

ALTERNATIVE SAFETY METHODS IN SUPPRESSING THE POPULATION OF TWO SPOTTED SPIDER MITE *Tetranychus urticae* KOCH INFESTING SOYBEAN PLANTS AT THE NEW RECLAIMED LANDS, NUBARIA PROVINCE EGYPT.

Soliman, M.S; Mariam A. El-Sanady and Mahasen A. Abdel – Aziz
Plant Protection Research Institute, Dokki, Giza, Egypt.

ABSTRACT

Three field experiments were conducted during the season 2006, at the private farm at Nubaria region: the first trial included releasing the predatory mite *Phytoseiulus persimilis* (A.-H.) with rate of 15-20 mites / hill. While the other trials included evaluation of some environmentally safe materials and study the effect of different fertilizers adding in different ways on spider mites population. Obtained results cleared that the predatory mite *P. Persimilis* minimizing the spider mites population 72.8% after 9 weeks of releasing and the infestation level was under threshold level during the season .The environmental safe compounds indicated that mixture of Vertimec and Super-misrona mineral oil exhibited the highest reduction (91.4%) followed by Vertemic (87.5%), mineral oil (72.9%), Oshar extract (58.4%), Enab El- Deab extract (54.6%) and Bioranza (53.6%).Foliar application of KP and micro- elements reduced the mite population (52.8 and 50.7 %) while soil spray bacteria solubility of potassium and phosphorus gave (43.7 and 12.9 %) ,respectively. It's cleared that different fertilizes were minemized the number of mites and also they improved plant health and crop yield.

INTRODUCTION

The integrated crop management system (ICMS) is defined as "A system whereby all interacting crop production and pest control tactics aimed to maintaining and protection plant healthy are harmonized in the appropriate sequence to achieve optimum crop yield and quality and maximum net profit. In addition to stability in the agroecosystem benefiting society and mankind " El-Zik and Frisbie (1985).

Recently there is a great interest in the use of alternative methods for controlling pests infesting different crops, because of the extensive use of pesticides which play dangerous role of environmental pollution, moreover to different pests acquired resistance to pesticides.

The common red spider mite *Tetranychus urticae* koch cause a great damage for Soybean plants. Baker and Connel (1963) mentioned that the spider mites damaged protective leaf surface and the stomata and it might inject toxic substances into the leaf and interfere with vital processes. Using biological control agents and environmentally safe materials for minimizing different pests consider one of the main goals of the Egyptian agriculture policy.

The present study aims to throw some lights on alternative safety points of alternative methods for suppressing the population two spotted spider mite *Tetranychus urticae* on soybean plants; such alternative methods like:

Soliman, M.S. et al.

- 1- The role of the predatory mite *Phytoseiulus persimilis* in suppressing spider mites
- 2- Evaluate some environmentally safe compounds
- 3- The role of biofertilizers in reducing the spider mite population on soybean crop.

MATERIALS AND METHODS

1-Mass production of the predatory mite *Phytoseiulus persimilis* (A-H.):-

The predatory mites were obtained from massrearing of the predatory mites on spider mite *Tetranychus urticae* on bean plants (*Phaseolus vulgaris* L.) planted in net plastic greenhouse belonging to Fruit Research mites Dept., Plant Protection Research Institute at Dokki, Giza. Egypt. An area of 1/8 Fadden (525 m²) divided into four replicates, planted with soybean plants Giza variety 111) in May, 15, 2006, this area had 9450 hills and 18900 plants. About 15-20 predator individuals were released for each hill one time at June, 18, 2006, about 25000 predators were used. Investigation was carried out directly before releasing and weekly after releasing to count the motile stages of spider mites of 20 leaflets per replicates in the laboratory using stereomicroscope and untreated area used as control. Also, predator mites were estimated in the area using a special magnified hand lens 20x. Handreson and Tilton equation (1955) was applied to calculated the reduction percentages of spider mite *Tetranychus urticae* population.

2- Evaluation some environmentally safe materials against spider mite *Tetranychus urticae* on soybean plants. The tested materials were :

- 1- Vertimec 1.8 % EC. (v) 40 cm / 100 l . water
- 2- Super Misrona Oil (SMO) 95% EC , 1%
- 3- Mixtures of (V+ SMO) 40 cm + 1% resp.
- 4- Oshar extract (*Calotropis procesa*) 500 cm / 10 L. water
- 5- Enab El-Deep (*Solanium nigrum* L.) unripe fruits extracts. 500 cm / 10 L. water
- 6- Bioranza. Bioinsecticide. Fungi, *Metarhiun anisoplae* (32x10³ viable spores / mg). Active ingredient 10% inner ingredient 90%
- 7- Potassium + Phosphorus foliar 1 liter/ Fadden
- 8- Micro- elements 150 ppm foliar
- 9- Control (untreated area).

Oshar and Enab El-Deep were obtained from Sinai (El- Aresh area), leaves were dried and grounded. 500 g. for each of powder were successive extracted with commercial methanol for 24 h. at room temperature according to Freedman *et al.* (1979).

An area of 1.5 Fadden (6300m²) was divided in 36 replicates, 175m² fore each used as complete random design. Investigation was carried out as protocol of Ministry of Agriculture before spray and after 3, 7, 14 and 21 days, 20 leaflets lower surfaces were examined using stereomicroscope to count the motile stages of spider mites whereas Handreson and Tilton equation (1955) was applied to calculation the reduction percentages.

3- Study the indirect effect of biofertilizers, bacteria solubility potassium and phosphorus on spider mites population on soybean plants:-

An area of 1.5 Fadden divided into three treatments (two materials + untreated area) potassium – mag and phosphorean were used as soil spray application in June, 8, 2006 after two days of irrigation. Weekly samples were examined at laboratory, the numbers of eggs and motile stages of spider mites were recorded. All experiments were carried out at Nubaria region during the season 2006.

RESULTS AND DISCUSSION

1- Mass production and field application of the predatory mite *Phytoseiulus persimilis* (A.-H.) for controlling the two spotted spider mite *Tetranychus urticae* Koch on soybean plants in the open field at Nubaria region during the season 2006 were the predator mite *P. persimilis* considered one of the important phytoseiid predators for controlling spider mites on different crops. Investigation soybean plants showed that the population of spider mites started with a few numbers and increased slowly till reached its peak during the flowering and bud formation stages or after 2 months of sowing data for untreated area.

Obtained results in table (1) showed that the population of spider mites ranged between 118-148 of motile stages 25 leaflets for each plot A, B, C, and D before releasing the predator mite *P. persimilis*, while the total number of untreated four replicated were 525 mites / 100 leaflets before releasing the predators. As shown in table (1) data revealed that the spider mites population decreased slightly after releasing whereas predation of A, B, C and D plots were by the average number of mites were 115, 104, 98 and 85 with reduction percentages of spider mites 30.1, 30.7, 28.9 and 35.2 % a week after releasing for A, B, C and D plots, respectively. The reduction percentages of mites increased gradually to reach 53.8, 57.1 and 68.8 % for the treated plots with average of 58.5% within the fourth inspection or after month of releasing. This finding agreed with these obtained by Taha *et al.* (2001) who evaluated the predator mite *Phytoseiulus macropilis* (Banks) for controlling the spider mites on soybean plants, Heikal *et al.* (2003) who utilized the phytoseiid mite *P. macropilis* for controlling the spider mite *T. urticae* on the strawberry plants and Fawzy *et al.* (2006) they evaluated the predatory mite *P. persimilis* for control the spider mites on peach and almond trees. By the end of August or after two months of releasing the reduction percentages were 68.1, 74.2, 67.9 and 81.5 % for A,B,C and D plots, with general mean 72.8% whereas the population abundance of spider mites were under the threshold level infestation till the end of season, finally, the foregoing results proved the possibility of controlling the spider mite *T. urticae* in soybean fields by applying one release of the predatory mite *P. persimilis* at Nubaria region.

Table (1): Evaluation the efficiency of the predatory mite *phytseiolus persimiliss* against the mite *T. urticae* Koch on soybean at Nubaria region during season 2006.

Sampling Data	No. of spider mite and reduction presenting % of <i>T. urticae</i> after release predatory.								Untreated area of No. <i>T. urticae</i> / 100 leaflets	General mean of redaction %	
	25 / Leaflets / Replicate										
	A		B		C		D				
	No.	Red.%	No.	Red.%	No.	Red.%	No.	Red.%			
28/6/2006										525	-
5/7/2006	148	-	135	-	124	-	118	-	584	31.22	
12/7/2006	115	30.1	104	30.7	98	28.9	85	35.2	612	38.6	
19/7/2006	121	29.9	101	35.8	83	42.6	73	46.9	635	47.04	
26/7/2006	105	41.3	93	43.0	76	49.3	65	54.5	741	58.6	
2/8/2006	95	54.5	88	53.8	75	57.1	52	68.8	625	58.3	
9/8/2006	78	55.1	75	53.3	67	54.6	43	69.4	514	59.5	
16/8/2006	65	64.7	56	57.0	53	56.3	36	68.8	482	67.3	
23/8/2006	48	68.2	39	68.5	39	65.7	32	70.4	435	70.0	
30/8/2006	39	68.1	32	71.3	35	65.9	29	70.3	422	72.81	
Total	38	-	28	74.2	32	67.9	18.0	81.0	5575	-	
Mean	852	-	751	-	682	-	551	-	557.5	-	

2- Evaluation some environmentally safe materials against the two spotted spider mite *Tetranychus urticae* Koch on soybean plants:-

As shown in table (2) data revealed that the activity of Vertmic (V), Super-Misrona oil (SMO), Mixture of Vertemic + Super- Misrona oil, Oshar and Enab El- Deab extracts, bioinsecticide *Metarhizium anisoplae*, bioranza, 32×10^3 spores / mg. foliar application of some fertilizers, Mixture potassium + phosphorus and micro-elements against the spider mite *T. urticae* on soybean crop. Its clear that all compounds exhibited mortality with different percentages of treatments, concerning data in table (2) indicated that mixture Vertemic with super Misrona exhibited the highest activity of spider mites moving stages (95.0%) followed by Vertemic (90.90%), SMO (82.5%), Oshar extract (64.0%), Enab El-Deab extract (57.8%), foliar application of KP and ME (65.8%) and (63.2%), respectively. While Bioranza was the lowest one (31.3%) after three days of treatments. General reduction percentages of the tested materials could be arranged in a descending order as follows; 91.4, 87.5, 72.9, 60.1, 53.7, 53.6, 52.8 and 50.7 For V+ SMO, V, SMO, Oshar extract, Enab El-Deab extract, Bioranza, KP and Me foliar, respectively. These results are agreement with those obtained by several investigators Sawires *et al.* (1995) Omar *et al.* 2000 and Hassan *et al.* 2005.

3- The potential effect of bacteria solubility potassium and phosphorus soil spray application on the spider mites population:-

The biofertilizers potassium and phosphorus as bacteria solubility were used to evaluate their indirect effect on spider mite *T. urticae* infestation. As shown in table (3) data indicated that soil spray application of bacteria solubility potassium and phosphorus were effect on the number of eggs and motile stages of spider mites were (5&20), (12&24) and (16&33) for potassium and phosphorus and untreated area after fortnight of application. Population abundance of spider mites reached its peak at the end of August were the number of eggs and moving stages were (117 & 247) for untreated

area, while potassium and phosphorus treatments were (77.0&139) and (94.0&215.0) with a reduction percentages of eggs and movable stages of spider mites (34.4&43.7) and (19.6&12.9), respectively.

The total number of eggs and motile stages were (330.&606), (407&440) and (540&1042) at the same pattern with reduction percentages of (38.8&41.8) and (24.5&19.9)for bacteria solubility potassium and phosphorus ,respectively. This results could be recommended as one of the main items of integrated sucking pests management.

Table (2): No. of mites and reduction percentages of environmentally safe compounds against the spider mite *T. urticae* on soybean plants at Nubaria region during the season 2006.

Treatments	Rate of application	No. of mites Pre-count /160sq.inches	No. of mites/160 sq.inches & % reduction at indicated days								General reduction %
			3 days		7 days		14 days		21 days		
			No.	%	No.	%	No.	%	No.	%	
V + SMO	40cm+1%/100 L.water	560	30	95.0	46	92.8	68	90.4	100	87.4	91.4
V	40cm / 100L.water	620	60	90.9	76	89.3	100	87.3	152	82.6	87.5
SMO	1%	590	110	82.5	150	77.8	200	73.3	250	58.0	72.9
Oshar extract	500cm/10L.wa ter	614	235	64.0	274	60.9	315	59.5	383	55.8	60.1
Enab-EI-Deeb extract	500cm/10L.wa ter	562	252	57.8	283	55.9	344	51.8	402	49.4	53.7
Bloranza 32 x 10 ⁷ spores/mg.	250g/fed.	520	380	31.3	300	49.5	224	66.1	240	67.3	53.6
KP foliar	1L./fed.	660	240	65.8	268	64.5	370	55.9	525	42.9	52.8
ME foliar	150 ppm	690	270	63.2	300	62.0	460	47.5	580	30.2	50.7
Untreated area	-	630	670	-	720	-	800	-	890	-	3080

Table (3):Effect of soil spray application of bacteria solubility potassium and phosphorus on mite infestation of soybean plants at Nubaria region during the season 2006.

Date	Potassium solubility bacteria		Phosphorus solubility bacteria		Control	
	Egg	Moving stages	Egg	Moving stages	Egg	Moving stages
	No of mites/20 leaflets					
8/6/2006	0	2	0	1	0	35
22/6/2006	5	20	12	24	16	33
6/7/2006	14	31	20	42	21	46
20/7/2006	70	94	71	104	123	165
3/8/2006	56	102	76	165	117	222
17/8/2006	77	139	94	215	117	247
31/8/2006	109	201	126	280	146	314
14/9/2006	0	17	0	9	0	14
Total	33	606	399	840	540	1076
Mean	41.4	75.75	49.9	105	67.5	134.5

4- Effect of different treatment on soybean yield parameters:-

As shown in table (4) data revealed that soybean yield affected by different treatments, whereas the weight of fresh / pods was high with mixture of potassium and phosphorus foliar application. and low with biocide bioranza (1.45)while the weight of dry pod was high with mixture at V+SMO and low with bioranza. The weight of 100 seeds could be arranged in descending order as follows: KP foliar (14.04), V (12.9), v+SMO(12.35), SMO(11.6), Me(11.5), bioranza (11.01), Oshar (9.91) and the lowest one enab – el-deep (9.5). The highest yielding of seeds was with vertmic (1635 kg) , while the lowest one was bioranza (1015 kg) table (4) this results agreement with Taha *et al* (2004), Allan and El-shikha (2005)and parihar &upadhyay (2001). Its cleared that although the foliar application of mixture potassium and phosphorus and micro-elements gave low reduction percentages of spider mites on soybean plants, but they gave high yielding of seeds because of improving the plant health.

Table (4): some characters of soybean yield as affected by used treatments in marbles village – Nubaria region season 2006.

Treatments	Weight of fresh pod	Weight of dry pod	No. of pod/ plant	Weight of 100 seeds	Yield Kg/fed
SMO	1.5	0.40	116	1160	1211
V	1.82	0.58	161	12.9	1635
V+SMO	1.92	0.54	158	12.35	1620
Oshar	1.84	0.53	88	9.91	1112
E. El-Deeb	1.72	0.50	82	9.5	1095
Bioranza	1.45	0.44	95	11.01	1015
KP foliar	1.98	0.5	148	14.04	1610
ME	1.81	0.49	134	11.5	1515
untreated	1.05	0.38	75	11.0	730
Mean	1.0	0.51	121.9	11.9	1306
Min	1.05	0.38	75	9.91	730
Max	1.98	0.75	161	14.04	1635
SD	0.31	0.12	33.3	1.28	339

Acknowledgment

The Principle investigator and the authors are indebted and thanks giving to "Regional councils for agricultural Research and Extension " which funded the project" Integrated pest management of soybean crop in new reclaimed lands at Nubaria region.

REFERENCES

- Allam, S. A. and S. A. El- Shikha (2005) the potential effect of nitrogen & potassium fertilizers level on soil mites and insect in relation to potato yield. Minufiya, J. agric. Res. Vol 30 No. 3 : 1069- 1079.
- Baker, J. E. and Connell, W.A. (1963) The morphology of the mouth parts of and observations of feeding by this mite on soybeans Ann. Entomol. Soc. Am. 5b : 733-736.

- Fouzy, M.M., K.M. El- Sayed and M. H El- Erksousy (2006) Evaluation of the predacious mite *Phytoseiulus persimilis* (A.-H.) release on peach and almond trees at North Sinai Governorate to control the two spotted spider mite *Tetranychus urticae* Koch. Egypt. J. Agric. Res. 84(6) 1811-181.
- Freedman, B., Nowak, J. and Kwolek (1979) A bioassay for plant derived pest control agent J. Econ. Entomol, 72, 45-54
- Handerson, C. F. and E. W. Tilton (1955) Test with acaricides against the brown wheat mite .J. Econ. Entomolo, 48: 157-161.
- El-Zik Kamal and Raymond, E. Frisbie (1985) Integrated crop management system for pest control and plant protection in Handbook of Natural pesticides, Methods vol.I Crcpress, Boca Raton Fl. 534 pp.
- Hassan, M.F., Z. R. Soilman and sherry, S. Dawoud (2005) Evaluation of some plant extracts against the two spotted spider mite *Tetranychus urticae* Koch (acari: tetranychidae). J Agric. Sci. Mansoura Unvi; 30 (1) 611- 621.
- Heikal, I. H. , G. A. Ibrahim, K. M.,El- sayed and M S. El- Ghobashy (2003) Biological control of *Tetranychus urticae* Koch in strawberry open fields and greenhouses by releasing *Phytoseiulus macropilis* (Banks) (acari: Tetranychidae& Phytoseiidae) Egypt. J. Agric. Res., 81 (4): 1595-1608.
- Omar, H. I.I; El- Bessiony , M. , El- Magraby, H. and El- Khawalka, M (2000) effect of abamectin compared with different compounds on two spotted spider mite and two insect leaf miners J. agric Sci- Mansoura univ., 25(12) : 8089- 8096
- Parithar, S. B. s and N. C. Upadhyay (2001) Effect of fertilizers (NPK) on incidence of leafhoppers and mites in potato crop. Insect Enveron., 7(1) : 10-21
- Taha, H A. , S. A. El-Hadad , I K Kotb and Amara, A. Shoeib (2004) Integrated management of some sucking pests infesting faba bean crop at Nubaria region J. Agric Sci. Mansoura univ., 29(11): 6643-6649.
- Taha, H. A., Amara, A. Shoeib, Ahmed, M. A and Ahlam, A. Younes (2001) Utilizing the predator mite *Phytoseiuls macropilis* (Banks) to control the two spotted spider mite *Tetranychus urticae* Koch on soybean plants. J. Agric. Sci. Mansoura unv.16 (9): 251-258.
- Sawires, Z.R.; Iskander, N G. and Ahmed, M. A. (1995) Toxic action of some plant extracts against *Tetranychus urticae* Koch proc. 6th Nat. Conf. pest &Dis. Of Vegetables & Fruits in Egypt. P. 165-177.

الطرق البديلة في مكافحة العنكبوت الأحمر العادي ذي البقعين *Tetranychus urticae* Koch على نباتات فول الصويا في الاراضى المستصلحة بمنطقة النوبارية - مصر.

سليمان مسعود سليمان ، مريم عبد الرحمن السندى و محاسن احمد عبد العزيز
معهد بحوث وقاية النباتات - الدقي - الجيزة - مصر.

اجريت ثلاث تجارب حقلية لتقييم بعض البدائل في مكافحة العنكبوت الأحمر العادي ذي البقعين على محصول فول الصويا بالا راضى المستصلحة بمنطقة النوبارية .
التجربة الأولى :- تقييم دور المفترس الاكاروسى *Phytoseiulus persimilis* في خفض تعداد العنكبوت الأحمر حيث تم الإطلاق في مرحلة البادرات بمعدل ١٥-٢٠ مفترس للجورة (نباتين) حيث تم الفحص قبل الإطلاق مباشرة ثم أسبوعيا وتسجيل أعداد الأطوار المتحركة في المساحات المعاملة والمقارنة واستخدمت معادلة هندرسون وتيلتون ١٩٥٥ لحساب نسب الخفض وأوضحت الدراسة أن المفترس الاكاروسى أعطى نسب خفض بدأت ٣١,٢٢% بعد اسبوع من الإطلاق ووصلت إلى ٨,٢% بعد شهرين حيث استمر تعداد الأفة اقل من الحد الاقتصادي الحرج للإصابة حتى نهاية الموسم.
التجربة الثانية :- تقييم بعض البدائل الأمنة بيئيا لمكافحة العنكبوت الأحمر وهى : الفيرتيميك ١,٨% والزيت المعدني سوبر مصرونا ومستخلص العشار والثمار النيئة لعنب الديب ومركب البيورانزا ومخلوط البوتاسيوم والفوسفور وأخير بعض العناصر الصغرى حيث أعطى مخلوط الفيرتيميك مع زيت سوبر مصرونا أعلى معدل إبادة ٩١,٤% ثم الفيرتيميك ٨٧,٥% فسوبر مصرونا ٧٢,٩% فمستخلص العشار ٦٠,١% فعنب الديب ٥٣,٧% فالمركب الحيوي البيورانزا فمخلوط البوتاسيوم مع الفسفور ٥٢,٨% وأخيرا العناصر الصغرى ٥٠,٧% وقد نلاحظ أن البوتاسيوم مع الفسفور والعناصر الصغرى كانت أقل المواد المختبرة في نسب الخفض إلا أنها أدت إلى تحسين حالة النباتات وأيضا إلى زيادة إنتاجية الحصول.
التجربة الثالثة :- وهى دراسة التأثير الغير مباشر البوتاسيوماج والفوسفورين كأسمدة حيوية في صورة بكتريا مذبية للبوتاسيوم والفوسفور في التربة الزراعية على مستوى الإصابة بالعنكبوت الأحمر حيث تم رش هذه المركبات بعد اكتمال مرحلة الإنبات بعد رية المحايية وتم الفحص كل أسبوعين ومقارنة النتائج التي أوضحت أن هناك خفض في تعداد البيض والأطوار المتحركة للعنكبوت الأحمر وصلت (٤٣,٧ & ١٩,٦) % بالنسبة للبوتاسيوماج والفوسفورين على الترتيب مقارنة بالكنترول.
وأخيرا تم تقييم تأثير المعاملات المختلفة على الخصائص المحصولية لفول الصويا أوضحت الدراسة حيث أوضحت النتائج ان اعلى معدل لإنتاج القرون الخضراء وكذا وزن ١٠٠ بذرة والإنتاجية للفدان كانت مع خلط البوتاسيوم والفوسفور عن طريق الرش وكانت المعاملات مع المركب الحيوي البيورانزا. ثم جاء مخلوط الفيرتيميك مع سوبر مصرونا في المرتبة الثانية لزيادة وزن القرون الخضراء والجافة ووزن ١٠٠ بذرة ثم الإنتاجية للفدان ثم مستخلص نبات العشار فالعناصر الصغرى.