Crop loss estimation due to Agrotis segetum (Denis and Schiffermuller) and Spoladea (=Hymenia) recurvalis (Fabricius) on palak

Palak is one of the most common leafy vegetables of tropical and subtropical region. It is botanically called as Beta vulgaris var. bengalensis Hort. of the family Chinopodiaceae. It is a rich and cheap source of Vitamin A as compared to spinach and carrot. It contains high quantity of ascorbic acid and iron. A 100 g of leaves supply as much essential amino acids as 100 g of any non- vegetarian foods like meat and fish. Iron and magnesium contents increase, while, zinc and copper contents decrease as the plants grow. Its succulent leaves and stems form a nutritious dish after cooking. It has some medicinal properties also. The herbaceous parts of palak are mildly laxative besides having other medicinal values. Snails cause the damage up to 95.3 per cent on palak (Balikai, 2008). Agrotis segetum (Denis and Schiffermuller) and Spoladea (=Hymenia) recurvalis (Fabricius) have been found to defoliate on palak during a recent study conducted by the authors (Manjula, 2014). Fipronil has excellent activity against foliar insect pests (Srivastava and Dhaliwal, 2014) and was found to be one of the most effective chemicals in controlling the defoliators on palak (Manjula, 2014).

To find out the extent of loss due to major defoliators namely *S. recurvalis* and *A. segetum* on palak, the crop was cultivated over an area of 300 m^2 and size of each plot was $3 \times 2 \text{ m}$. Each field was divided in to three equal plots. Each plot had four replications thus total of 12 plots were maintained. After randomization, four plots were treated with fipronil 5 SC @ 1 ml/l by using knapsack sprayer after 15 days and 30 days of sowing. Another four plots were covered with shade net with the help of pegs and strings immediately after sowing. Remaining four plots were fully exposed to the environment, without any control measures (Untreated control). In each plot, 10 plants were randomly selected to record percentage of

foliage damage inflicted by the defoliators. Percentage of foliage damage was also recorded before and after spray as follows: Grade 0 - No damage; Grade 1 - 1 to 20 per cent damage; Grade 2- 21 to 40 per cent damage; Grade 3 - 41 to 60 per cent damage; Grade 4- 61 to 80 per cent damage; and Grade 5 - 81 to 100 per cent damage.

At the time of harvesting, leaf biomass (fresh leaf weight) was recorded. Based on the market price, extent of monitory loss was calculated. The data collected were analyzed statistically using paired t-test.

The treatment with fipronil 5 SC @ 1 ml/l was found to be superior over other plots with respect to all the parameters of yield loss estimation. Maximum foliage damage of 24.50 ± 15.17 per cent was recorded in open field and it was 10.50 ± 10.11 per cent in net protected plot. Whereas, fipronil 5 SC @ 1 ml/l recorded least per cent foliage damage of 10.00 ± 8.61 per cent. The differences with respect to foliage damage between insecticide treated plot ν/s open plot and chemical treated plot ν/s open plots were statistically significant. Whereas, there was no significant difference with respect to foliage damage between chemical treated plot and net protected plot (Table 1).

Highest foliage yield was recorded in the case of plots treated with fipronil (14.78±0.70 t/ha) followed by net protected plot (13.78±0.65 t/ha). Significantly, lowest yield was observed in the untreated control (9.80±0.63 t/ha). The differences with respect to foliage yield between insecticide treated plot v/s open plot and chemical treated plot v/s open plots were statistically significant. While, there was no significant difference with respect to foliage yield between chemical treated plot and net protected plot (Table 2). The total additional foliage yield in insecticide treated plot was 7.56±0.97 tonnes/hectare followed

SI.	Treatments	Per cent of		Leaf vield	Additional	Per cent leaf yield
No.		leaf damage	Damage	(t/ha)	leaf yield over	loss over insecticide
		$(Mean \pm SD)$	range (%)	$(Mean \pm SD)$	open plot (t/ha)	treated plot
					$(Mean \pm SD)$	$(Mean \pm SD)$
1.	Insecticide	10.00 ± 8.61	0-20	14.78 ±0.70	4.98 ± 0.97	00
	(Fipronil 5 SC @ 1 ml/l)					
	treated plot					
2.	Netted plot	10.50 ± 10.11	0-30	13.87 ± 0.65	4.07 ± 1.00	6.15 ± 10.13
3.	Open plot	24.50 ± 15.17	10-50	9.80 ± 0.63	00	33.69 ± 5.70
		Test	of significance (Pa	ired t -test) (t at 5%)		
1.	Insecticide	NS	-	NS		-
	(Fipronil 5 SC @ 1 ml/l)					
	treated plot v/s Netted plot					
2.	Insecticide	2.203	-	2.447	-	2.447
	(Fipronil 5 SC @ 1 ml/l)					
	treated plot v/s Open plot					
3.	Netted plot v/s Open plot	1.991	-	1.991	-	-
Fac	h value is the mean of four rer	lications				

Table 1. Extent of leaf damage and yield loss due to Agrotis segetum and Spoladea recurvalis in protected and open fields of palak

Each value is the mean of four replications

SD-Standard deviation

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by net protected plot $(6.65\pm1.00 \text{ t/ha})$ over open plot. Among the three different plots evaluated for yield loss estimation due to defoliators on palak, the highest yield loss of 33.69 ± 10.13 per cent was recorded in the case of open plot followed by net protected plot $(6.15\pm10.13\%)$. The differences with respect to per cent loss between insecticide treated plot v/s open plot and chemical treated plot v/s open plots were statistically significant. While there was no significant difference with regard to per cent yield loss between insecticides treated plot and net protected plot.

Department of Entomology, College of Horticulture, Bagalkot University of Horticultural Sciences, Bagalkot - 587 104, Karnataka, India E-mail: ykkotikal@yahoo.co.in Significantly less per cent of foliage damage was recorded in plots treated with fipronil 5 SC @ 1 ml/l of water, than in open field and net protected plot. Correspondingly significantly higher foliage yield was recorded in plots treated with fipronil 5 SC @ 1 ml/l of water, compared to net protected plot and open plot. The per cent yield loss was maximum in untreated open plot. Results indicated significant differences with respect to foliage damage, leaf yield and yield loss between fipronil treated plot and untreated plot, and between net protected plot and untreated plot.

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