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STUDIES ON COMPARATIVE EFFICACY OF DIFFERENT INSECTICIDES USED AGAINST COTTON THRIPS

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ABSTRACT

The results of the studies on comparative efficacy of different insecticides used against cotton thrips thus obtained are summarized as under:

The insecticides caused appreciable reduction of the thrips by about 66.9 to 80.5 % that were attacking the cotton crop, while in the control (no treatment) plots the thrips population increased by about 19.5 %.

All the insecticides had shown a good kill of the pest upto first to three days after their spraying; however two insecticides Thiodan and Zolone D.T. had shown a persistant effect upto 14 days after spraying.

Thiodan caused the highest reduction of the pest population 89.5 %. It was followed by Zolone D.T., Azodrin and Nuvacron causing reduction of 76.8 to 66.9 per cent respectively.

At first spraying, Azodrin and Nuvacron both as monocrotophos showed persistant effect upto 14 days, registering about 84.0, 82.9, 30.5 and 87.7 and 83.3, 82.9, 90.5 and 87.7% reduction in the pest population respectively for one, three, seven and fourteen days after spraying. But at the second spraying both insecticides showed that 94.5, 76.3, 45.8, and 8.9 and 8.70, 70.1, 34.5 and 1.1% reduction of the pest population respectively for one, three, seven and fourteen days after the spraying.

At first spraying, Thiodan initiated reduction of 84.5% of the pest on one day and persisted to be 77.6% 14 th days after the treatment. Similarly, Zolone D.T. was a little less than Thiodan showing initial reduction of 83.6 and the highly less effective 39.5%, at 14 days after spraying, than Thiodan showing the pest reduction to 66.7 %.

PAMUK THRİPS'LERİNE KARŞI KULLANILAN FARKLI İNSEKTİSİTLERİN KARŞILAŞTIRMALI ETKİLERİ ÜZERİNDE ARAŞTIRMALAR

ÖZET

Pamuk Thrips'lerine karşı kullanılan farklı insektisitlerin karşılaştırmalı etkileriyle ilgili araştırma bulguları aşağıdaki gibi özetlenmiştir.

İnsektisitler pamuk bitkilerine zarar veren thripsler'de yaklaşık % 66.9-80.5'lik bir azalmaya yol açmıştır. Buna karşılık insektisit uygulanmayan kontrollar'da thrips populasyonu yaklaşık % 19.5 artmıştır.

Tüm insektisitler uygulandıktan sonra ilk gün ile üçüncü güne kadar öldürücü etkilerini korumuşlardır. Buna karşılık insektisitler'den Thiodan ve Zolone D.T. uygulandıktan sonra 14 gün boyunca öldürücü etkilerini korumuşlardır.

Thiodan, % 89.5 ile zararlı populasyon'da en fazla azalmaya yol açmıştır. Bunu zararlı populasyon'da sırasıyla % 76.8 ile 66.9'luk bir azalmaya yol açan Zolone D.T. Azodrin ve Nuvacron takip etmiştir.

İlk püskürtmede hem Azodrin ve hemde Nuvacron, monokrotofas olarak 14 gün boyunca sürekli etkiye sahip olmuş ve püskürtmeyi takiben bir, üç, yedi ve dördüncü günlerde zararlı populasyonun'da sırasıyla yaklaşık % 84.0, 82.9, 30.5 ve 87.7 ile % 83.3, 82.9, 90.5 ve 87.7'lik bir azalmya yol açmışlardır. Ancak ikinci püskürtmede her iki insektisit'de püskürtmeyi takiben bir, üç, yedi ve dördüncü günlerde zararlı populasyonun'da sırasıyla % 94.5, 76.3, 45.8 ve 8.9 ile % 8.7, 70.1 34.5 ve 1.1 lik bir azalmaya yol amışlardır.

İlk püskürtmede Thiodan bir günde zararlı populasyonun'da % 84.5'lik bir azalmaya yol açmış ve püskürtmeyi takiben 14. günde etkisini % 77.6 olarak sürdürmüştür. Benzer şekilde Zolone D.T, Thiodan'a kıyasla biraz daha az etkide bulunmuş ve zararlı populasyonun'da başlangıç olarak % 83.6'lık bir azalmaya yol açmıştır. Zolone D.T. püskürtmeden sonraki 14 günde zararlı populasyonun'da % 66.7'lik azalmaya yol açan Thiodan'a kıyasla % 39.5 ile çok daha az bir etki göstermiştir.

INTRODUCTION

Cotton is a silver fiber crop of Pakistan and plays a very significant role in its economy, being major source of the country's foreign exchange earnings.

In the last one and half decades, the yield per hectare as well as total cotton production in Pakistan has almost doubled but as compared to the yields obtained by other major cotton growing countries of the wold, our yields are still low. One of the vital factors responsible for low yields is the quantum of damage caused by insect pests, since this crop is highly susceptible to a variety of insects.

In Pakistan, as many as 148 insect pests have been found causing a considerable damage to this crop, and out of them about one dozen species are considred as key or major pests

which inflict severe economic losses to the cotton growers (1) and (2). Crammer (3), Bindra (4). Naqvi (2), have respectively reported the losses about 14.05, 37.5, and 30 to 40 per cent of the cotton production due to pest attack in the developing countries of Asia and other continents, where insecticides are not used.

The insect pest of cotton may be grouped under sucking and chewing complex. Thrips, thrips tabaci Lind. and Scrotothripsp. and jassids.

Amrasca devastaus Dist. are the most important pest including in the sucking complex which cause substantial to heavy damage to the crop.

The thrips have been found damaging many crops in the world, but it has establihed itself as a very serious pest of cotton. They appear on the crop at a very early seedling stage and infects young foliage and continue to be present on the upper most succulent leaves and later they are found infesting the floral parts of the plant.

For controlling the pest, use of insecticides is one of the quickest and most effective measures. The spraying of insecticides has increased the yield of seedcotton from 500 to 1000 kilograms and even upto 3000 kilograms per hectare in well managed areas. The proportion of stained and damaged cotton lint has been appreciably reduced (5) and (6).

Keeping in view the damage caused by insect pests especially thrips, this experiment was conducted in the field to evaluate some commonly used insecticides namely; Nuvacron, Azodrine, Zolone D.T. and Thiodan to control the thrips. So the object of this study was to tet the relative toxicity and persistence of these insecticides under field conditions.

MATERIAL AND METHODS

The studies were under taken to determine the comparative efficacy of different insecticides against cotton thrips. The experiment was laid out in a randomized complete block design with four replications. There were five treatments including a control. The plot size was 30 square meters (5 m x 6 m). The plots were separated from one another by leaving a one and half meter gap on all the sides as buffer zone or partition. The two outer rows and one meter at each end of the four central rows were left as buffer, and only four meter long central rows were kept for recording observations. The seed of the standart cotton variety Qalandri was planted in uniformly spaced rows on May 27 th and 21 st of 1990 and 1991 with the help of a single row cotton seed drill. The rows were spaced at 75 cm apart and thinning was done 15 days after germinating the seed. The distance between plant to plant was kept at about 60 thousand plants per hectare. The experimental area received the normal recommended doses of nitrogenous and phosphatic fertilizers. All the phosphorus (50 kilograms per hectare) was applied at the time of sowing together with one third portion of nitrogen (75 kilograms per hectare). The second portion of 25 kgs Nitrogen per hectare was applied at the time of first irrigation and the remaining one-third portion (25 kilograms of nitrogen per hectare) at the time of second irrigation when the crop was in profase flowe-

ring condition. The first irrigation was applied 25 days after sowing and subsequently seven irrigations were given at fortnightly intervals. The first interculturing was done a week after first irrigation (42 days after planting) followed by two weeding after second and third irrigations.

The four insecticides were sprayed twice, firstly 40 days after sowing and subsequently 2 nd spray was done after 22 days of interval. The pest population had again builtup. Both the first and second spraying operations were done in the early morning hours on clean and clear days to avoid wind drift and hot-mid-day temperatures. The four insecticides and their solutions used per spray per plot, were as under:

Symbol Trade Name	Chemical name	Dose per Hec.	Acre	Plot
T1 Nuvacron 40 E.C.	Monocrotophos	2.471 lit.	1 lit.	3.61 ml.
T2 Azodrin 40 E.C.	Monocrotophos	2.471 lit.	1 lit	3.61 ml.
T3 Zolone D.T. 41. 5E.C	Phosalone	7.413 lit	3 lit	8.59 ml.
T4 Thiodan 35 E.C.	Endosulfan	3.089 lit	1.25 lit	4.91 ml.
T5 Control	No insecticide is applicable.			

An eight litre capacity knap-sack compression type had sprayer namely PIR was used in all the spraying operations. After spraying of one insecticides the tank was thoroughly cleaned and rinsed with clean water and re-revised with the spray solution of the next insecticides which was to follow.

For each application of the insecticide, pre-treatment counts of thrips were recorded on five plants which randomly selected from the four central expermental rows per-treatment per replication. From each selected plant five leaves were tagged, one at its top, and two each at middle and bottom portions. Moiz and Naqvi (7) found this methodology to be the most dependable. While recording the pest population counts care was taken not to disturb the insect during the counting. All the observations were made on both the surface labelled leaves and both the nymphal and adult stages of the insect were including in the count. The pest population counts were made in the morning hours on all the counting dates. The post-treatment observations were recorded after one day (24 hours) three days, one week and two weeks after each insecn-ticidal application.

The pest population count of 2 nd week after first spray was considered as pre-treatment count for the second spray.

The population reduction percentage of all post-treatment observations have been worked out from the figures of the pre-treatment by using the ABBOT formula.

The reduction prcentages so computed have been subjected to analysis of variance ac-

cording to the design of the experiment. The significance of the population reduction percentages under the respective insecticides have been determined by the applicating of LSD (least significant difference) figures both at 5 and 1 per cent levels.

RESULTS AND DISCUSSION

The results of the thrip mortality both the nymphs and adults due to insecticidal treatments, and their record at different intervals after treatment have been computed to population reduction percentages basing those on the pre and post-treatment observations on the pest population cont. The results have been presented in the Tables 1 to 6.

Since the insecticides were sprayed twice, so the results of the two sprayings for 1, 3, 7 and 14 days after their individual treatment have been consolidated.

Table 1: Population reduction percentages of cotton thrips one day after each spraying.

Treatment	Sprayings			Average
	First	Second	Total	
T1	83.29**	86.98**	170.27	85.14
T2	83.99	94.51	178.50	89.25
T3	83.59	96.90	180.49	90.25
T4	84.54	92.44	176.98	88.49
T5	-53.74	-34.00	-87.74	-43.87

** Significant at 1% level

It may be observed from table 1 that one day (24 hours) after both sprayings the highest average pest population reduction percentage was 90.25 in T3 treatment. This was followed by T2 (89.25), T4 (88.49), and T1 (85.14), but the differences between them were not statistically significant although all the insecticide used gave very high significant performances than the check treatment. Secondly, it may be further seen from table 1 that the results of T2 (Azodrin)/ and T4 (Thiodan) are very close and could be considered to have the same position in the order of performances of the insecticides. Thirdly, all the insecticides gave better performance of second spray that the first one in terms of greater population reduction percentages.

From the data presented in table 2, it could be seen that the highest average population reduction percentage of 87.38 was recorded in T4 and followed by T3, (84.74), T2 (79.61) and T1 (77.13) respectively although the differences between them were not significant. All the insecticides gave very highly. Significant and control of the pest. The table also would indicate that T3 (Zolone D.T.) and T4 (Thiodan) have remained presistantly more effective than the other two insecticides (after three days of their application) in controlling the pest. However, Thiodan could be seen better effective insecticide than Zolone D.T.

Table 2: Population reducton percentages of cotton thrips three days after each spraying.

Treatment	Sprayings			Average
	First	Second	Total	
T1	84.14**	70.23512**	154.26	77.13
T2	82.94	76.28	159.22	79.61
T3	81.17	88.30	169.47	84.74
T4	83.47	91.29	174.76	87.38
T5	-59.14	-26.43	-85.57	-42.79

** Significant at 1% level

Table 3: Population reduction percentages of cotton Thrips seven days after each spraying.

Treatment	Sprayings			Average
	First	Second	Total	
T1	87.09	34.54	121.63	60.82
T2	80.53	45.79	126.32	63.16
T3	80.97	67.24	148.21	74.11
T4	77.96	75.21	153.17	76.59
T5	40.11	-33.91	6.20	3.10

The data presented in table 3 would reveal that T4 (Thodan) again gave the best and more persistant effect in the control of the pest even after one week, recording 76.59% kill of the pest. This was closely followed by T3 (Zolone D.T.) with a percentage kill of 74.11. The lowest reduction percentage (60.82) was furnished by T1 (Nuvacron). It seems some what mysterious that both the insecticids, Nuvacron and Azodrin, possessing monocrotophos as an active ingredient had shown poor performance in the second spraying, when the results of one week performance of the both sprayings are viewed together. It may, however be observed that all the insecticides gave significantly, superior performance to the control, but the differences between their effectiveness were not statistically significant.

Table 4: Population reduction percentage of cotton thrips 14 days after each sprayings.

Treatment	Sprayings			Average
	First	Second	Total	
T1	88.05*	1.09 N.S.	89.14	44.57
T2	87.67	8.96	96.63	48.32
T3	76.73	39.50	116.23	58.12
T4	77.67	61.66	139.29	69.65
T5	63.09	-52.25	10.84	5.42

* Significant at a 5% level

It may be observed from table 4 that 14 days after the second spraying, the average pest population reduction percentage was again the highest (69.65) in case of T4 (Thiodan). This was followed in order of effectiveness and presistency by T3 (58. 12), T_2 (48.32) and T_1 (44.57) being the lowest pest population reduction. Although all the insecticides gave significantly superior results to the control, the differences amongst themselves, even 14 days after spraying were not statitically significant.

Furthermore, the results obtained 14 days after the first spraying, table 4 would show that Nuvacron was slightly superior to all the other insectcides, but in the second spraying it had the least highly non-significantly persistance effect. In order to assess and compare the table performance or the persistance effect of different insecticides, their results of the population reduction at all the intervals of observations after first spraying (one day three days, seven days and fourteen days) have been consolidated and presented in table 5 and have been subjected to statistical analysis of variance.

Table 5: Total performance of insecticides against cotton thrips after first spraying.

Treatment	Population reduction percntages at different intervals in days				Average
	One	Three	Seven	Fourteen	
T1	83.29	84.14	87.09	88.05	85.64**
T2	83.99	82.94	80.53	87.67	83.78
T3	83.59	81.17	80.97	76.73	80.61
T4	84.54	83.47	77.96	77.63	80.90
T5	-53.74	-59.14	-40.11	63.09	-22.47
Avarage:	56.33	54.51	57.29	78.63	

* Significant at a 1 % level

The examination of table 5 would shows that the thrips highest average population reduction percentage was obtained with the application of T1 (85.64). This was followed by T2, (83.78), T4 (80.90) and T3 (80.61). But the differences in the pest population reduction among the insecticides were not statistically significant. However, all the insecticides gave superior performance to the control which was statistically significantly lowest as per application of LSD value at 1% level. On comparing the results of different intervals (table-5) it was observed that the variations in all the average population reduction percentages for one day, three days, seven days and fourteen days intervals were statistically non-significant. However, a little more reduction in T5, the control showing natural death of the thrips.

Similarly, the data of second spraying of the pest population reduction at one day, three days, seven days, and fourteen days itervals have been consolidated, presented in table 6 and that has been subjected to the statistical analysis of variance.

Table 6: Total performance of insecticides against cotton thrips after second spraying.

Treatment	Population reduction percentage at different intervals in days				Average
	One	Three	Seven	Fourteen	
T1	86.98	70.12	34.54	1.09	48.18
T2	94.51	76.28	45.79	8.96	56.38
T3	96.90	88.30	67.24	39.50	72.98
T4	92.44	92.29	75.21	61.66	80.15
T5	-34.00	-26.43	-33.91	-52.25	-36.65
Avarage:	67.39	59.91	37.77	11.79**	

* Significant at a 1 % level

Tablo 6 presenting the total performance of different insectcides at ther second spraying, would show that the variations in the effect of all the insecticides were statistically significant. T4 gave the most persistant highest average population reduction percentages at all the intervals, averaging to 80.15 and it was nearly significantly different by T3 (72.98), followed by T2 (56.38). Further, it could be observedt that all the insecticides differed highly significantly from the control. The population reduction percentages averaged for all the four intervals, table 6, would show that they were statistically different. The highest average population percentage 65.36 was recorded at one day post treatment following by three days (59.91), seven days (37.77) and fourteen days (11.79) post-treatment respectively.

These findings in some or other way are in agreement of the following workers.

Rathore et al (8) evaluated some insecticides for controlling T. tabaci attack on cotton. He reported that the insecticides giving the best results upto 10 days after spraying were endrin, carbarly, monorotophos (Nuvacron) and dimethoate in that order. All these insecticides has lost their effectiveness 20 days after their application.

Stankovaç et al (9) evaluated six insecticides for their comparative effectiveness in controlling T. tabaci on cotton. The most effective control was provided by monocrotophos (Azodrin) which gave complete kill of both the nymphs and the adults five days after the treatment and the effect lasted upto 15 days. This was followed by dicrotophas (Bidrin) and endosulfan (Thiodan) and others. Zolone D.T. was the least effective.

Naqvi (10) carried out an experiment on the control of cotton thrips with eight insecticides and reported that dicrotophos (Bidrin) gave the best results, followed by monocrotophos (Azodrin), endsulfan (Thiodan) Zolona D.T. and others. In another trial conducted by him with dicrotophos (Bidrin) monocrotophos (Nuvacron), azinphos-methyl (Gusathion), cyanophenphos (cyanox), Ambithion and phenthoate (cidial). Bidrin was again found to be the best in controlling thrips. This was followed by Nuvacron, Gusathion and Cyanox.

Kemel et al. (11) tested some newer insecticides against T. tabaci attacking cotton in Bani-suef province of Eqypt and reported that the insecticides showed good persistant effect upto 15 to 20 days, folimate 8496 (of unstated composition) being the best and most effective among the four insecticides sprayed. In order of effectiveness it was followed by Nuvacron, Phosphamidan and Zolone D.T.

Sundara Muothi and Ramakrishan (12) studied the effectiveness of spray of seven organo phosphorus insecticides against thrips in India. As judged by the reduction in pest population 0.025 percent monocrotophos (Nuvacron) was the best treatment, followed by 0.025 per cent dimethioate (B1 85) Phosphamidan (Dimacron) and formothion (Anthio).

At Tandojam, Nizmani (13) tested phosphamidan (Dimecron), formothian (Anthio), monocrotophos (Azodrine) and Zolone D.T. in June, July and August against insect pests of cotton. He found phosphamidan to be the most effective in controlling thrips. It reduced the pest population upto 100 per cent by the third day and had a persistant effect upto one week. Formation and monocrotophos gave 79.1 and 92.5 per cent reductions of thrips populations respectively at three days interval and their effectiveness tested upto 20 days. Zolone D.T. was the least effective among the insecticide used.

Sindhu and Dhawan (14) reported that in field tests on small plots sprayed with eleven insecticides and examined two days after treament, monocrotophos (Nuvacron) at 0.5 kg toxcacant (active ingredient) per hectare proved to be significantly superior (95.3%) mortality to quinalphos and endosulfan at 0.5 kg, which were themselves superior to the remaining insecticdes used. Seven days after application, monocrotophos (82.9 %) mortality was still significantly superior to other insecticides but 14 days later it was slightly but not significantly inferior (70.8% mortality) and the rest of the insecticides viz, phethoate, quinalphus and dimenthoate, which showed similar results with no significant differences among

them. The least effective insecticides were malathion and carbaryl. It was conducted that the monocrotophos gave the best control of T. tabaci followed by endosulfan and quinalphos.

Any how if there is an variation, which might be due to environmental condition or any error in recording and calculating the data.

Summing up the overall performance of all the insecticides the results of their first and second sprayings for all the four intervals presented in table 1 to 4 have been consolidated and presented in table 7.

Table 7: Overall performance of both spraying of the insecticides against thrips attacking cotton crop.

Treatmet	Population reduction percentage at different intervals in days				Performance population reduction %	
	One	Three	Seven	Fourteen	Total	Average
T1	85.14	77.13	60.82	44.57	276.66	66.91
T2	89.25	79.61	63.16	48.32	280.34	70.08
T3	90.25	84.74	74.11	58.12	307.22	76.80
T4	88.49	87.38	76.59	69.65	322.11	80.52
T5	-43.87	-42.79	3.10	5.42	---	---

The glance of table 7 would reveal that T4 had almost persistantly controlled thrips. It was followed by T3. On the first day after treatment T3 had shown a little more reduction 90.25% in the population but that was just close to T2 (89.25%) and T4 (88.49%). T2 was better than its contemporary stock insecticides T1. However, the control plots of cotton had always suffered the attack of the thrips.

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