

Impacts of The Pesticides Used In The Agriculture Setor, on Jassid Sucking Insect Pests of Almond In District Quetta, Balochistan

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Abstract: Field evaluation of various insecticides was carried out during 2017-18 against different insect pests of almond, in district Quetta (Balochistan). The tested pesticides include Superacide, Acetamiprid and Carbosulfan; while winter oil was also kept as a treatment which is commonly applied in the study area and Control was kept to compare the insecticidal efficacies. The efficacy of these pesticides was evaluated against jassid insects. The results show that insect pest population was significantly differed on pistachio trees sprayed with different insecticides. On the basis of pre-treatment count, the 1st and 2nd spray efficacy of Acetamiprid against the 1st and 2nd spray efficacy of Carbosulfan was highest (90.50 and 88.71%), followed by Superacide (80.78 and 78.89%), Acetamiprid (62.46 and 60.45%) and winter oil (56.18 and 57.21%). Against jassid insects, the 1st and 2nd spray efficacy of winter oil was highest (99.78 and 99.83%), followed by Carbosulfan (52.64 and 49.76%), Acetamiprid (43.54 and 40.01%) and Superacide (36.34 and 38.44%). However, and against jassid insects the winter oil showed almost 100 percent efficacies on almond. Ranking of insecticides on the basis of efficacy showed that again winter oil and against jassid insects winteroil>Carbosulfan>Acetamiprid>Superacide

Keywords; impact , pesticides , almond , jassid insects, Quetta Balochistan.

INTRODUCTION

Almond is a nut fruit of high economic importance in the Anacardiaceae plant family. The almond has been cultivated in the Iran and Pakistan surrounding regions extensively. Other species cultivated include *P. terelanthus*, *P. atlantica*, *P. motica* and *P. chinensis*. It originates in China, mid Asian region, Algeria and Mediterranean region. Almond is more commonly cultivated in Italy, Spain, France, Palestine, Iran, Pakistan and in various parts of United States (PARC, 2018). Pakistan ranks 15th in Pistachio production (682 tons); but ranks 1st in yield per hectare (384431 kg ha⁻¹); while Iran is on top of almond producing countries of the world; followed by USA, China, Turkey, Syria, Greece, Spain, Italy, Tunisia, Madagascar, Afghanistan, Australia, Kyrgyzstan and Uzbekistan (FAOSTAT, 2017). Pakistan has tremendous potential almond farming and particularly entire Balochistan province has incredible potential of pistachio farming. However, only 200-300 hectares are under the almond cultivation in the province (Khan, 2015). In 2008, the almond production of Pakistan was 784 tons but in 2014 production declined to 649 tons. Regardless of tremendous production potential, Pakistan has a tiny share in world production that is only 0.1 percent (FAOSTAT, 2014).

Almond tree is generally infested by numerous insect pests at its entire growth stages; and the common almond insect pests included almond psylla, *Agonoscena* ; and *Acrosternum heegeri*, *Acrosternum millieri*, *Apodiphus amygdali*, *Brachynema germari*, *Brachynema segetum*, *Lygaeus spandurus*. The phytophagous insects also attack almond which mainly include mites fruit moth, *Recurvaria Idioceris stali*, fruit scale, the trunk and branch scale, *Melanaspis inopinata*; the bark beetle, *Hylesinus vestitus*; leaf borer, *Ocneri aterebinthina* and common mites, Mehrnejad, 1998; Mehrnejad and Daneshvar, 1991a; Mehrnejad and Daneshvar, 1991b; Michailides and Morgan, 1990). In Pakistan, the almond is cultivated mostly in Quetta Mastung Kalat Balochistan and in some parts of KPK. In Balochistan, the almond is infested by spiders, mealy bug and many species of scale insects.

Chemical control of insect pests is yet an effective tool to deal with; and with the introduction of new insecticides, their efficacy level needs to be evaluated time to time to ensure their quality and efficacy to control insect pests. There are a number of insecticidal groups used to combat insect pests. Nevertheless, many of the insect and thrips pests of almond can be controlled by chemical control using different pesticides.

In Quetta district of Balochistan, the almond is attacked mainly by Reportedly Supracide, Methidathion, Methiathion, Acetamiprid, Carbosulfan are used against scale insects; while Panadublin, Prapergit and Abamectin are used against scale insect. However, Propenophos and Carbosulfan are found effective against sucking insect pests attacking almond (Anon,

2018). Yazdani (2001) recommends an integrated pest management that included mechanical control, collection and burning of dried branches in the gardens until late March, cultural control with improved soil, regular irrigation and supply adequate soil moisture, use of animal manure, pruning, follow planting distance, ploughing which increased the pupa mortality in soil. The proposed study was carried out to investigate the impact of pesticides against insect pests of almond at district Quetta Balochistan.

Objective

1. To evaluate the impact of against sucking insect pest of almond in Quetta,
2. To observe the effect of different pesticides on yield of almond.

MATERIALS AND METHODS

This study was carried out during 2018 in the almond plantation at farmers' field at district Quetta, Balochistan. Various synthetic pesticides and locally used winter oil was applied as chemical control against scale insects in the *Coccus hesperidum* species. An untreated (control) was also kept to compare the efficacy of synthetic pesticides and winter oil. The test was conducted using a randomized block design with three replications of each treatment. The following pesticides were used to evaluate their efficacy against target pests on almond.

Preparation of botanical extracts:

Treats	Trade Name	Chemical Name	Group	Dosage
T ₁	Superacide	Trifluoromethanesulfonic	Sulpher	1.00 L/100 L water
T ₂	Winter oil	Methyl Salicylate	Hydrogen	1.00 L/100 L water
T ₃	Acetamiprid	Mospilan	Chloropyridinyl	1.00 L/100 L water
T ₄	Carbosulfan	Carbosulfan	Methylcarbamate	1.00 L/100 L water
T ₅	Control (untreated)	--	--	--

The pistachio plantation was sprayed using above treatments with a knapsack hand sprayer. Five branches on each of the sample almond trees were selected (two branches from the bottom of the tree, two branches from top of the tree and one from the middle of the mottom) and tagged and on the basis of these five branches, the insect pest infestation was recorded. Each treatment was applied and the efficacy was examined after 3 days, 7 days and 14 days of spray and compared with pre-treatment population. One almond plant/tree was considered as treatment replicated three times; so a total of 15 almond trees were selected for spray applications. The significance of the efficacy of pesticides was evaluated using analysis of variance and least significant difference using Statistix Ver 8.1 software package.

RESULTS

The field evaluations were carried out during 2017-18 to investigate the effect of different pesticides against insect pests of almond in district Quetta (Balochistan). The tested pesticides included Superacide, Acetamiprid and Carbosulfan; while winter oil was also kept as a treatment which is commonly applied on almond. Control was kept to compare the pesticides efficacies. The efficacy of these pesticides was evaluated against Jassid insects. The pre-treatment pest population was monitored one day before spray of each

treatment; while post-treatment count of certain insect pests was done after three, seven and fourteen days of each spray of different pesticides. Five branches in each experimental tree were monitored for insect pest infestation and on the basis of insect mortality the efficacies of the pesticides were developed and the data are given in Tables 1-2.

Jassid insects (*Coccus hesperidum*)

First spray

The ANOVA proposed that the population of jessed insects on almond trees sprayed with various pesticides differed significantly when monitored after three days of first spray ($F=17.44$; $DF=14$; $P<0.05$); after seven days of spray ($F=37.62$; $DF=14$; $P<0.05$) and after fourteen days of spray ($F=39.67$; $DF=14$; $P<0.05$) while pre-treatment population on all the experimental trees was insignificant ($F=0.24$; $DF=14$; $P>0.05$).

The data (Table 1) demonstrated that winter oil remained highly effective to control the jassid insects with population of 223.52, 11.18 and 1.79/tree after 3, 7 and 14 days of spray over 802/tree pre-treatment population showing 99.78 percent efficacy. The insect population on trees sprayed with Carbosulfan was 379.58, 360.60 and 346.18/ tree after 3, 7 and 14 days of spray over 731/tree pre-treatment population showing 52.64 percent efficacy. The Acetamiprid spray application decreased jassid insects population upto 510.65, 485.12 and 412.35/tree after 3, 7 and 14 days of spray over 730.33/tree pre-treatment insect count showing an efficacy of 43.54 percent. However, Superacide among the insecticides resulted in least efficacy with average Jassid insects population of 585.90, 533.17 and 469.19/tree after 3, 7 and 14 days of spray over 737.90/tree pre-treatment insect count showing efficacy of 36.34 percent; while jassid insects were abundantly on control trees. On the basis of experimental results, the treatments were ranked as winter oil> Carbosulfan> Acetamiprid> Superacide.

Second spray

The analysis of variance suggests that jassid insects population on almond trees sprayed with different pesticides varied significantly when observed after three days of second spray ($F=21.72$; $DF=14$; $P<0.05$); after seven days of spray ($F=36.96$; $DF=14$; $P<0.05$) and after fourteen days of spray ($F=38.75$; $DF=14$; $P<0.05$); while pre-treatment population on all the experimental trees was insignificant ($F=0.24$; $DF=14$; $P>0.05$). It is evident from the data (Table 2) that after second spray too, the winter oil proved to be highly against jassid insects with population of 156.40, 7.82 and 1.25/tree after 3, 7 and 14 days of spray over 737.84/tree pre-treatment population showing 99.83 percent efficacy. The insect population on trees sprayed with Carbosulfan was 370.51, 351.98 and 337.90/tree after 3, 7 and 14 days of spray over 672.52/tree pre-treatment population showing 49.76 percent efficacy. The Acetamiprid spray application decreased jassid insects population upto 499.16, 474.20 and 403.07/tree after 3, 7 and 14 days of spray over 671.91/tree pre-treatment insect count showing an efficacy of 40.01 percent. However, Superacide was least effective with average jassid insects population of 521.26, 474.34 and 417.42/tree after 3, 7 and 14 days of spray over 678.04/tree pre-treatment insect count showing efficacy of 38.44 percent; while jassid insects were copiously existed on control trees. On the basis of experimental results, the second spray treatments were ranked as winter oil> Carbosulfan> Acetamiprid> Superacide.

Table 1: Population of jassid insect per tree in different plots sprayed with pesticides before and after 3, 7 and 14 days of 1st spray

Treatment	Pre treat. count	Post treatment count			Total reduction	Efficacy (%)
		3 days	7 days	14 days		
Superacide	737.00	585.90 ^b	533.17 ^b	469.19 ^b	267.81	36.34
Winter Oil	802.00	223.52 ^d	11.18 ^d	1.79 ^c	800.21	99.78

Acetamiprid	730.33	510.65 ^{bc}	485.12 ^{bc}	412.35 ^b	317.98	43.54
Carbosulfan	731.00	379.58 ^{cd}	360.60 ^c	346.18 ^b	384.82	52.64
Control	766.67	766.44 ^a	758.77 ^a	751.19 ^a	15.48	2.02
<i>SE</i> _±	89.877	69.638	63.358	60.426	--	--
<i>LSD</i>	<i>NS</i>	160.59	146.10	139.34	--	--
<i>P-value</i>	0.9093	0.0005	0.0000	0.0000	--	--

Table 2: Population of jassid insect per tree in different plots sprayed with pesticides before and after 3, 7 and 14 days of 2nd spray

Treatment	Pre treat. count	Post treatment count			Total reduction	Efficacy (%)
		3 days	7 days	14 days		
Superacide	678.04	521.26 ^b	474.34 ^b	417.42 ^b	260.62	38.44
Winter Oil	737.84	156.40 ^d	7.82 ^c	1.25 ^c	736.59	99.83
Acetamiprid	671.91	499.16 ^{bc}	474.20 ^b	403.07 ^b	268.84	40.01
Carbosulfan	672.52	370.51 ^c	351.98 ^b	337.90 ^b	334.62	49.76
Control	705.33	705.12 ^a	698.07 ^a	694.58 ^a	10.75	1.52
<i>SE</i> _±	82.687	61.645	58.848	56.307	--	--
<i>LSD</i>	<i>NS</i>	142.15	135.70	129.84	--	--
<i>P-value</i>	0.9096	0.0002	0.0000	0.0000	--	--

Almond yield

The impact of pesticides on almond for its yield was investigated and statistical analysis identified significant difference in yield ($P < 0.05$) due to application of various pesticides as compared to control (untreated). Among pesticides, the almond trees sprayed with Acetamiprid produced highest almond yield of 35.72 kg/tree, closely followed by winter oil (35.66 kg/tree); while relatively lower yields were obtained from trees sprayed with Carbosulfan (33.45 kg/tree) and Superacide (31.34 kg/tree). However, the least almond yield (18.75 kg/tree) was obtained in control (untreated). The data showed that all the treatments were effective to increase almond yield over control, and jassid insects suppression by Acetamiprid and winter oil more positively influenced the almond yield over rest of the treatments.

Table 3 : almond yield (kg/tree) as affected by different pesticides.

Treatments	RI	RII	RIII	Mean
Superacide	32.12	31.45	30.45	31.34 b
Winter Oil	36.25	37.10	33.65	35.66 a
Acetamiprid	36.14	38.95	32.08	35.72 a
Carbosulfan	33.70	31.65	35.00	33.45 ab
Control	19.06	20.32	16.88	18.75 c

S.E.±	1.5502
LSD 0.05	3.5749
P-Value	0.0000
CV%	6.13

DISCUSSION

almond is a fruit crop of high economic significance; and Balochistan is renowned worldwide for almond production. However, less attention has been given towards quality production of almond; and insect pest infestation is the major cause to affect the fruit quality of almond. Hence, the present study was carried out to investigate impact pesticides against different insect pests of almond in district Quetta (Balochistan). The tested pesticides included Superacide, Acetamiprid and Carbosulfan; while winter oil was also kept as a treatment which is commonly applied on pistachio and Control was kept to compare the pesticides efficacies. The efficacy of these pesticides was evaluated against Jassid insects. The major results achieved in this study are discussed in this chapter.

The 2016) found that scale insects sometimes damage the foliage and fruits entirely and apart from the chemical means including systematic pesticides use of winter oil is a proven solution of all jassid insects. The jassid insect mostly rest in holes in barks of the tree; and winter oil spray coats the barks; keep the jassid insects in holes and in most cases these insect die after spray of winter oil. Mohammadrezaei and Hayati (2015), Amirzade et al. (2014), Beck et al. (2014) and Mehrnejad (2001) reported that there are many different techniques to control jassid insects on almond but winter oil application has been most effective to control these serious almond pests. The study clearly suggested that winter oil is highly effective against scale insect to control them timely; and with the application of winter oil, the quality produce is achieved. against almond insects the winter oil showed almost 100 percent efficacies on almond.

Conclusions

1. Acetamiprid proved to be most appropriate pesticides to combat jassid insects on almond on the basis of population record after two spray applications.
2. The Carbosulfan has proved to be most effective insecticide for controlling on almond.

3. The winter oil is highly effective against jassid insect to control them timely; and with the application of winter oil, the fruit quality could be maintained.
4. The treatments were impact to increase almond yield over control. However, jessed insects suppression by Acetamiprid and winter oil more positively influenced the almond yield over rest of the treatments.

Suggestions

On the basis of research findings from the present study, it is suggested that Acetamiprid may be applied to control jassid insect on almond. However, for combating jassid insects on almond, winter oil could be a single economical and effective solution to combat these insect pests on almond.

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APPENDIX

jassid insects first spray

Appendix-XVII Analysis of variance for pre-treatment count of jassid insects

Soruce	DF	SS	MS	F	P
Replication	2	1369	684.6		
Treatment	4	11522	2880.6	0.24	0.9093
Error	8	96934	12116.8		
Total	14	109826			

Appendix-XVIII Analysis of variance for post-treatment count of jassid insects three days after first spray

Soruce	DF	SS	MS	F	P
Replication	2	717	359		
Treatment	4	507584	126896	17.44	0.0005
Error	8	58194	7274		
Total	14	566495			

Appendix-XIX Analysis of variance for post-treatment count of jassid insects seven days after first spray

Soruce	DF	SS	MS	F	P
Replication	2	104	52		
Treatment	4	906016	226504	37.62	0.0000
Error	8	48172	6021		
Total	14	954291			

Appendix-XX Analysis of variance for post-treatment count of jassid insects fourteen days after first spray

Soruce	DF	SS	MS	F	P
Replication	2	305	153		
Treatment	4	868994	217248	39.67	0.0000
Error	8	43815	5477		
Total	14	913114			

Jassid insects second spray**Appendix-XXI Analysis of variance for pre-treatment count of jassid insects (second spray)**

Soruce	DF	SS	MS	F	P
Replication	2	1158.9	579.4		
Treatment	4	9752.4	2438.1	0.24	0.9093
Error	8	82045.1	10255.6		
Total	14	92956.4			

Appendix-XXII Analysis of variance for post-treatment count of jassid insects three days after second spray

Soruce	DF	SS	MS	F	P
Replication	2	4	2		
Treatment	4	495297	123824	21.72	0.0002
Error	8	45601	5700		
Total	14	540902			

Appendix-XXIII Analysis of variance for post-treatment count of jassid insects seven days after second spray

Soruce	DF	SS	MS	F	P
Replication	2	132	66		
Treatment	4	767945	191986	36.96	0.0000
Error	8	41557	5195		
Total	14	809634			

Appendix-XXIV Analysis of variance for almond yield

Soruce	DF	SS	MS	F	P
Replication	2	14.657	7.328		
Treatment	4	600.557	150.139	41.65	0.0000
Error	8	28.839	3.605		
Total	14	644.053			