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Evaluation of Some Insecticidal Combinations and Neem (*Azadirachta indica* A. Juss) Extracts Against Jassids and Whitefly on Cotton and Their Effect on the Yield.

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Abstract: The insecticidal combinations and the neem extracts at their recommended doses reduced 70.2-95.3% pest infestation 2days after the spray but gradually decreased to 6.5-39.6% infestation 17 days after the spray. Baythroid-TM 525EC ranked first in the initial as well as in its residual toxicity to the test insect pests, followed by Polytrin-C, Decis-D, and neem extracts (Ethanol, Hexane, Chloroform, and Water). Water extract of neem was inferior to other treatments in its toxicity and its effect on the yield of cotton. The highest yield 1915 Kg/hectare was obtained from the plots treated with Baythroid-TM.

Key words: Baythroid-TM 525EC, neem extract, polytrin-c, Decis-D

Introduction

Cotton is an important cash crop of Pakistan and contributes a major share to foreign exchange by the export of its raw and finished products. Seed of cotton is also a good source of edible oil and play important role in the national oil production (Awan, 1994). Besides, the lack of modern Agro-technology, a heavy attack of insect pests every year is also a main reason for low yield. Jassids (*Emrasca devastans*) (Distant) and Whiteflies (*Bemisia tabasi*) (Gennd.) are the major insect pests of cotton which suck the sap of the plant and thus reduce the quality and quantity of the crop.

These insect pests are commonly kept below economic injury level by different synthetic insecticides. Because of resistance development in insects, these insecticides are now used in combinations. The management of cotton insect pests by insecticidal combinations have also been studied by Munshi *et al.* (1991).

Most of the tropical plants naturally carry chemical substance, which they use in their own defence against their enemies. Among these tropical plants, neem tree (Azadirechta indica A Juss.) native to India and Pakistan is well known for its insecticidal activities (Ahmad and Grainage 1988). Neem derivatives are less environmental pollutant, friendly to the natural enemies of the insect pests and non-toxic to man and other animals. Although, neem is basically anti-ovipositional, repellent and insect growth regulator, it kills some insect pests, especially, soft bodied and or the immature stages (Jacobson, 1988). The insecticidal properties of the neem derivatives (neem oil, neem seed powder, and neem extracts) have been investigated against different insect pests at different dose levels by Shapiro *et al.* (1994).

Materials and Methods

Cotton variety AUH-50 was obtained from the Plant Breeding Department, Agriculture Faculty, Gomal University, Dera Ismail Khan. It was sown by dibling method (3 seeds/hill) during the last week of May in the experimental area of the Agriculture Faculty. Plant to plant and row to row distance was kept 30cm and 75cm, respectively. All other agricultural operations and recommended irrigations and fertilizer doses were practiced through out the growing period at an appropriate time. The crop was treated 4 times at interval of 15-20 days with Decis-D. 12.5 + 300 EC, Polytrin-C. 440 EC, Baythroid-TM. 525 EC and four neem extracts (Ethanol, water, chloroform, and hexane). The recommended doses for Decis-D. 12.5 + 300 EC, Polytrin-C. 440 EC, Baythroid-TM. 525 EC, and neem extracts were 400 ml, 500 ml, 400-500 ml and 500 g/acre, respectively. First spray was done when the insect pest attack reached to economic threshold level, which for different insects was as follows.

Jassids---------- 1-2/leaf
White flies---------- 3-5/leaf

To estimate the density of the insect pests, five plants/treatment were selected at random and tagged. Data on three leaves (upper, middle, and lower) were recorded for the test insects.

The Neem extracts and the insecticidal combinations were sprayed with 10 liters capacity knapsack hand operated sprayer. Pre-treatment infestation was recorded a day before spray and post-treatment data was recorded after 2, 7, 12, and 17 days. For these sucking insect pests, the percent mortality was computed according to Hinderson & Tilton (1955).

Percent Efficacy = (1-Ta/Ca.Cb/Tb) x 100

Where
Ta = Infestation in the treated plot after application
Ca = Infestation in the check plot after application
Cb = Infestation in the check plot before application
Tb = Infestation in the treated plot before application

The data of check plots were used to compute reduction percentages. The data on reduction percentages to the population of jassids and whiteflies in different plots were subjected to statistical analysis to test the significance of the effectiveness of various insecticidal combinations and neem extracts. The significance was verified by DMR test.

The economics of each treatment was calculated separately. The insecticidal effect was also evaluated by measuring the yield per treatment. The yield and quality of cotton were compared among the treatments. In all these trails there were three replications for each treatment.

Results and Dicussion

Percent efficacy of the insectcidal combinations and neem extracts against:

Jassids: The insecticidal combinations and neem extracts significantly killed the test insect up to 17 days after the spray (Table 1). Baythroid-TM with 95.3% kill of the test insect

Table 1: Percent efficacy of various insecticidal combinations and neem extracts against jassids on cotton

First spray Treatment	Percent efficacy after			
Insecticidal combinations	2d	7d	12d	17d
Polytrin-C. 440 EC	94.5A	87.5A	69.3A	23.6B
Decis-D. 12.5 + 300 EC	88.7B	71.1B	70.4A	23.4B
Baythroid-TM. 525 EC	95.3A	87.4A	75.0A	35.4A
Neem extracts				
Ethanol	88.8B	72.2B	57.7B	15.3C
Water	71.8D	65.7C	49.8C	10.3C
Chloroform	82.8C	69.5C	57.0BC	15.0C
Hexane	82.6C	75.2B	56.3BC	15.6C
Control	00.00	00.00	00.00	00.00
Second spray				
Polytrin-C. 440 EC	93.9A	84.3A	31.2A	16.3A
Decis-D. 12.5 + 300 EC	89.7AB	78.5B	29.5A	14.7A
Baythroid-TM. 525 EC	94.7A	86.7A	33.2A	16.9A
Neem extracts				
Ethanol	85.1BC	65.8C	18.2B	10.2B
Water	70.2E	44.4E	14.0C	6.5C
Chloroform	80.0CD	49.8D	15.6BC	7.4C
Hexane	76.8D	49.5D	15.0BC	7.8C
Control	00.00	00.00	00.00	00.00
Third spray				
Polytrin-C. 440 EC	92.5AB	49.3AB	31.9B	19.1B
Decis-D. 12.5 + 300 EC	90.3BC	45.8C	32.1B	18.2B
Baythroid-TM. 525 EC	95.1A	53.5A	37.8A	25.7A
Neem extracts				
Ethanol	88.9C	42.9C	25.3C	13.8C
Water	81.6E	34.4D	20.8D	9.6E
Chloroform	84.7D	39.9CD	23.3CD	12.1CD
Hexane	84.7D	40.9C	22.2CD	11.5DE
Control	00.00	00.00	00.00	00.00
Forth spray				
Polytrin-C. 440 EC	93.6AB	79.7B	70.7A	39.6B
Decis-D. 12.5 + 300 EC	92.6BC	79.2B	68.9AB	39.0B
Baythroid-TM. 525 EC	95.3A	88.9A	73.0A	45.2A
Neem extracts				
Ethanol	90.3C	73.7C	62.9C	26.9C
Water	73.6E	71.9C	57.1D	19.2E
Chloroform	79.0D	72.9C	63.5BC	22.8D
Hexane	77.8D	73.8C	60.5CD	22.3D
Control	00.00	00.00	00.00	00.00

[a]Each value is a mean of 3 replications. Means followed by the same letters are not significsntly different from each other at $\alpha = 0.01$.

Table 2: Percent efficacy of various insecticidal combinations and neem extracts against white flies on cotton

First spray Treatment	Percent efficacy after			
Insecticidal combinations	2d	7d	12d	17d
Polytrin-C. 440 EC	96.0B	88.0A	64.5A	43.3B
Decis-D. 12.5 + 300 EC	95.0B	86.2A	59.6A	42.4B
Baythroid-TM. 525 EC	98.0A	88.8A	64.4A	47.5A
Neem extracts				
Ethanol	90.8C	81.5B	54.6A	28.5C
Water	80.8E	70.1D	36.8B	20.6E
Chloroform	83.8D	74.7C	40.8B	25.0D
Hexane	83.8D	75.4C	39.4B	26.5D
Control	00.00	00.00	00.00	00.00
Second spray				
Polytrin-C. 440 EC	89.6AB	69.1A	49.9A	19.1B
Decis-D. 12.5 + 300 EC	88.3AB	67.4A	41.6A	18.1B
Baythroid-TM. 525 EC	91.5A	70.6A	45.6A	21.7A
Neem extracts				
Ethanol	85.8B	47.6B	29.3B	11.7C
Water	76.7C	41.1C	15.4D	6.0E
Chloroform	78.3C	43.3C	22.0C	8.9D
Hexane	78.2C	42.8C	22.7C	6.7E
Control	00.00	00.00	00.00	00.00
Third spray				
Polytrin-C. 440 EC	94.7A	75.7AB	49.6A	24.4A
Decis-D. 12.5 + 300 EC	93.8AB	74.2B	48.8A	20.5B
Baythroid-TM. 525 EC	95.4A	78.9A	52.5A	27.2A
Neem extracts				
Ethanol	91.5C	69.4C	44.6B	15.9C
Water	82.4E	57.2D	26.7C	8.9E
Chloroform	89.6D	61.0D	34.2B	13.9CD
Hexane	88.5D	59.7D	32.5B	11.0DE
Control	00.00	00.00	00.00	00.00
Forth spray				
Polytrin-C. 440 EC	92.2A	76.2AB	52.4B	21.2B
Decis-D. 12.5 + 300 EC	90.7A	74.3B	51.5B	17.3C
Baythroid-TM. 525 EC	93.2A	80.2A	55.6A	27.4A
Neem extracts				
Ethanol	86.8B	67.1C	35.8C	14.6C
Water	78.0D	54.8E	20.2E	9.6D
Chloroform	82.1C	61.6D	29.3D	11.0D
Hexane	82.1C	60.9D	27.3D	10.1D
Control	00.00	00.00	00.00	00.00

Each value is a mean of three replications. Means followed by the same letters are not significantly different from each other at $\alpha = 0.01$.

ranked first, followed by polytrin-C, decis-D, and neem extracts (ethanol, chloroform, hexane, and water) with 94.5, 88.7, 87.8, 82.8, 82.7, and 71.1% kill, respectively. The insecticidal combinations and the neem extracts, although, reduced 70.2-95.3% 2 days after the spray, they gradually decreased in their percent efficacy and reached to 6.5-39.6% 17 days after the spray. The trend of initial toxicity and decrease in the residual toxic effect of all the treatment remained the same in all four sprays. In general the insecticidal combinations were superior to neem extracts in killing the test insect. As compared to other neem extracts, water extract remained inferior in its efficacy throughout the trials.

Tufail (1989) observed that all the insecticidal combinations (Pay off plus 225EC, Challange 313EC, Boom 425 EC and Comando 340 EC) significantly reduced the insect pests population on cotton. Out of Miken-Top, Baythroid- TM, Polytrin-C, and Decis-D, the most effective in reducing the population of jassids, thrips and bollworms was Mikan-Top (Khalid, 1990). Khattak (1994) observed the repellent, residual, deterrent, and anti-ovipositional effect of neem oil against maize weevil. Neem seed kernel extracts inhibited growth and development of gypsy moth, *Lymantria dispar* L. larvae (Shapiro *et al.*, 1994).

White flies: All the insecticidal combinations and the neem extracts applied at recomended doses gave an excellent results which were highly statistically significant ($P < 0.01$) to that of the control (Table 2). Insecticidal combinations as compared to neem extracts were ahead in their percent efficacy; as Baythroid-TM., Polytrin-C., Decis-D, and neem extracts (ethanol, water, chloroform, and hexane) gave 96.0, 95.0, 98.0, 90.8, 80.8, 83.0, and 83.8%, respectively, mortality of the test insect. Although, there was a gradual decrease in the effectiveness of the insecticidal combinations and the neem extracts, they significantly reduced the test insect infetation up to 17 days after spray as compared to the control. The trend of gradual decrease in percent efficacy and residual toxicity of the insecticidal combinations and neem extracts remained almost the same in all the four sprays. Overall the insecticidal combinations proved to be more toxic and showed longer residual effect than the neem extracts against whiteflies on cotton.

Meisner and Nemny (1993) found that Margoson-0 at the rate of 0.1-0.4mg a. i. (azadirachtin) caused ca. 70% mortality of

the *Spodoptera lattoralis* larvae up to pupation when applied topically on cotton seedling. Pyrethroids (nurelle and ripcor) and organophophates (larsban and azodrin) used in combonations were more effective in reducing the population of bollworms then they were used alone (Munshi *et al.*, 1991). Khalid and Watson (1983) found that dimilin + curacron and dimilin + sumicidin significantly controlled aphids, white flies and spider mites on cotton.

Table 3: Effect of the insecticidal combinations and neem extracts on the yield (kg/hectare) of cotton

Treatment	Yield
Insecticidal combinations	
Polytrin-C. 440 EC	1818A
Decis-D. 12.5 + 300 EC	1822A
Baythroid-TM. 525 EC	1915A
Neem Extracts	
Ehtanol	1693AB
Water	1289D
Chloroform	1407CD
Hexane	1544BC
Control	0924E

Each value is a mean of 3 replications. Means followed by the same letters are not sgnificantly different at $\alpha = 0.01$.

Effect of the insecticidal combinations and neem extracts on the yield of cotton: Cotton treated with the insecticidal combinations and neem extracts gave significantly ($P < 0.01$) higher yield compared to that of untreated cotton (Table 3). Although, Baythroid-TM showed a better positive effect on the yield of cotton as compared to the other insecticidal combinations and neem extracts, it was not significantly different ($P = 0.01$) to Decis-D and Polytrin-C.

Reddy and Rao (1993) found that cotton seed yield was increased when cotton was treated with mineral oil, nicotin sulphate and neem oil for the control of white flies, aphids and bollworms. Endsulfan at 0.06% gave better results than neem oil at 0.05% against bollworms on cotton. Maximum yield was observed in cotton treated with fish oil and nicotin sulphate against jassid, aphids and cicadellids (Path *et al.*, 1993).

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