EFFICACY OF CHLORPYRIFOS, IMIDACLOPRID AND BIFENTHRIN INSECTICIDES AGAINST APHID POPULATION (*LIPAPHIS ERYSIMI*) WITHIN THE RESPONSE OF *BRASSICA NAPUS*.

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خلاصہ

موجودہ مطالعہ تین کیڑے مار ادویات یعنی کلورو پائیر فاس، امیڈاکلوپرڈ اور بائی فینتھرین کی سرسوں کی فصل پر تیلوں کی آبادی پر افادیت پر کیا گیا۔ یہ مطالعہ بابر زرعی فارم واقعہ موضع حامد پور ضلع ملتان پر سال 2015 تا 2016 میں کیا گیا۔ اس مطالعہ میں سرسوں کے پودے کے چار مختلف پلاٹ تیار کئے گئے جس میں ایک پلاٹ کو بغیر ادویات افزائش کیا گیا جبکہ باقی تین پلاٹس کو اوپر بیان کی گئی تین مختلف ادویات کے ساتھ 2 مراحل (پھول بننے اور پکنے) کے دوران تین دن کے وقفے سے چھڑکاؤ کیا گیا۔ ان عوامل کے بعد پودوں پر تیلوں کی تعداد کو گنا گیا۔ پھول بننے اور پکنے کے مراحل میں اوسط پیداوار میں نمایاں اضافہ کلورو پیئر فاس نے دیا جو کہ 1208 کلو گرام فی ایکڑ اور 1010 کلو گرام فی ایکڑ رہی۔ جبکہ کم اثر ترین بائی فینتھرین رہی جسکی ان دونوں مراحل میں اوسط پیداوار 1106 کلو گرام فی ایکڑ اور 960 کلو گرام فی ایکڑ رہی۔

Abstract

The present study was carried out to evaluate the efficacy of three insecticides i.e. chlorpyrifos, imidacloprid and bifenthrin against aphid (*Lipaphis erysimi*) population on *Brassica napus* replicated three times as compared to control at Babar Agricultural Farm, Hamid Pur, District Multan during 2015-2016. At flowering and ripening stages these insecticides after 1, 4 and 7 days of treatment being non-significant with each other resulted in significant control over the check at aphid. Mean yield was significantly higher in chlorpyrifos 1208kg/ha, 1010kg/ha at flowering and ripening stages, respectively while lowered in bifenthrin 1106kg/ha at flowering and 960kg/ha at ripening stages.

Introduction

There are approximately 4000 species of aphids which are found in the world. Aphids belong to family Aphididae and order Hemiptera. There are different common aphids pest of crops including the melon or cotton aphid (*Aphis gossypii*), green peach aphid (*Myzus persicae*), the rose aphid (*Macrosiphum rosae*), the foxglove aphid (*Aulacorthum solani*), the chrysanthemum aphid (*Macrosiphoniella sanborni*) and the potato aphid (*Macrosiphum euphorbiae*) (Linquist and Richard, 1991).

The oilseed *Brassica* comprises four species namely *B. carinata*, *B. napus*, *B. juncea* and *B. campastris*. In Agriculture Statistics of Pakistan, Pakistan Agricultural Research Council in 2010 reported 0.126 million hectares cultivation of *Brassica* species in Pakistan. In India these crops occupy over 15 million hectares with an annual production of 24.65 million metric (Singh, 1990). Despite the highest oil yields by oil bearing tree fruits (coconut, palm and olive), the largest source of vegetable oil are the oil seeds (Sarwar, 2013).

In edible oil, Pakistan is facing the crucial shortage. During 2000-2001, the domestic production for edible oil meets approximately 35% of country's requirements and continued to import large quantities of edible oil to fulfil the local demand at a cost of Rs. 2.15 billions in the foreign exchange (Anonymous, 2001).

According to Sarwar *et al.* (2011), there are 43 aphid insect species recorded on mustard crops in Pakistan and if infested severely can cause 100% crop damages.

Aslam *et al.* (2001) observed that one day after insecticide application mortality of *Brevicoryne brassicae* (Linn.) in Imidacloprid 25WP, Carbosulfan as 328.98, 334.93, 306.27 and 314.78 µg/cm^{-2} for *A. craccivora, A. gossypii* and *M. persicae*, respectively. Maximum aphid density was recorded on yellow sarson and minimum infestation was recorded on musrtard cultivars (Kumar *et al.* 1996).

Narkiewiez (1995) obtained best control of cabbage aphid by the application of Marshall 250 EC (Carbosulfan), Pirimor 50 DG (Pirimicarb), Aztec 140 EC (Triazamaate), Danadim 400EC (Dimethoate) and Talstar 100EC and, (Bifenthrin). Each of these insecticides destroyed over 96% of the aphids.

Materials and Methods

This study was conducted to find out comparative efficacy of three different types of insecticides (Chlorpyrifos, imidacloprid and bifenthrin) against aphid population on *Brassica napus*. The experiment was carried out in the research area of Babar Agricultural Farm, Hamid Pur, District Multan following Randomized Complete Block Design (RCBD) replicated three times. *Brassica napus* was sown and divided into different plots for two experiments (flowering and ripening stages). The plot size was kept to be 4mX5m.

The formulation of imidacloprid, bifenthrin and chlorpyrifos was sprayed on *Brassica napus* with the help of hand knapsack sprayer when sufficient population of aphid was observed in experiment. As per plant basis population of aphid was recorded from experiment. For this purpose the data on the population of aphid was taken randomly, from the corner 1-2 meters inside the field 8 samples and from the middle of the plot 4 samples were counted. Aphids were counted after 1, 4 and 7 days of spray. To see the effect of pesticides on the population of insect from control plots, they were also recorded. With the help of analysis of variance, mean density of aphid in treatment was separated. Treatment means were separated by LSD at 5% level of significance. One way ANOVA was applied for the statistical analysis for significance and mean.

Results and Discussion

In one experiment mean density of aphids (*Lipaphis erysimi*) was measured at flowering stage after 1 day, 4 days and 7 days of three formulations of chlorpyrifos, imidacloprid and bifenthrin insecticides. After 24 hours (1 day) of application of three formulations of chlorpyrifos, imidacloprid and bifenthrin, the population of aphid (*L. erysimi*) was 94 per plant in control plots but mean density of aphids in treated plots was near about half 47 in chlorpyrifos, 45 in imidacloprid and 43 in bifenthrin (Table 1). All the insecticides chlorpyrifos, imidacloprid and bifenthrin lowered the aphid density as compared to the control plots significantly.

The data of the mean density of aphids recorded after 4 days of application of treatment of insecticides showed that the population of aphids was 94.98 per plant in control plots while in the treated (chlorpyrifos, imidacloprid and bifenthrin) plots the mean density of aphids was near about 22.15 in chlorpyrifos, 21.13 in imidacloprid and 20.10 in bifenthrin per plant (Table 1). All the insecticides (chlorpyrifos, imidacloprid and bifenthrin) equally lowered the aphid density, highly significantly when compared with control plots. After four days of treatment, population was much reduced.

Similarly, the data of the mean density of aphids recorded after 7 days of application of treatment (chlorpyrifos, imidacloprid and bifenthrin) the population of aphids was 93 per plant in control plants while 17.5 per plant in chlorpyrifos treated. The mean density of aphids was 15 in imidacloprid treated plots and 13 per plant in bifenthrin treated plots (Table 1). All the insecticides (chlorpyrifos, imidacloprid and bifenthrin) lowered the aphid density equally and significantly as compared to control plots.

Also the mean density of aphids was measured at ripening stage after 1, 4 and 7 days of three formulations of chlorpyrifos, imidacloprid and bifenthrin insecticides. After 24 hours (1 day) of application of three formulations of chlorpyrifos, imidacloprid and bifenthrin the population of aphids was 62 per plant in control plots but mean density of aphids in treated plots was near about half 32.16 in chlorpyrifos, 31.13 in imidacloprid and 30.11 in bifenthrin (Table 1). All the insecticides (chlorpyrifos, imidacloprid and bifenthrin) lowered the aphid density significantly as compared to the control plots.

One way ANOVA based on statistical analysis showed highly significant differences among treatments as compared to control, whereas, variation in variety and interaction of variety and treatment between and within the group was non-significant (Table 2 to 11). The means were compared at p=0.05 (Table 12 to 14).

The data of the mean density of aphids recorded after 4 days of application of treatment of insecticides showed that the population of aphids was 48 per plant in control plots while in the treated (chlorpyrifos, imidacloprid and bifenthrin) plots the mean density of aphids was about 26.15 in chlorpyrifos, 24.13 in imidacloprid and 22.11 in bifenthrin per plant (Table1). All the insecticides (chlorpyrifos, imidacloprid and bifenthrin) lowered the aphid density more or less equally and significantly as compared with control plants.

Similarly, the data of the mean density of aphids recorded after 7 days of application of treatment as the population of aphids was 45 per plant in control plots while 19.15 per plaint in chlorpyrifos treated. The mean density of aphids was 17.17 in imidacloprid treated plots and 16.14 were in bifenthrin treated pots (Table 1). All the insecticides (chlorpyrifos, imidacloprid and bifenthrin) significantly lowered the aphid density.

At flowering stage yield was 1010 kg/ha in control group while in treated plots in chlorpyrifos 1208 kg/ha, in imidacloprid 1175 kg/ha and in bifenthrin it was 1106 kg/ha (Table 1). Similarly, at ripening stage the yield was 931 kg/ha in control plots while in treated plots in chlorpyrifos 1010 kg/ha, in imidacloprid 978 kg/ha and in bifenthrin it was 960 kg/ha (Table 1).

From the above results it is proved that the formulations of (chlorpyrifos, imidacloprid and bifenthrin) gave better yield at both stages of flowering and ripening of *Brassica napus*. Similarly yield at flowering stage was higher as compared with the ripening stage.

At flowering stage after 1, 4 and 7 days of three formulations of insecticides (chlorpyrifos, imidacloprid and bifenthrin) results revealed chlorpyrifos and imidacloprid gave higher reduction in aphid population while bifenthrin gave lowered reduction in aphid density non-significantly as compared to the control plots which showed significantly. Similarly at ripening stage after 1, 4 and 7 days of three formulations of insecticides (chlorpyrifos, imidacloprid and bifenthrin) showed lowered the aphid density non-significantly as compared to control plots where it was significant. Kumar *et al.* (1996) evaluated the efficacy of ten insecticides against aphids on *Brassica*. It was estimated that all insecticides reduced the pest population upto 94.4% on leaves and 99.5% on inflorescence but chlorpyrifos, monocrotophos and methyl-o-demeton were among the most effective insecticides.

Mustafa (2000) worked out different experiments in field trials to observe the efficacy of different insecticides against aphids on *Brassica*. All the insecticides showed reduced aphid population by 74.56% to 80.49%. After 72 hours, imidacloprid proved to be most effective with 92.30% mortality followed by polo, metasystox and bifenthrin.

Kumari and Dikshit (2001) applied imidacloprid as seed treatment and foliar spray on *Brassica* to control aphids and found to be safe for crop protection.

Under bifenthrin and imidacloprid treatment the lowest benefit cost ratio was observed as compared to under dimethoate treatment where highest benefit cost ratio was observed (Ahuja and Kalyan, 2003). Maximum yield in chlorpyrifos treatment while lower yield in the bifenthrin. Gour and Pareek (2004) in field experiment in India during the rabi season of 1999-2001 found highest yield of mustard seed in dimethoate (0.03%) following by imidacloprid (0.05%), acephate (0.06%) and dimethoate (0.015%). Shakeel *et al.* (2007) found mean yield of mustard seed was significantly higher in chlorpyrifos treatment with 582 kg / ha, against 478 kg/ha in BtA treatment.

Conclusion

As regards to the control of *Lipaphis erysimi* (aphids) chlorpyrifos shows the best results in the crop of mustard while bifenthrin shows the poor results as compared to other insecticides i.e. chlorpyrifos and imidacloprid.

Table 1: Mean density of aphids (*Lipaphis erysimi*) population after different days of formulation and yield of *Brassica napus*.

	Mean density of aphids (*Lipaphis erysimi*) at flowering stage			Mean density of aphids (*Lipaphis erysimi*) at ripening stage			Yield of *Brassica napus* (kg/ha) at flowering stage	Yield of *Brassica napus* (kg/ha) at ripening stage
	After 1 day formulation	After 4 days formulation	After 7 days formulation	After 1 day formulation	After 4 days formulation	After 7 days formulation		
Control	94 ±0.27	94.98 ±1.10	93.00 ±1.29	62.00 ±2.12	4800 ±2.50	45.00 ±2.90	1010 ±0.94	931 ±0.64
Chlorpyrifos	47 ±1.23*	22.15 2.01	17.50 ±1.75*	32.16 ±1.94	26.15 ±2.10	19.15 ±1.41	1208 ±0.91	1010 ±0.84
Imidacloprid	45 ±2.07	21.13 ±1.83*	15.00 ±2.23	31.13 ±1.94	24.13 ±1.79*	17.17 ±1.98*	1175 ±0.83	978 ±0.67
Bifenthrin	43 ±1.61	20.10 ±1.97	13.00 ±1.29	30.11 ±1.53*	22.11 ±1.03	16.14 ±1.69*	1106 ±0.89	960 ±0.91

*The mean difference is significant at the 0.05 level.

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