Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(1): 527-529

Received: 12-11-2016
Accepted: 13-12-2016

Saboor Naeem
Department of Entomology, The University of Agriculture Peshawar, Pakistan

Sajjad Ahmad
Department of Entomology, The University of Agriculture Peshawar, Pakistan

Kamran Sohail
Department of Entomology, The University of Agriculture Peshawar, Pakistan

Syed Fahad Shah
Department of Entomology, The University of Agriculture Peshawar, Pakistan

Fazal-e-Subhan
Department of Entomology, The University of Agriculture Peshawar, Pakistan

Correspondence
Saboor Naeem
Department of Entomology, The University of Agriculture Peshawar, Pakistan

Effect of systemic insecticide applied before flowering stage and densely grown Pea (*Pisum sativum*) on prevalence of Insect pollinators

Saboor Naeem, Sajjad Ahmad, Kamran Sohail, Syed Fahad Shah and Fazal-e-Subhan

Abstract
The present study was conducted in New Developmental Farm (N.D.F), The University of Agriculture Peshawar during 2014-2015 to determine the prevalence of insect pollinators in systemic insecticide treated and densely grown pea fields. Insects were observed on each second day at morning (9:00 am - 12:00 pm) and evening (3:00 pm- 5:30 pm) of the flowering season i.e. 16/2/2015 to 28/3/2015. The experiment was comprised of four treatments, that were Recommended plant population (T1), Dense plant population (T2), Recommended plant population treated with Imidacloprid insecticide (T3) and Dense plant population treated with Imidacloprid insecticide (T4). Each treatment in each replication was given a time of 5 minutes such that to record the density of insect pollinators. It was observed that highest total numbers of insect pollinators in morning and evening both during the whole observation period was recorded in T3 with a value of 515 pollinators having a percentage of 28, followed by T4 with a value of 497 pollinators having a percentage of 27. Lowest insect pollinators were reported in T2 and T1 with values of 416 and 419 having percentages of 22 and 23 respectively.

Keywords: Pea, imidacloprid, insect pollinators, flowering season

1. Introduction

Pea is one of the earliest vegetable in the world. History about its initial cultivation and origin is silent, although it has been found during excavation in Switzerland, linked to the Bronze Age. It has been also found in Thebes at the Egyptian Tombs. According to a survey Peas were present in Afghanistan in 2000 B.C and in Harappa, Pakistan and North West India from 2250 B.C. to 1750 B.C[1].

Pea belongs to order Fables. Its family and sub family are Fabaceae and Faboidae respectively, while its scientific name is *Pisum sativum* [2]. Pea seeds are spherical, smooth or wrinkled and has different sizes, shapes and colours while pea pod is commonly cylindrical and bulging out [3].

Pea fixes atmospheric nitrogen, therefore it is considered very beneficial for treatment of land and also good forerunner to next crop. It can also be used as manure [3][4]. Peas have sweet taste that is why it can be eaten without cooking. In Ghana and Trinidad, Indians have enough population who split Peas to make *Dhaal*. Dry Pea seeds are used in soup, it can also be eaten directly without any treatment. Pea soup is liked in most part of the world including countries in Northern and Central Europe, Russia, Iraq and India [2].

Pea on the basis of production after Soya bean, Ground nut and French beans is on 4th number in the world. Its annual production is 441.53 thousand tons. It is cultivated on almost 528.71 thousand hectares of land [5]. In Khyber Pakhtunkhwa total production was 13085 tons during 2013-2014, obtained from 1865 hectares of land with an average yield of 7002 kg per hectare [6].

An insecticide is a substance used to kill insects [7]. The term systemic means that the chemical is soluble enough in water that it can be absorbed by a plant and moved around in its tissues. Movement of systemic insecticides, like all transportable chemicals in the plant, takes place principally in the plant's vascular system, which includes the phloem and xylem [8]. Imidacloprid is a systemic insecticide which acts as an insect neurotoxin and belongs to a class of chemicals called the neonicotinoids which act on the central nervous system of insects, with much lower toxicity to mammals [9]. Very minute amounts of these chemicals may contaminate nectar and pollen, or liquid exudates coming from a plant [8].

In Pakistan more than 90% of angiosperms sexual production depend on animal pollination. Today, highly improved quality and more production of seeds and crops are due to efficient pollination [10]. In Kenya in 2009 scientists assessed market value of pollinators and estimated benefits of worth 3.2 million U.S. dollars from the pollination services provided by insects to 8 vegetable crops [11].

Keeping in view the above important facts about pea the present study was conducted to know the prevalence of insect pollinators in an insecticide treated and densely grown pea plants in Peshawar valley.

2. Material and methods

The present study was conducted at New Developmental Farm (NDF) of The University of Agriculture Peshawar during the year 2014-2015 to study the effect of plant population and systemic insecticide on the population of pollinators. Size of the experimental field was 13.5m x7m. A common, vine culture of Pea *Pisum sativum* was sown in two types of plant population.

1. Dense plants population having plant to plant distance of 5cm or 2 inches.
2. Recommended plant populations having plant to plant distance of 10cm or 4 inches.

The experiment was comprised of four treatments with the size of (3m x 2m). Each treatment was replicated three times. Treatments of the experiment were as follow:

1. T_1. Recommended plant population.
2. T_2. Dense plant population.
3. T_3. Recommended plant population treated with Imidacloprid insecticide.
4. T_4. Dense plant population treated with Imidacloprid insecticide.

The distance between treatments was 50cm both vertically and horizontally. Standard agronomic practices were applied during the research work.

2.1 Application of Insecticides

Systemic insecticide with commercial name of Imidacloprid having active ingredient (imidacloprid) of 25% with residual effect of 5 to 7 days was applied in two treatments (recommended and dense plant population) per replication before flowering stage in order to determine density of pollinators in an insecticide treated plants.

2.2 Data Collection

The data were collected after every two days with two time interval in morning and evening from the start of flowering stage up to the crop maturity. Pea plants in each sub plot were given a time of 5 minutes in each observation, during which the number of insect pollinators visited were noted. Total insect pollinators were added separately, recorded in each treatment during the observations.

Fig 1: Field layout of the experiment

R 1	R 2	R 3
T 1	T 3	T 2
T 2	T 1	T 4
T 4	T 2	T 3
T 3	T 4	T 1

3. Result and discussion

The Table 1 shows total number of insect pollinators visited in each experimental treatment. In Recommended plant population (T1), total insect pollinators recorded were 35, 33, 24, 65 and 75 during morning in W1, W2, W3, W4 and W5 respectively. During evening the total number was same in W2 and W3 i.e.27, while in evening of W1, W4 and W5 the numbers of insects that have visited the treatment were 21, 46 and 66 respectively. Total insect pollinators during morning and evening in all the weeks of observation were 232 and 187 respectively. The total sum of the insect pollinators during morning and evening both was 419. In Dense plant population (T2), in morning and evening during W1 the sum of insect pollinators were 29 and 24 respectively. In W2 the sum elevated to 52 and 37 during morning and evening respectively, while in W3 the sum was 29 and 34 respectively. In W4 and W5 during morning total sum of insect pollinators recorded were 47 and 75 respectively, while during evening of these weeks i.e. W4 and W5 the sum was 39 and 50 respectively. The sum total of insect pollinators recorded in all the weeks of observations were 232 and 184 during morning and evening respectively. Sum of total of insect pollinators in (T2) during morning and evening was 416. In T3 (Recommended plant population treated with Imidacloprid insecticide) the sum of insect pollinators during W1, W2, W3, W4 and W5 in morning was 34, 73, 59, 54 and 62 respectively while during evening of these weeks, total insect pollinators recorded were 33, 47, 51, 49 and 53 respectively. Total sum of insect pollinators in all the weeks (W1 to W5) of observation during morning and evening was 282 and 233 respectively. Collectively in morning and evening, total insect pollinators recorded were 515. The table further indicates that in T4 (Dense plant population treated with Imidacloprid) during morning and evening in W1 total insect pollinators were 34 and 33 respectively, while in W2 during morning and evening the numbers were raised to 70 and 53 respectively. In W3 the sum of insect pollinators was 48 and 31 during morning and evening respectively. In W4 the populations of insect pollinators were again increased to 64 and 47 during morning and evening respectively. In W5 the sum of insect pollinators during morning and evening was 65 and 52 respectively. Total population of insect pollinators from W1 to W5 in morning and evening that visited the respective treatment was 281 and 216 respectively. The sum of the insect pollinators in morning and evening from W1 to W5 was 497 as shown in the table.

Table 2: Total Number of Insect Pollinators Visited Per Treatment.

S. No.	Treatment		W1	W2	W3	W4	W5	Total	Total Morning+Evening
1	Recommended plant population. (T1)	Morning	35	33	24	65	75	232	419
		Evening	21	27	27	46	66	187	
2	Dense plant population. (T2)	Morning	29	52	29	47	75	232	416
		Evening	24	37	34	39	50	184	
3	Recommended plant population treated with Imidacloprid insecticide. (T3)	Morning	34	73	59	54	62	282	515
		Evening	33	47	51	49	53	233	
4	Dense plant population treated with Imidacloprid insecticide. (T4)	Morning	34	70	48	64	65	281	497
		Evening	33	53	31	47	52	216	

3.2 Prevalence (%) of Insect pollinators in different treatments of Pea in Peshawar

The pie chart below indicates prevalence of insect pollinators in percent in different treatments. The figure 1 shows that in treatments of Recommended plant population (T1), the percentage of population of insect pollinators is 23. In T2 (Dense plant population) percent prevalence of insect pollinators is 22. The figure further shows highest percent of density of insect pollinators in T3 (Recommended plant population treated with imidacloprid insecticide) which is 28 followed by T4 (Dense plant population treated with imidacloprid insecticide) in which the percent population is 27.

Kessler *et al*., (2015)[12] in lab conditions found honeybees *Apis mellifera* in higher proportion to insecticide treated food as compare to untreated food, which is same as in present study.

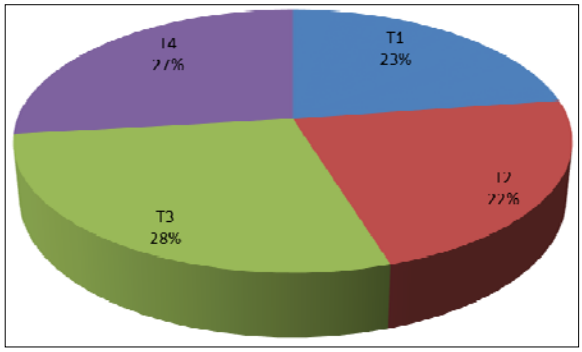

Fig 1: Prevalence (%) of Insect pollinators in different treatments.

4. Conclusion and recommendations

Maximum numbers of insect pollinators were observed in the plots where peas were grown in recommended i.e. 10 cm or 4 inches plant to plant distance treated with imidacloprid, where as least number of insect pollinators were recorded in those plots where peas were untreated and grown densely. Systemic insecticide that was applied before flowering stage has not any adverse effect on insect pollinators rather highest population was recorded in the insecticide treated treatments. Densely grown pea plants i.e. 5 cm or 2 inches plant to plant distance, both treated and untreated attract fewer insects than the peas grown in recommended plant to plant distance. Pea growers should apply systemic insecticide (imidacloprid) before the appearance of flowers in peas. Growers are further advised to grow pea plants in recommended plant to plant distance.

5. References

1. Zohary Daniel, Hopf Maria. Domestication of Plants in the Old World, third edition. Oxford Univ. Press. 2000, 105-107.
2. http:// en.wikipedia.org/wiki/Pea. 2014.
3. Cherepanov SK. Plantae Vasculares Rossicae et Civitatum Collimitanearum (in limics USSR olim). List of Vascular Plants of Russia. St. Petersburg: Mir I Semia. 1995, 990.
4. Konovalov YB. Particular Breeding of Field Crops. Moscow. ed. 1990, 216-235.
5. Food and Agriculture Organization of the United Nations. Newsletter. Helping to build a world without hunger. 2009.
6. Directorate of Crop Reporting Services. Bureau of Agricultural Statistics. Ministry of Agriculture Khyber Pakhtunkhwa. 2014.
7. International Union of Pure and Applied Chemistry IUPAC. Glossary of Terms Relating to Pesticides, 2006, 2123. Retrieved January 2014.
8. http:// citybugs.tamu.edu/factsheets/landscape/sapfeed/ent-6006/.
9. Pesticide Information Profiles: Imidacloprid. Extension Toxicology Network. Retrieved, April 7, 2012.
10. Irshad M, Stephen E. Review: Pollination, pollinated and pollinators interaction in Pakistan. J. Bio resource Manag. 2014; 1(1).
11. Kasina M, Kraemer M, Mueller KH. Economic benefit of crop pollination by bees: A case of Kakamega small holder farming in Western Kenya. J. Econ. Entomol. 2009; 10(2):467-473.
12. Kessler SC, Tiedeken EJ, Simcock KL, Derveau S, Mitchell J, Softley S *et al*. Bees prefer foods containing neonicotinoid pesticides. Nature. 2015; 521:74-76.