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Insect fauna of soybean at different growing seasons: A comparative study**Rohit Pattar^{1*} and Subhash B. Kandakoor²**¹*Department of Agricultural Entomology, University of Agricultural Sciences, Dharwad-580005, Karnataka, India*²*Agricultural Research Station, Bailhongal-591102, UAS, Dharwad, Karnataka, India****Corresponding author: rohitpattar5@gmail.com****Abstract**

Present investigation was a field experiment to document the insect pests of soybean at different growth stages during *rabi*-summer season of 2020-21 and comparing them with the *Kharif* season pests in order to know the incidence pattern. Among sucking pests, leaf hoppers and thrips were causing considerable damage while whiteflies and aphids considered as minor during *rabi* and summer. Leaf miner and leaf folder were considered as major defoliators during *rabi*-summer which are replaced by *Spodoptera litura* and Bihar hairy caterpillar in *Kharif*. Among the pod borers *Etiella zinckenella* and *Cydia ptychora* were major and caused considerable damage during summer and *Kharif*, respectively. Stem fly was absent during early *rabi* while it was present in late *rabi*, *Kharif* and summer. The insect pest incidence spectrum varied in different growing seasons of soybean crop in this region.

Keywords: Insect pests, soybean.**Introduction**

Soybean (*Glycine max* (L.) Merrill) is an important oilseed crop in the whole world due to its multiple uses as it contributes about 25% global edible oil and 2/3rd of world's protein concentrate for livestock feeding, poultry, fish feed and soybean meal as human diet supplements for protein (Alexander, 1974). Global soybean production of 336.11 million tonnes in an area of 121.69 million hectares was remarked during 2019-20 (Anon., 2019a). In India, Madhya Pradesh, Maharashtra and Rajasthan are leading states

with 92-93 per cent contribution in both area and production. In Karnataka, Belgaum, Dharwad, Bidar, Bagalkot and Haveri districts are the major contributors. The soybean production was influenced by different biotic and abiotic factors. Among many biotic factors insect pests and diseases play an important role because of the luxurious growth of plant, succulent shoots and soft tender foliage. The crop is known to harbor by more than 380 species of insect pests in the world and with 10-12 species in India initially (1970's) and then it has increased to 270 pests, besides

mites, millipedes, vertebrates and snail (Singh, 1999).

So, over time the incidence of different insect pests and number of insect pests attacking soybean have increased. As soybean is majorly a *Kharif* crop many studies were undertaken in this particular season while, *rabi* and summer season crops are also a very important factor of soybean production in north Karnataka region in particular Belagavi region as the farmers grow soybean during *rabi*-summer for seed production to avoid losses from shattering. Hence, this study is very helpful for the farmers to understand the occurrence of insect pests in different growth stages of soybean crop.

Material and methods

Present study was conducted in Agricultural Research Station, ARS, Bailhongal, Karnataka. A field experiment which was carried out during *rabi*-summer season of 2020-21. Bailhongal is a taluk place in Belagavi district, Karnataka with an altitude of 699.31 meter above MSL with the annual rainfall of 370-630 mm annually. The variety JS-335 was sown (5 rows of 10 m² with spacing 30×10 cm) on different dates from November to January with fortnight intervals. November and December sown crops were considered as *rabi* crop while, January sown crops were considered summer crop. Observations on incidence of insect pests at different growth stages were recorded in both *rabi* and summer crops. The observations were

compared with other similar studies from the past. The conclusions on the occurrence and persistence of insect pests of soybean during *rabi*- summer was drawn.

Results and Discussions

The occurrence of soybean pests was recorded during *rabi* and summer season. The results of present investigation are explained in Table 1. The occurrence of sucking pests started from two weeks after sowing and they remained throughout crop period. Among them, leaf hoppers and thrips were causing considerable damage while whiteflies and aphids considered as minor pests. The results were in line with Krishna (2021) who recorded similar results in summer season at Dharwad. Spiraling whitefly was also recorded on soybean during *rabi*-summer season in Belagavi region of Karnataka (Fig. 1). Leaf miner and leaf folder were considered as major defoliators during *rabi*-summer while the semiloopers were absent (Fig. 2). During *kharif*, *Spodoptera litura* and Bihar hairy caterpillar were considered as major defoliators (Anon., 2021 & Swati, 2018). Stem fly incidence was observed in later sown crops while it was absent in early sown crop. Among different pod borers *Etiella zinckenella* is the only recorded. While, others are absent during the study period. Similarly, in *Kharif* season *Cydia ptychora* was considered as major pod borer on soybean (Madhurima, 2015 & Anon., 2021). Some other pests were also recorded such as hairy caterpillars, pod sucking bug, pumpkin beetle *etc.* Due to the insufficient

Table 1. Occurrence of soybean insect pests during different growing seasons.

Sl. No.	Insect pests	Order/ Family	Occurrence of insect pests		
			Rabi season (Nov. & Dec. sown crops)	Summer season (Jan. sown crops)	Other/Previous studies (Dharwad & Belagavi region)
Sucking pests					
01	Aphids <i>Aphis glycines</i>	Hemiptera/ Aphididae	First week after sowing till 4 weeks (Nov. sown crops) & absent in Dec. sown crops.	Absent	-
02	Whiteflies <i>Bemisia tabaci</i>	Hemiptera/ Aleyrodidae	Two weeks after sowing till maturation (70 DAS) (48 th MSW–8 th MSW).	Two weeks after sowing till maturation (2 nd MSW–12 th MSW)	Two weeks after sowing till maturation (2 nd MSW- 14 th MSW) at Dharwad during summer (Krishna, 2021).
03	Leafhoppers <i>Empoasca sp.</i>	Hemiptera/ Cicadellidae	Three weeks after sowing till maturation (50 th MSW–10 th MSW). Peak population of 10.50 hoppers/top 3 leaves.	Three weeks after sowing till maturation (3 th MSW–15 th MSW). Peak population of 10.33 hoppers/top 3 leaves.	Two weeks after sowing till maturation (3 rd MSW- 12 th MSW) at Dharwad during summer (Krishna, 2021).
04	Thrips	Thysanoptera/ Thripidae	Three weeks after sowing till maturation (50 th MSW–8 th MSW). Peak population of 10.34 thrips/top 3 leaves.	Three weeks after sowing till maturation (4 th MSW–12 th MSW). Peak population of 10.80 thrips/top 3 leaves.	Two weeks after sowing till maturation (3 rd MSW- 11 th MSW) at Dharwad during summer (Krishna, 2021).
Defoliators					
05	Leaf miner <i>Aproaerema modicella</i>	Lepidoptera/ Gelechiidae	Three weeks after sowing (WAS) till 10 WAS (49 th MSW–7 th MSW). Peak population of 14.30 larvae/MRL.	3 WAS till 8 WAS (4 th MSW–11 th MSW). Peak population of 14.30 12.56 larvae/MRL.	-

Sl. No.	Insect pests	Order/ Family	Occurrence of insect pests		
			Rabi season (Nov. & Dec. sown crops)	Summer season (Jan. sown crops)	Other/Previous studies (Dharwad & Belagavi region)
06	Leaf folder <i>Omoides indicata</i>	Lepidoptera/ Crambidae	4 WAS till maturation (51 st MSW- 10 TH MSW). Peak population of 15.10 larvae/MRL.	3 WAS till 8 WAS (4 th MSW-12 th MSW). Peak population of 12.65 larvae/MRL.	Five weeks after sowing till maturation (32 nd MSW- 39 th MSW) during <i>Kharif</i> at Dharwad with 22.35% infestation (Anon., 2019b).
07	Tobacco caterpillar <i>Spodoptera litura</i>	Lepidoptera/ Noctuidae	40 DAS till maturation (53 rd MSW- 10 th MSW). Peak population of 3.68 larvae/MRL.	45 DAS till 70 DAS (8 th MSW- 14 th MSW). Peak population of 3.80 larvae/MRL.	i. 31 st MSW to 39 th MSW during <i>Kharif</i> at Dharwad (Anon., 2021). ii. 30 DAS to 75 DAS during <i>Kharif</i> at Dharwad (Swati, 2018).
08	Bihar hairy caterpillar <i>Spilosoma obliqua</i>	Lepidoptera/ Erebidae	Absent	Absent	i. 33 rd MSW to 40 th MSW during <i>Kharif</i> at Dharwad (Anon., 2021). ii. 50 DAS to 75 DAS during <i>Kharif</i> at Dharwad (Swati, 2018).
09	Semiloopers <i>Thysanoplusia orichalcea</i>	Lepidoptera/ Noctuidae	Absent	Absent	i. 32 nd MSW to 38 th MSW during <i>Kharif</i> at Dharwad (Anon., 2021). ii. 30 DAS to 60 DAS during <i>Kharif</i> at Dharwad (Swati, 2018).
Pod Borers					
10	<i>Cydia ptychora</i>	Lepidoptera/ Tortricidae	Absent	Absent	i. 33 rd MSW to 42 nd MSW with 36% pod damage (Madhurima, 2015) ii. 37 th MSW to 42 nd MSW with 52.34% pod damage (Anon., 2021).

Sl. No.	Insect pests	Order/ Family	Occurrence of insect pests		
			Rabi season (Nov. & Dec. sown crops)	Summer season (Jan. sown crops)	Other/Previous studies (Dharwad & Belagavi region)
10	<i>Etiella zinckenella</i>	Lepidoptera/ Pyalidae	60 DAS and lasts till harvesting (2 nd MSW- 11 th MSW)	60 DAS and lasts till harvesting (9 th MSW- 15 th MSW). up to 44.67 % pod damage.	-
11	<i>Helicoverpa armigera</i>	Lepidoptera/ Noctuidae	Absent	Absent	33 rd MSW to 40 th MSW during <i>Kharif</i> at Dharwad (Anon., 2022).
Other insect pests					
12	Pod sucking bug <i>Nezara viridula</i>	Hemiptera/ Pentatomidae	Minor pest present during pod development stage	Minor pest present during pod development stage	34 th MSW to 40 th MSW during <i>Kharif</i> at Dharwad (Anon., 2022).
13	Stem fly <i>Melanagromyza sojae</i>	Diptera/ Agromyzidae	Absent in Nov. sown crops & Less incidence in Dec. sown crops (up to 14.26% seedling mortality).	2 WAS and continued up to 30 days (up to 29.15% seedling mortality).	30 th MSW to 36 th MSW during <i>Kharif</i> at Dharwad (up to 3.94% stem tunneling) (Anon., 2021).
14	Girdle beetle <i>Obereopsis brevis</i>	Coleoptera/ Cerambicidae	Absent	Absent	32 nd MSW to 40 th MSW during <i>Kharif</i> at Dharwad (up to 6.57% infestation) (Anon., 2021).
Minor pests observed during the study period					
Pumpkin beetle, Spiralling whitefly, <i>Eurybrachus tomentosa</i> , <i>Creotiadetes dilutus</i> , Hairy caterpillars.					

* MSW- Meteorological standard week, WAS- Weeks after sowing, DAS- Days after sowing



Figure 1. Spiralling whitefly on soybean (Image by: Rohit Pattar)

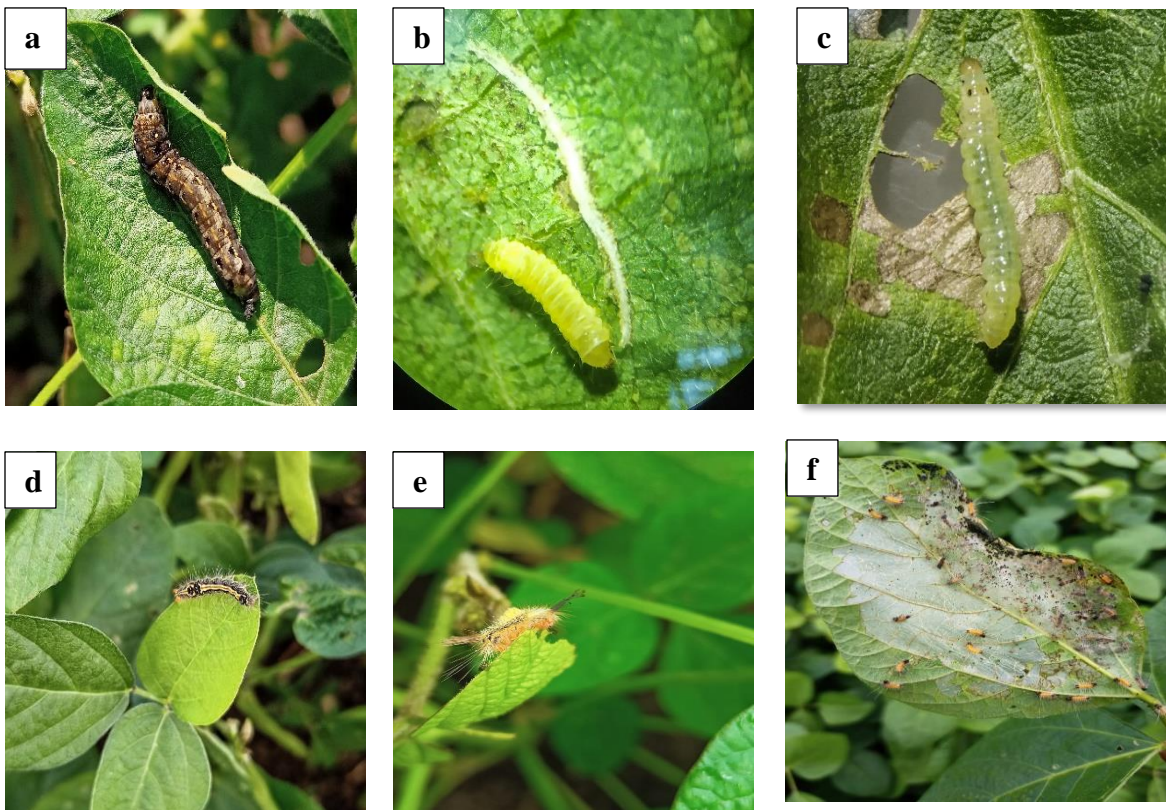


Figure 2. Defoliator pests of Soybean. a. *Spodoptera litura*, b. *Aproaerema modicella*, c. *Omoides indicata*, d. *Somena* sp., e. Hairy caterpillar, f. *Spilosoma obliqua*. (Image by: Rohit Pattar).

literature on incidence of soybean pests during *rabi*-summer, *Kharif* season literature were taken to compare the results (Table 1).

Conclusions

During *rabi*-summer season the incidence of soybean pests varied from the traditional *Kharif* season. This study was helpful for the farmers of this region to know the pest spectrum and to manage them effectively on time to reduce the losses.

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