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EFFECT OF INFESTATION WITH *TETRANYCHUS ARABICUS* (ATTIAH) AND PESTICIDAL TREATMENT ON DATURA PLANT.

M.A. DARWISH AND N.G. ISKANDER

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

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Abstract

The effect of some tested acaricides (Tedifol, Kelthane and Peropal) on *Tetranychus arabicus* Attiah infesting *Datura tatula* plant inidcated that Tedifol was very effective against the moving stages of the mite either in early, medium or late infestations followed by Kelthane and Peropal.

The effect of infestation and the three acaricidal treatments on the vegetative growth of Datura (plant height, number of branches / plant, number of leaves/plant, the leaf area, fresh weight, dry weight, chlorophyll A&B and alkaloid content), showed that all these criteria increased regularly by decreasing infestation Reduction of such criteria was more pronounced in early infestation than in medium or late infestations.

INTRODUCTION

The medicinal and aromatic plants have relatively higher economic values compared with the other field crops. Datura plant is one of the most important medicinal plants , because it contains many important alkaloids such as hyoscyamine , hyoscine and atropine (Sabah; 1984. Sawires, and El-Halawany, 1989; Darwish, 1990).

The spider mite, *T. arabicus* is considered one of the most important pests infesting Datura plant and affect their active components.

The aim of the present work is to investigate the effect of some acaricides against the mite *Tetranychus arabicus* infesting datura plant, the effect of infestation on the vegetative growth of the plant, and on some chemical components. The impact of infestation on yield was also studied.

MATERIALS AND METHODS

Infestation with *T.arabicus*

Planting of *Datura tatula* seeds was carried out in clean pots of 25 cm in diameter. The pots were weekly irrigated. The pots were divided into 4 groups. The first was infested with mites after 45 days from planting, the second after 75 days, the third after 105 days and the fourth (40 replicates) was left without infestation and served as a control. In treatments, each leaf was infested with 4 mite individuals (one male + 3 females) and each treatment was replicated 40 times.

Effect of mite infestation on vegetative growth

Every month , plant height (cm), number of branches and leaves /plant and the leaf area (cm^2) were recorded for plants previously treated.

Effect of mite infestation on fresh and dry weight

Forty plants were weighed (dried leaves, stems, branches and flowering tops) and the average of fresh weight/plant (g) was obtained. By placing 40 plants for 24 h in an oven at 70°C , the dry weight /plant was obtained.

Chlorophyll concentration

Chlorophyll A and B and total chlorophyll content in 100g of fresh leaves (12-15 randomly collected) were determined according to the method of Van Wattstein (1957) . Acetone was used as a solvent and chlorophyll content was measured colorimetrically.

Alkaloid determination

Total alkaloids in the leaves were determined according to the standards of Anonymous (1968).

Acaricidal treatment

Three specific acaricides were chosen as follows :

1 - Tedifol, mixture of Dicofol 18.5% + Tetradifon 6% at the rate of 250cc /100l of water

2 - Kelthane EC (Dicofol 18.5 %) at the rate of 250 cc/100l of water

3 - Peropal WP (Azocycloten 25%) at the rate of 100g /100l of water.

The acaricides were used to suppress mite infestation to compare their efficacy on *T. arabicus* and to study their effect on the vegetative growth and some chemical components of *D. tatula* plants.

Acaricide concentrations were prepared. The 1st spray was applied 25 days after mite infestation, and the second after 46 days of infestation . Two groups of plants were set up, the first was left healthy without infestation and the other was early infested then left without acaricidal treatment.

Examination of leaves in order to count the moving stages took place before treatment and after 1,1006,7,14 and 21 days from treatment . The percentage reduction of mite population was calculated by Henderson and Tilton equation (1955).

RESULTS AND DISCUSSION

As shown in Table 1 , mite population increased gradually in the control reaching the peaks 11.9 , 11.2 and 11.3 individuals /cm^2 for early, medium and late infestation , respectively. Tedifol proved to be very efficient against the moving stages of *T. arabicus* infesting Datura plant at early, medium or late infestation recording the mean percentages of reduction in population 91.65, 91.75 and 92.30%, respectively. Peropal was the least effective, resulting in 69.29, 76.75 and 78.35% reduction of mite population in early, medium and late infestation treatments, respectively. Kelthane showed an intermediate effect and resulted in 83.97, 86.05 and 89.85% reduction at early, medium and late infestation, respectively.

As shown in Table 2, all the estimated criteria of the vegetative growth were negatively correlated with the days after infestation . The effect was more evident with early infestation regime than with medium and late infestation. In all estimated parameters, the magnitude of reduction was more pronounced in early infested

Table 1. *Tetranychus arabicus* counts on Datura tatula plant sprayed with acaricides.

Treatment		No. of moving stages/cm^2															Average % reduction
		1st spray							2nd spray								
		Before treatment	Days after application				Mean	% Reduction	Before treatment	Days after application				Mean	% Reduction		
			1	3	7	14	21				1	3	7	14	21			
Tedifol	E.	8.4	1.5	0.5	0.1	0.5	1.5	0.82	89.7	1.5	0.1	0.0	0.0	0.0	0.5	0.12	93.6	91.65
	M.	7.2	1.5	1.0	0.2	0.3	0.0	0.60	92.9	1.1	0.0	0.0	0.0	0.0	0.5	0.10	90.6	91.75
	L.	6.8	1.2	0.3	0.3	0.3	1.0	0.62	91.4	1.2	0.0	0.0	0.0	0.0	0.5	0.10	93.2	92.30
Kelthane	E.	8.5	2.0	0.5	1.0	1.0	2.0	1.30	83.9	2.0	0.1	0.1	0.2	0.5	1.0	0.40	84.0	83.97
	M.	7.3	1.9	0.6	0.5	1.0	2.0	1.20	86.1	2.2	0.5	0.0	0.0	0.0	1.0	0.30	86.0	86.05
	L.	6.5	1.5	0.5	0.3	0.2	1.5	0.80	88.4	1.7	0.0	0.0	0.0	0.4	0.5	0.10	91.3	89.85
Peropal	E.	8.6	3.0	2.0	2.0	2.0	3.0	2.40	70.5	3.0	1.0	0.5	1.0	1.5	2.0	1.20	68.0	69.29
	M.	7.5	2.5	2.0	0.5	1.0	3.2	1.80	79.7	3.3	1.5	0.4	0.3	0.5	1.5	0.80	73.8	76.75
	L.	6.6	2.6	2.1	1.2	1.5	3.0	2.00	70.5	3.2	1.0	0.0	0.2	0.5	1.0	0.50	86.2	78.35
Control	E.	9.5	9.5	9.0	8.0	9.0	9.5	9.00	-	9.5	9.5	10.0	12.0	13.0	15.0	11.9	-	-
	M.	8.0	7.8	7.0	9.0	10.5	11.0	9.40	-	11.5	11.0	10.0	10.0	12.0	13.0	11.2	-	-
	L.	7.5	7.5	7.6	7.7	8.5	8.8	8.00	-	9.2	9.5	9.8	10.2	12.2	15.0	11.3	-	-

E = Early artificial infestation.
M = Medium artificial infestation.
L = Late artificial infestation.

Table 2. Effect of artificial infestation with *T. arabicus* on the vegetative growth of *D. tatula* plants treated with acaricides.

Vegetative growth	Plant age (days)	Treatment	Days after infestation	Days after		Acaricidal treatments Tedifol Kelthane Peropal			Untreated plants	Healthy plants	L.S.D. 5 %
				1st spray	2nd spray						
Plant height (cm)	165	E M L	120 90 60	100 70 40	75 45 15	53.3 56.6 58.5	51.2 54.4 56.5	49.6 52.6 54.4	42.7 48.4 52.2	60.6	1.5
No. of branches/plant	165	E M L	120 90 60	100 70 40	75 45 15	17.2 18.1 19.0	16.3 17.2 18.4	15.5 16.1 17.5	13.4 15.3 16.5	20.1	1.2
No. of leaves/plant	165	E M L	120 90 60	100 70 40	75 45 15	83.0 88.7 95.2	81.0 87.7 94.8	80.4 86.2 93.4	69.3 70.5 80.5	100.2	4.9
Leaf area (cm^2)	165	E M L	120 90 60	100 70 40	75 45 15	60.5 62.6 64.4	59.4 61.5 64.2	58.2 60.2 63.5	49.5 57.8 60.6	66.0	2.4

plants than in medium and late infestations with all acaricidal treatments . This also applies to the untreated plants compared with the healthy ones.

Tedifol was superior in controlling *T. arabicus* as compared with Kelthane and Peropal. It could be concluded that using Tedifol egainst late infestation as compared with the healthy plants, i.e. there were no significant differences between the effect of Tedifol treatment at late infestation regime and the healthy plants as judged by the vegetative growth criteria, plant height (58.5 & 60.6 cm), number of branches/ plant (19.0 & 20.1), number of leaves /plant (95.2 & 100.2) and leaf area (64.4 & 66.0 cm2) for Tedifol and healthy plants, respectively.

Table 3 shows the effect of infestation with *T.arabicus* and acaricidal treatments on the fresh and dry weight of Datura plant. In spite of acaricidal treatment, the reduction in both fresh and dry weight was obvious at early infestation rather than at medium and late infestations . Highly significant differences were observed at early infestation than in medium and late infestations as compared with healthy plants and untreated ones. Tedifol was superior in controlling the mites compared with Kelthane and Peropal (Tables 2 & 3) . Using Tedifol against late mite infestation gave good results for both fresh and dry weights as compared with the healthy plants . There was no significant difference between the effect of Tedifol treatment at late mite infestation and the healthy plants; 295.5 and 301.4 g in case of fresh weight and 49.5 and 50.1 mg for dry weight, respectively.

Data given in Table 3 also revealed that both chlorophyll (A,B and total) and alkaloid (percentage and total) were affected by mite infestation in spite of using acaricidal treatments. The early infested plants were more affected by mites infestation than at medium and late infestations

Tedifol proved to be the most effective against the mite *T. arabicus* infesting Datura plant either at early, medium or late infestations than Kelthane, Peropal and untreated plants. The effect of Tedifol in controlling the mites reached its maximum at late infestation . There were no significant differences between the effect of Tedifol treatment in controlling *T. arabicus* at late infestation and healthy plants.

Chlorophyll A contents of Tedifol treated and healthy plants were 0.8282 & 0.8585 mg/g . Chlorophyll B was 0.5372 & 0.5553 mg/g . Total content of chlorophyll was 1.3654 & 1.4138 mg/g.

Table 3. Effect of artificial infestation regime with *T. arabicus* on yield and chemical composition of *D. tatula* plant treated with indicated acaricides.

Yield and chemical composition	Plant age (days)	Treatment	Days after infesta-tion	Days after		Acaricidal treatment			Untrea-ted plants	Healthy plants	L.S.D. 5 %
				1st spray	2nd spray	Tedifol	Kelthane	Peropal			
Fresh weight (g)	165	E M L	120 90 60	100 70 40	75 45 15	280.8 285.3 295.5	275.5 280.3 290.9	270.2 275.4 281.3	170.9 230.0 265.5	301.4	2.30
Dry weight (mg)	165	E M L	120 90 60	100 70 40	75 45 15	47.5 48.7 49.5	46.5 47.2 49.2	46.0 47.0 48.7	35.5 45.2 49.5	50.1	0.52
Chlorophyll A mg/g	165	E M L	120 90 60	100 70 40	75 45 15	0.6832 0.7976 0.8282	0.6781 0.7534 0.7979	0.6552 0.7233 0.7666	0.6262 0.6864 0.7272	0.8585	0.0022
B mg/g	165	E M L	120 90 60	100 70 40	75 45 15	0.4665 0.4966 0.5372	0.4545 0.4772 0.5244	0.4322 0.4531 0.5122	0.4252 0.4422 0.4992	0.5553	0.0639
Total mg/g	165	E M L	120 90 60	100 70 40	75 45 15	1.1497 1.2942 1.3654	1.1326 1.2306 1.3223	1.0874 1.1764 1.2788	1.0514 1.1286 1.2264	1.4138	0.0169
Alkaloid content %	165	E M L	120 90 60	100 70 40	75 45 15	0.20 0.22 0.24	0.20 0.22 0.23	0.19 0.21 0.23	0.18 0.20 0.22	0.26	0.03
Total alkaloids contents (mg/plant)	165	E M L	120 90 60	100 70 40	75 45 15	95.0 107.1 118.8	93.0 103.8 113.2	87.4 98.7 112.0	63.9 90.4 108.9	130.3	4.52

Alkaloid percentage in plants treated with Tedifol and healthy plants were 0.24 and 0.26 % with the total contents of alkaloids being 118.8 and 130.3 g/plant, respectively

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تأثير الإصابة بالعنكبوت الأحمر العادى والمعاملة بالمبيدات على نباتات الداتورة

محمد على محمد درويش ، نبيل جورج اسكندر

معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - الجيزة .

أوضحت نتائج إختبار مبيدات التديفول والكلثين والبيروبال فى مكافحة أكاروس العنكبوت الأحمر العادى على نبات الداتورة أن مادة التديفول تعتبر من أكفأ المواد فى خفض نسبة الإصابة بهذا النوع من الأكاروس سواء كانت الإصابة الصناعية مبكرة أو متوسطة أو متأخرة .

كذلك أوضحت الدراسة تأثير التداخل بين ميعاد الإصابة بالعنكبوت وإستعمال المبيدات الثلاثة السابقة على النمو الخضرى لنبات الداتورة والذى يشمل (طول النبات - عدد الفروع /نبات - عدد الأوراق /نبات - مساحة الأوراق) . وقد أوضحت النتائج وجود علاقة بين ميعاد الإصابة بالأكاروس والنمو الخضرى لنبات الداتورة ، حيث زاد النمو الخضرى كلما قلت مدة تعرض النباتات للإصابة بالأكاروس فى الإصابات المتأخرة . كذلك تأثر الوزن الجاف والأخضر لنبات الداتورة ونسبة الكلوروفيل والقلويات الكلية الموجودة فى النبات حيث كانت أقل ما يمكن فى النباتات ذات العدوى المبكرة عنها فى النباتات ذات العدوى المتأخرة .

ويمكن القول أن إستعمال مادة التديفول ضد الإصابة المتأخرة بالعنكبوت الأحمر لنبات الداتورة يعطى أفضل النتائج بالمقارنة بالنباتات السليمة .