).

**Green semilooper (*Thysanoplusia orichalcea*):** Among the various taluks surveyed in Haveri district the maximum mean population of green semilooper per plant was registered in Ranebennur taluk (0.67), followed by Haveri taluk (0.52 larvae/plant) and Byadagi taluk (0.37 larvae/plant) (Table 3).

**Tobacco caterpillar (*Spodoptera litura*):** The mean larval population of tobacco caterpillar *S. litura* was noticed only in Hullahalli village (5.4 larvae/plant), during survey at Haveri district in the *rabi*, 2018 (Table 3).

**Population of predators:** Among the different taluks of Haveri district, the highest and lowest mean population of coccinellids was observed in Haveri taluk (0.80 coccinellids/plant) and Byadagi taluk (0.37 coccinellids/plant), respectively. In case of spiders, the highest and lowest mean population was recorded in Ranebennur taluk (0.30 spiders/plant) and Byadagi taluk (0.20 spiders/plant), respectively (Table 3).

**At Koppal districts**

**Bihar hairy caterpillar (*Spilarctia obliqua*):** In the various taluks surveyed in Koppal district, the highest mean population of *S. obliqua* per plant was recorded in Yalaburga taluk (6.05 larvae/plant), followed by Koppal taluk (5.80 larvae/plant) and Kustagi taluk (4.30 larvae/plant) during *rabi*, 2018 (Table 3).

**Green semilooper (*Thysanoplusia orichalcea*):** Among the various taluks surveyed in Koppal district, the maximum mean population of green semilooper per plant was registered in Yalaburga taluk (0.35 larvae/plant), followed by Koppal taluk (0.27 larvae/plant), but Kustagi taluk there was no incidence during *rabi*, 2018 (Table 3).

**Tobacco caterpillar (*Spodoptera litura*):** Among the selected villages and taluks surveyed at vegetative stage of the crop in Koppal district, the mean larval population of *Spodoptera litura* per plant was noticed only in Koppal village (0.25 larvae/plant) of Koppal taluk, whereas there was no incidence of *Spodoptera litura* in other taluks of Koppal district (Table 3).

**Population of predators:** In various taluks of Koppal district, the maximum mean population of coccinellids and spiders was noticed in Koppal taluk (0.85 coccinellids/plant) and Yalaburga taluk (0.37 spiders/plant) and lowest mean population of coccinellids was noticed in Yalaburga taluk (0.51 coccinellids/plant), whereas lowest spider mean population was recorded in Koppal taluk (0.20 spiders/plant) (Table 3) during the *rabi* 2018.

**Reproductive stage (45-65 days after sowing)****At Haveri district**

**Bihar hairy caterpillar (*Spilarctia obliqua*):** In the various

taluks surveyed at Haveri district, the maximum mean population of *S. obliqua* was registered in Haveri taluk (2.80 larvae/plant), followed by Byadagi taluk (2.32 larvae/plant) and Ranebennur taluk (1.90 larvae/plant) (Table 4).

**Green semilooper (*Thysanoplusia orichalcea*):** In the various taluks surveyed in Haveri district, the maximum mean population of green semilooper per plant was registered in Byadagi taluk (0.45), followed by Haveri taluk (0.40) and no incidence of green semiloopers was recorded in Ranebennur taluk (Table 4).

**Tobacco caterpillar (*Spodoptera litura*):** The mean population of *S. litura* recorded in Byadagi taluk was 0.02 larvae/plant, while in other taluks of Haveri district population was recorded during the survey period.

**Population of predators:** In taluks of Haveri district, the maximum mean population of coccinellids and spiders per plant was registered in Ranebennur taluk (0.72 coccinellids/plant) and spiders in Ranebennur taluk (0.21 spiders/plant) respectively, the lowest mean population of coccinellids was noticed in Haveri taluk (0.42 coccinellids/plant), whereas lowest mean spider population was noticed in Haveri taluk (0.05 spiders/plant) (Table 4). In Guttal and Motebennur village no incidence of spiders was noticed at reproductive stage during the *rabi*, 2018.

**At Koppal districts**

**Bihar hairy caterpillar (*Spilarctia obliqua*):** The various taluks surveyed at Koppal district, the highest mean population of *S. obliqua* per plant was registered in Yalaburga taluk (1.72 larvae/plant) followed by Koppal taluk (1.32 larvae/plant) and Kustagi taluk (1.12 larvae/plant) during *rabi*, 2018 (Table 4).

**Green semilooper (*Thysanoplusia orichalcea*):** At reproductive stage of crop in the various taluks surveyed in Koppal district, the maximum mean population of green semilooper per plant was recorded in Yalaburga taluk (0.15 larvae/plant) followed by Kustagi taluk (0.05 larvae/plant), but Koppal taluk was totally free from the incidence of *T. orichalcea* during the period of survey during *rabi*, 2018 (Table 4).

**Tobacco caterpillar (*Spodoptera litura*):** During survey at reproductive stage of the crop, the population of *S. litura* was totally free from the pest incidence in Koppal district, during *rabi*, 2018 (Table 4).

**Population of predators:** In taluks of Haveri district, the maximum mean population of coccinellids and spiders per plant was registered in Ranebennur taluk (0.72 coccinellids/plant) and spiders in Ranebennur taluk (0.21 spiders/plant) respectively, the lowest mean population of coccinellids was noticed in Haveri taluk (0.42 coccinellids/plant), whereas lowest mean spider population was noticed in Haveri taluk (0.05 spiders/plant) (Table 4). In Guttal and Motebennur village no incidence of spiders was noticed at reproductive stage during the *rabi*, 2018.

Survey indicated that the population of the defoliator insect pests and natural enemies varied from location to location and also depending on the stage of the crop. During survey at

seedling stage, in the different taluks of Haveri and Koppal district, the larval population of *S. obliqua* per plant was not found in both districts. But during vegetative stage, the maximum larval population of *S. obliqua* per plant was recorded in all the taluks of both the districts. Haveri taluk recorded the highest larval population, which was followed by Byadagi taluk in Haveri district, whereas in Koppal district, the maximum larval population of *S. obliqua* per plant was recorded in Yalaburga taluk and least population was noticed in Kustagi taluk during vegetative stage of the crop.

Further, their larval population was bare minimum during reproductive stage of the crop in all taluks of both the districts. However, Haveri district recorded more pest population than Koppal district because of greater area under sunflower cultivation and the prevailing weather condition such as temperature hovering around 25-30 °C and around 70-75% relative humidity (RH) during *rabi* season might have promoted the population of the *S. obliqua* also because of the dense foliage growth of the crop during *rabi* 2018.

Present finding is in conformity with that of Singh and Singh (1993) [9] who reported a peak incidence of *Spilarctia obliqua* (2300 larvae/50 plants) at vegetative stage of sunflower at Ludhiana, Punjab when the average temperature was 30.6 °C. Geetha (2018) [10] also reported the peak incidence of *Spilarctia obliqua* on sunflower at three districts viz., Bagalkot, Dharwad and Gadag, at vegetative stage and because of prevailing weather conditions such as temperature, which ranged from 25-30 °C and 70% RH. Muzammil and Biradar (2017) [11] also reported that the during seedling stage of crop the activities of defoliator insect pests was started and it gradually increases during vegetative stage and at reproductive stage of the crop it reaches a peak. In Basavana

Bagewadi taluk the highest defoliator insect pests population was noticed because it had more area under cultivation of sunflower and also it had favourable climatic conditions for the pest.

*Thysanoplusia orichalcea* population was negligible in both the districts, but the pest population started to appear at seedling stage itself and at vegetative stage it gradually increased and subsequently decreased during reproductive stage of the crop. At seedling stage the population of *Thysanoplusia orichalcea* was the highest in Byadagi taluk of Haveri, whereas it was lowest in Kustagi taluk of Koppal.

Present finding is in conformity with that of Muzammil (2017) [11] who recorded the prevalence of defoliators such as *Spodoptera litura*, *Thysanoplusia orichalcea* and *Spilarctia obliqua* on sunflower and reported that defoliator population was very low during the seedling stage of the crop, and at vegetative stage, the population of defoliators gradually increased and reached a peak at reproductive stage.

From the above results it can be concluded that occurrence of defoliator insect pests starts during seedling stage and gradually increased and reached a peak during vegetative stage and during reproductive stage of the crop gradually decreased. Haveri district recorded the highest larval population of defoliator insect pests because of the greater area under sunflower cultivation and also it had favourable climatic conditions which might have resulted good development of the pest stages. The difference in defoliators population level might be due to changes in the location, changes in the sowing time, varieties or hybrid used, surrounding crops, weather parameters and cropping system followed.

**Table 2:** Incidence of defoliators and predators on sunflower in *rabi*, 2018 at Haveri and Koppal districts during seedling stage

District	Taluka	Villages	Larval population / plant			No of predators / plant	
			<i>S. obliqua</i>	<i>T. orichalcea</i>	<i>S. litura</i>	Coccinellids	Spiders
Haveri	Haveri	Guttal	-	0.65	-	0.60	0.26
		Belavigi	-	0.30	-	0.40	0.30
	Taluk mean			0.47		0.50	0.28
	Ranebennur	Hullihalli	-	0.25	-	0.30	0.15
		Kakol	-	-	-	0.17	0.29
	Taluk mean			0.12		0.23	0.22
	Byadagi	Byadagi	-	0.90	-	0.50	0.22
		Motebennur	-	0.15	-	0.35	0.17
	Taluk mean			0.52		0.42	0.19
	District mean			-	0.37	-	0.38
Koppal	Koppal	Koppal	-	0.35	-	0.50	0.20
		Tanakanakalla	-	0.25	-	0.30	0.15
	Taluk mean			0.30		0.40	0.17
	Yalaburga	Nelajeri	-	0.40	-	0.40	0.25
		Bevur	-	0.35	-	0.50	0.20
	Taluk mean			0.37		0.45	0.22
	Kustagi	Kustagi	-	0.15	-	0.15	0.00
		Dotihal	-	0.10	-	0.20	0.10
	Taluk mean			0.12		0.17	0.05
	District mean			-	0.26		0.34

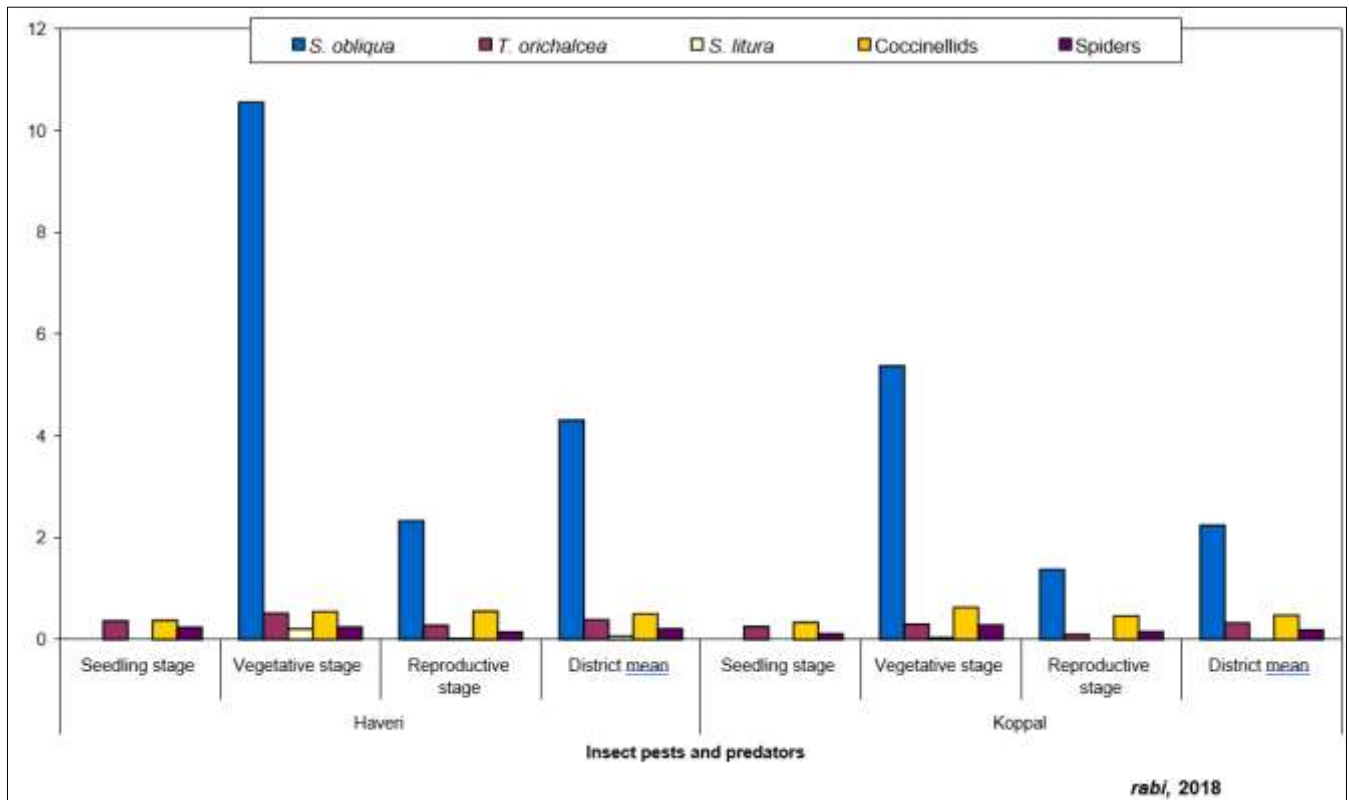


**Table 3:** Incidence of defoliators and predators on sunflower in *rabi*, 2018 at Haveri and Koppal districts during vegetative stage

District	Taluka	Villages	Larval population / plant			No of predators / plant	
			<i>S. obliqua</i>	<i>T. orichalcea</i>	<i>S. litura</i>	Coccinellids	Spiders
Haveri	Haveri	Guttal	12.65	0.50	-	0.90	0.30
		Belavigi	9.60	0.55	-	0.70	0.25
	Taluk mean		11.12	0.52	-	0.80	0.25
	Ranebennur	Hullihalli	10.40	0.70	5.4	0.65	0.20
		Kakol	9.15	0.65	0.00	0.35	0.40
	Taluk mean		9.77	0.67	0.65	0.50	0.30
	Byadagi	Byadagi	13.25	0.20	-	0.55	0.15
		Motebennur	8.35	0.35	-	0.20	0.25
	Taluk mean		10.80	0.37	-	0.37	0.20
	District mean			10.56	0.52	0.21	0.55
Koppal	Koppal	Koppal	5.50	0.25	0.25	1.10	0.30
		Tanakanakalla	6.10	0.30	0.00	0.60	0.10
	Taluk mean		5.80	0.27	0.12	0.85	0.20
	Yalaburga	Nelajeri	5.05	0.40	-	0.33	0.45
		Bevur	7.05	0.30	-	0.70	0.30
	Taluk mean		6.05	0.35	-	0.51	0.37
	Kustagi	Kustagi	3.60	-	-	0.65	0.25
		Dotihal	5.00	-	-	0.50	0.35
	Taluk mean		4.30	-	-	0.57	0.30
	District mean			5.38	0.31	0.04	0.64

**Table 4:** Incidence of defoliators and predators on sunflower in *rabi*, 2018 at Haveri and Koppal districts during reproductive stage

District	Taluk	Villages	Larval population / plant			No of predators / plant	
			<i>S. obliqua</i>	<i>T. orichalcea</i>	<i>S. litura</i>	Coccinellids	Spiders
Haveri	Haveri	Guttal	3.30	0.55	-	0.50	-
		Belavigi	2.30	0.25	-	0.35	0.10
	Taluk mean		2.80	0.40	-	0.42	0.05
	Ranebennur	Hullihalli	3.05	-	-	0.82	0.23
		Kakol	0.75	-	-	0.60	0.20
	Taluk mean		1.90	-	-	0.72	0.21
	Byadagi	Byadagi	1.50	0.50	0.15	0.70	0.40
		Motebennur	3.15	0.40	0.00	0.40	0.00
	Taluk mean		2.32	0.45	0.07	0.55	0.20
	District mean			2.34	0.28	0.02	0.56
Koppal	Koppal	Koppal	1.15	-	-	0.80	0.10
		Tanakanakalla	1.50	-	-	0.32	0.25
	Taluk mean		1.32	-	-	0.56	0.17
	Yalaburga	Nelajeri	1.80	0.10	-	0.65	0.34
		Bevur	1.65	0.20	-	0.30	0.10
	Taluk mean		1.72	0.15	-	0.47	0.22
	Kustagi	Kustagi	2.25	0.10	-	0.50	0.23
		Dotihal	-	-	-	0.30	0.00
	Taluk mean		1.12	0.05	-	0.40	0.11
	District mean			1.38	0.10	0.00	0.47



**Fig 1:** Comparative incidence of defoliators and predators on sunflower at Haveri and Koppal district during

### Conclusion

The studies indicated that, defoliator insect pest population such as *Spilarctia obliqua*, *Thysanoplusia orichalcea* and *Spodoptera litura* were very low during seedling stage, gradually increased during vegetative stage and reached a peak during reproductive stage of the crop. Predators such as coccinellids and spiders were in maximum number at vegetative stage of the crop. Among the these both districts, survey the highest defoliators like Bihar hairy caterpillar, Green semilooper and Tobacco caterpillars were recorded in Haveri as compared to Koppal districts at vegetative (25-45 days after sowing). Hence Haveri district has continues growing sunflower crop and weather parameters were congenial for more attracting of insect's pest.

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