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# LABORATORY EVALUATION OF TETRADIFON AGAINST THE TWO-SPOTTED SPIDER MITE, *TETRANYCHUS ARABICUS* ATTIAH.

**N. G. ISKANDER AND MAGDA K. MEGALI**

*Plant Protection Research Institute , Agricultural Research Centre, Dokki, Egypt.*

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***Abstract***

The efficacy of tetradifon at 80 and 160ppm was very high on eggs, larvae and nymphs of *Tetranychus arabicus* Attiah. Tetradifon caused prolongation in duration of active and quiescent stages followed by death.

Treated deutonymphs at 80ppm were less affected and 45.71% individuals completed their life-cycle. Tetradifon greatly affected the longevity and fecundity of *T. arabicus* adult female.

## INTRODUCTION

After the wide application of orgainc pesticides, *T. arabicus* has become of great economic importance. It infests many crops and causes great damage resulting in adversely affected growth and loss of yield and quality. If timely action is not taken the plants can be badly injured.

Many authors reported that tetradifon is very effeictive on eggs and immature stages of *Tetranychus* spp. (Henneberry *et al* ., 1960; Mialloux and Morrison, 1962; El-Dahan, 1972; Mohamed *et al.*, 1977 and El-Halawany and Kandeel , 1981). El-Halawany (1980) reported that tetradifon had the least toxic effect on the egg stage of the predatory mite *Euseius scutalis* (Athias-Henriot) (= *Amblyseius gossipi* El-Badry).

The aim of the present work is to evaluate the efficiency of tetradifon on eggs, immature stages and adult females of *T. arabicus* which is considered one of the most impotant phytophagous mites infesting many crops in Egypt.

## MATERIALS AND METHODS

The effect of tetradifon 8% (4-chlorophenyl-2, 4, 5-trichlorophenyl sulfone) was tested against egg and the immature stages of *T.arabicus* larva , protonymph and deutonymph. The tests were extended to include the developmental stages resulting from treated adult females. The effect of tetradifon on females' oviposition period, fecundity and hatchability of deposited eggs was also studied.

Adult females of *T. arabicus* were reared on potato leaves kept under controlled conditions in an incubator held at 23±2°C and 65 ±5% relative humidity.

The effect of tetradifon on eggs laid by treated females was studied by spraying adult females of *T. arabicus* kept on the lower surface of sweet potato leaf discs, by 160ppm and 80ppm (half the recommended dose ) of the aqueous dilution of tetradifon using a manual atomizer. After 24h, the females were removed, and deposited eggs were counted. Other females were sprayed by water only representing the control. Each hatched larva was transferred to a disc of potato leaf (2cm in diameter) placed on moistened cotton wool in Petri-dishes.

For other experiments , eggs of 24h-old from unsprayed females were treated by direct spraying as previously mentioned. For testing larva, proto- and deutonymph, newly hatched individuals of these stages were sprayed then left singly on potato- leaf discs to examine mortality percentage and duration of developmental periods.

Twenty five newly hatched females were also treated to determine the effect of tetradifon on the pre-oviposition, oviposition and post-oviposition periods, as well as its effect on the number of deposited eggs and percentage of hatchability . The females were reared singly as mentioned before.

All the experiments were incubated at 23 ± 2°C and 65+5% R. H. Inspection of treatments was carried out twice daily and the data were statistically analyzed.

## RESULTS AND DISCUSSION

### Effect of tetradifon on duration of the immature stages

Table 1 indicates the effect of applying tetradifon at 80 ppm on the different immature stages of *T. arabicus*. The mortality percentage of newly hatched larvae was more highly affected than that produced from eggs of treated females and 24 h-old eggs. The percentages of mortality in individuals reached 80.95 in the first case and 40.0 and 31.25 in the two latter cases, respectively. All larvae produced from the three previous cases were unable to come out from the first quiescent stage, in which the mortality percentages reached 100% . The same concentration was less effective on the newly hatched protonymphs and deutonymphs. In case of protonymphs, 9 out of 40 individuals reached the adult stage (survival percentage 22.50) , while 16 out of 35 individuals (survival percentage 45.71) reached the adult stage in case of deutonymphs.

The prolongation of quiescent stages before complete mortality was clearly observed in all cases. The mean durations of the first quiescent stage of larvae hatching from eggs laid by treated females as well as those resulting from treated 24h-old eggs and newly hatched larvae reached 2.75±1.03 and 2.92±0.86 days compared with 1.04±0.38 days for the control. The 3rd quiescent stage of both newly hatched protonymph to deutonymph was 2.11±0.48 and 2.28+0.58 days, respectively compared with 0.96±0.14 days for the control. Concerning the active stage of the different cases, they increased in comparison with the control averaging 1.82+0.24 and 2.81+0.70 days compared with 0.98±0.1 and 1.28±0.25 days for the control.

By increasing the concentration of tetradifon to 160ppm (Table 2), all active larval stage hatched from eggs of treated females, 24h-old eggs and newly hatched larvae failed to come out from the first quiescent stage as mortality percentage reached 100% in all cases. At this concentration, newly hatched protonymph did not succeed to reach the adult stage as mortality percentage was 100% after the second quiescent stage.

The newly hatched deutonymph was also highly affected by treatment with the concentration, in which two individuals out of 20 deutonymphs reached the adult

Table 1. Effect of tetradifon (80 ppm) on *T. arabicus* developmental periods (days) and mortality percentages

| Stage | Larva | Mortality % | 1st quiescence | Mortality % | Protonymph | Mortality % | 2nd quiescence | Mortality % | Deutonymph | Mortality % | 3rd quiescence | Mortality % | No. of adults | % of survivals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Treated females eggs | 2.10 ±0.34 (15ind.) | 10.00 | 2.92 ±0.86 | 100 | -- | --- | -- | -- | -- | -- | -- | -- | -- | -- |
| 24 h-old eggs | 2.22 ± 0.44 (32 in.) | 31.25 | 2.85 ± 0.34 | 100 | -- | --- | -- | -- | -- | -- | -- | -- | -- | -- |
| Newly hatched larvae | 2.26 ± 0.58 (42ind.) | 80.95 | 2.75 ± 1.03 | 100 | -- | --- | -- | -- | -- | -- | -- | -- | -- | -- |
| Newly hatched protonymphs | --- | -- | --- | --- | 67.50 | 67.50 | 2.69 ±0.52 | 77.50 | 2.72 ±0.26 | 77.50 | 2.11 ±0.48 | 77.50 | 9 o | 22.50 |
| Newly hatched deutonymphs | --- | -- | --- | --- | --- | --- | --- | --- | 2.81 ±0.70 (35ind.) | 54.29 | 2.28 ±0.58 | 54.29 | 16 o | 45.71 |
| Control | 1.22 ± 0.25 (25ind.) | 0 | 1.04 ± 0.38 | 0 | 0.98 ±0.1 | 0 | 0.26 ±0.21 | 0 | 1.28 ±0.25 | 0 | 0.96 ±0.14 | 0 | 19 o,6 o | 100 |

Table 2. Effect of tetradifon (160 ppm) on *T. arabicus* developmental periods (days) and mortality percentages.

| Stage | Larva | Mortality % | 1st quiescence | Mortality % | Protonymph | Mortality % | 2nd quiescence | Mortality % | Deutonymph | Mortality % | 3rd quiescence | Mortality % | No. of adults | % of survivals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Treated females eggs | 2.44 ±0.45 (18ind.) | 22.27 | 3.44 ±0.56 | 100 | -- | --- | -- | -- | -- | -- | -- | -- | -- | -- |
| 24 h-old eggs | 2.58 ± 0.51 (23ind.) | 52.17 | 3.25 ± 0.65 | 100 | -- | --- | -- | -- | -- | -- | -- | -- | -- | -- |
| Newly hatched larvae | 2.45 ± 0.42 (40ind.) | 87.50 | 3.60 ± 0.43 | 100 | -- | --- | -- | -- | -- | -- | -- | -- | -- | -- |
| Newly hatched protonymphs | --- | -- | --- | --- | 1.93 +0.65 (14ind.) | 85.14 | 3.75 ±0.35 | 100 | -- | -- | -- | -- | -- | -- |
| Newly hatched deutonymphs | --- | -- | --- | --- | --- | --- | --- | --- | 2.94 ±0.42 (27ind.) | 81.48 | 2.60 ±0.42 | 92.59 | 2 | 7.41 |
| Control | 1.22 ± 0.25 (25ind.) | 0 | 1.04 ± 0.38 | 0 | 0.98 ±0.1 | 0 | 0.26 ±0.21 | 0 | 1.28 ±0.25 | 0 | 0.96 ±0.14 | 0 | 19 o,6 o | 100 |

stage (Survival per-centage 7.41%).

Prolongation of the quiescent stage before complete mortality was observed in all previous cases. In case of the first quiescent stage of larvae hatching from eggs of treated females, 24h and newly hatched larvae ranged from 3.25±0.65 to 3.60±0.43 days compared with 1.04±0.38 days for the control . The duration of the second quiescent stage of newly hatched protonymph was 1.93± 0.65 compared with 0.98 ±0.1 days for control. The third quiescent stage of newly hatched deutonymph was 2.60± 0.42 days compared with 0.96 ±0.14 days for the control . Prolongation in the duration of the active stage of all cases was highly affected in comparison with the control.

In general tetradifon at 80 and 160 ppm, was very effective on eggs larvae and nymphs of *T. arabicus*. It caused prolongation in duration of both active and quiescent stages due to the failure of the cuticle to fully develop during the quiescent stage leading to the death of individuals . The obtained data agree with those of Henneberry *et al.*, ( 1960), Mailloux and Morrison (1962), El-Dahan (1972), Mohamed *et al.*, (1977) and El-Halawany and Kandeel (1981).

## Effect of tetradifon ( 80ppm) on longevity and fecundity of adult female

As indicated in Table 3, the pre-oviposition period was prolonged in treated females reaching 2.75 ± 1.18 days, while it was 1.23 ± 0.25 day in the control. The oviposition period decreased to 6.38 + 2.60 days compared with 12.80 ± 2.56 days for control. The short oviposition period resulted in marked deficiency in number of

Table 3. Oviposition periods , hatchability of eggs and fecundity of females of *T. arabicus* treated with tetradifon at 80 ppm

| Biological aspects | Treated femal (25 individuals) | Control (25 individuals) |
|---|---|---|
| Pre-oviposition period (days) | 2.75 ± 1.18 | 1.23 ± 0.25 |
| Oviposition period (days) | 6.38 ± 2.60 | 12.80 ± 2.56 |
| Post - oviposition period (days) | 1.35 ± 0.38 | 1.94 ± 0.51 |
| Eggs deposited per female | 15.71 ± 7.32 | 86.95 ± 13.60 |
| Incubation period (days) | 6.33 ± 0.49 | 4.06 ± 0.91 |
| % Hatchability | 13.50 | 93.40 |

deposited eggs by treated adults. Average female layed 15.71 ± 7.32 eggs, compared with 86.95 ± 13.60 eggs in the control . The incubation period of eggs deposited by treated females was prolonged to 6.33 + 0.49 days compared with 4.06 ± 0.91 days in the control . Hatchability percentage decreased to 13.50 % compared to 93.40% in the control.

It could be concluded that tetradifon ( 80ppm) had greatly affected the longevity and fecundity of *T. arabicus*. These results are in conformity with the findings of Henneberry et al ., ( 1961) who reported that Tedion had obvious effect on eggs of different ages and larvae of three strains of *Tetranychus telarius* (L.). However, a high percentage of hatched larvae were killed. Mialoux and Morrison ( 1962) indicated that Tedion, Ovex and Chlorobenzilate were effective against immature stages but poor against aduits. Also Tedion had a very long lasting residual action against eggs.

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# تقييم معملي لمركب tetradifon ضد العنكبوت الأحمر العادي ذو البقعتين *Tetranychus arabicus Attiah*

نبيل جورج اسكندر ، ماجدة خله مجلي

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي

تم في هذا البحث دراسة تأثير مركب الـ tetradifon معملياً بتركيزات ٨٠. ١٦٠ جزء في المليون والتي تمثل نصف الجرعة والجرعة الكاملة الموصي باستخدامها في الحقل علي أكاروس العنكبوت الأحمر ذو البقعتين *Tetranychus arabicus Attiah* . ووجد أن المركب قد أثر بشكل ملحوظ علي البيض واليرقات والحوريات، وقد أطال مرحلتي النشاط والسكون . كما تسبب أيضا في تثبيط عمليه الانسلاخ للأفراد الساكنة مما ترتب عليه موت الأفراد.

ومن جهة أخري فقد وجد أن معاملة الحورية الثانية بتركيز ٨٠جزء في المليون كان أقل تأثيراً عن التركيز ١٦٠ جزء في المليون ولقد أظهرت النتائج أن المعاملة بمركب الـ tetradifon كان لها تأثير ملحوظ علي فترة حياة الأنثي وكمية البيض الموضوعة .