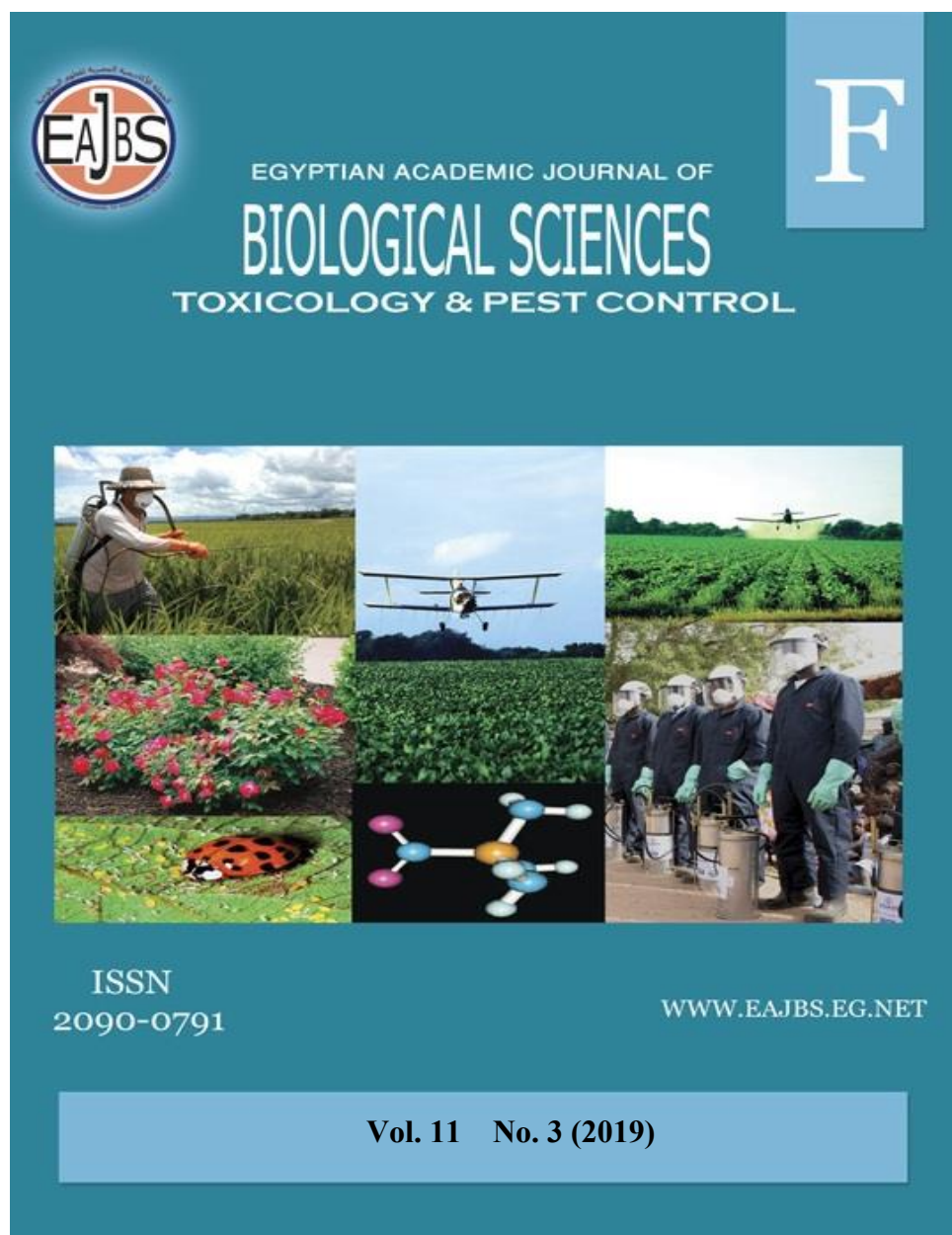


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Efficacy of Predacious Mite, *Phytoseiulus presimilis* and the Acaricide, Sanmite In Controlling the Spider Mite, *Tetranychus urticae* on Soybean Plant at Beni-Suef Governorate, Egypt.

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ABSTRACT

In this study, the evaluation of some control methods against the two-spotted spider mite, *Tetranychus urticae* Koch on Soybean plants, *Glycin max* L. was carried out under field conditions at Beni-Suif Governorate, Egypt in season 2018. The predatory mite *Phytoseiulus persimilis* Athias-Henriot, (Acarina: Phytoseiidae), and the acaricide (Sanmite) 20% WP were tested. Obtained results showed that the total average number of the mite population was significantly different with control ($F= 75.37, P < 0.0001$ & $EV = 87.6\%$), with the mean reduction percentage of significance ($F= 56.31, P < 0.0001$ & $EV = 84.07\%$). The mean reduction percentage of the mite population on soybean plants cultivars using the released predatory mite *P. persimilis* at rate of 30 adult predators/soybean plants seedling was significantly the highest reduction (83.84%), followed by (Sanmite) (78.66%). The second trial included the released predator at levels 20 and 10 adult predators/soybean plants seedling and gave the highest reduction at the level of 20 adult predators/soybean plants seedling (72% and 62.55%). It could be concluded that the using *P. persimilis* at rate of 30 adult predators/Soybean plants for controlling *T. urticae* was superior than using The acaricide, Sanmite 20% (WP).

INTRODUCTION

Soybean plants, *Glycin max* L. is widely cultivated in many parts of the world as major and strategy food crop to the human. Soybean plants are considered an important host to a several number of pests such as the two-spotted spider mite, *Tetranychus urticae* Koch; however, there is a considerable variation in the respective importance of the different pests in different countries. The spider mite, *T. urticae*, is one of the main pests of agriculture crops due to its broad host range. This phytophagous, species feeds on more than 1,100 plant species, from which about 150 are of great economic value. Thus, it represents a very important pest of field crops, ornamentals, annual and perennial plants all over the world (Takafuji *et al.*, 2000, Sim *et al.*, 2003). The importance of this mite pest is not only due to direct damage to plants, including defoliation, leaf burning, and even in excessive outbreaks plant death, but also indirect damage to plants which decreases in photosynthesis and transpiration and great loss in yield, (Brandenburg and Kennedy, 1987 and Golam, 2002). Host plants of spider mites differ in the degree of food quality, which either depend on the level of primary plant metabolites, or on the quantity

and nature of secondary metabolites (Rosenthal and Berenbaum, 1991). Unfortunately, chemical control of this pest has limitations because of the development of resistance (Tsagkarakou *et al.*, 2002). As a result, a more integrated approach including biological control with predatory insects and/or mites is recommended by (Grafton-Cardwell *et al.*, 1997, Skirvin and Fenlon 2001). Biological control of spider mites has centered on the use of predatory mites in the family Phytoseiidae (Schausberger and Croft 2000, Schausberger and Walzer 2001). The predator *Phytoseiulus persimilis* A. H. (Acari: Phytoseiidae) is one of the most important biological control agents against the two spotted spider mite, *T. urticae* Koch, infesting different crops. The present study aims to evaluate the efficiency of the predatory mite *Phytoseiulus persimilis* comprising with the acaricide Sanmite 20% WP. in controlling the spider mite, *T. urticae* as the main pest of Soybean plants crop.

MATERIALS AND METHODS

Planting for Reared Predator:

Bean plant *Phaseolus vulgaris* L. was used as the host plant. Bean seeds were planted in plastic trays (50 x 50 x 15 cm) with the rate of 15 seeds per trays. These trays were used in rearing the predatory mite *persimilis* which used as bio-agent predacious mite *persimilis* releasing on Soybean plants seedling at Beni-Suif governorate Egypt.

Prey used: On the other hand, castor bean leaves infested with the two-spotted spider mite *T. urticae* Koch were collected from Beni-Suif governorate and transferred to the laboratory to use in the feeding of the predatory mites *P. persemilis*.

Mass rearing of Predator:

Five females of predatory mite *P. persimilis* transferred to each bean plant, there were followed up the relation between the predator and the prey *T. urticae* when it needs for prey; it was supported with more prey. About one month when the rate of predator increased to reach 20-25 individuals/ leaflet. The predator mite was picked in small paper bag with few preys on bean leaves and transferred to inside ice box.

Field Experiments:

The present study was conducted at the farm of Agricultural Research Station, Beni-Suif Governorate, Egypt, during the Soybean plants season 2018. An area of about half feddan was divided into 15 equal plots (1/200 feddan) and arranged in completely randomized blocks with three replicates for each treatment.

Predator Release:

When the number predator mite increased for suitable number, collect and release. The leaves of the beans having the predator and small number of prey were picked in small paper bags with few prey on bean leaves and transferred inside ice box and the predator released on the seedling with three levels 10, 20, 30 predator females/ seedling. Samples of 10 leaves were randomly selected weekly from upper, middle and lower level of Soybean plants per each plot. Samples started after 15 days from sowing date, then continued to harvesting. The selected samples were transferred to the laboratory for inspection using a stereomicroscope to determine the number of *T. urticae* and predator.

Chemical Used:

The acaricide, (Sanmite) 20% WP.

Statistical Analyses:

Statistical analyses were performed using the equation of Henderson and Tilton (1955) to calculate reduction percentages, which recorded to the end of experiment. Also, the obtained data were analyzed using ANOVA with the computer program (SAS

Institute 1988) determine any significant difference between the means applied with the age of the week seedling Soybean plants of each trial.

RESULTS AND DISCUSSION

As shown in the Table (1) obtained data revealed that the mean number and reduction percentages of *T. urticae* Koch by, the predator mite, *Phytoseiulus persimilis* A. H. on soybean plants crop at Beni-Suef Governorate. The predatory mite, *P. persimilis* released three times after 30, 60 and 90 days of sowing date during April, May and June 2018 at rates 10, 20 and 30 adult predators/plant of soybean plants. The same trend was followed with the acaricide, Sanmite (20% WP) at 3- 4 individuals of spider mite, *T. urticae* infestation.

The First Release:

As shown in Table (1) obtained results demonstrated that, when the predator mite was released at the rate of 10 individuals/plant; the spider mite pest population was generally lower than pre-count. They were 50, 48, 57.4 and 77.1 individuals/30 leaves randomly picked at weekly intervals, respectively.

While in the second and the third levels of the predatory mite, released at 20 and 30 predators / plant. The population of mite pest was (30.5 & 23) ,(31 & 21), (37.3 & 23) and (56.4 & 30), respectively at the same trend.

On the other hand The acaricide, Sanmite 20% WP decreased the population of spider mite, *T. urticae* by 20, 20.5, 34 and 65.2 mites / 30 leaves, therefore, the obtained results showed that the reduction percentages of spider mites reached 66.17, 76.77 and 86.9 % at the rate of 10, 20 and 30 predators after three weeks of releasing, while, in case of using Sanmite 20% WP. the reduction percentage was 80.9 %.

The Second Release:

Results in the Table (1) indicated the count of spider mite, *T. urticae* population was highly decreased at level 30 predatory mites released per plant to (16.2, 13, 12.5 and 17.2) spider mites individual, while, the non-release treatment, the mite pest increased gradually from 250 to 315 motile stages / 30 leaves.

On the other hand, the acaricide, Sanmite (20% WP) the population of mite pest decreased in number to 30.4, 25, 39.3 and 64.6 mite individuals / 30 leaves, respectively. Ultimately, this predator can be used in controlling the spider mite, *T. urticae* on different crops, when it releases at low infestation and early season.

The Third Released:

The obtained data revealed that, incomparison between the three levels of release, the efficiency of the predator mite suppressing the population density of the mite pest increased with increasing the level of release. Resulting 62.55 at level of 10 predators/plant while it was 83.84 at the level of 30 predatory mites/plant, whereas at the level of 20 predatory mites/plant, the reduction percentages of spider mite population was 72%. On the other hand, the acaricide, Sanmite (20% WP), gave 78.66% reduction of spider mite by the fourth of investigation. These results coincided with that obtained by (Gould, 1977 and Mori & Saito, 1979).

The mean number of spider mite (*T. urticae*) population per sample: Weekly fluctuations in the mean number of spider mite (*T. urticae*) population showed a regression between time (week) and the mean average of *T. urticae* population/ treatment of about three levels released (10, 20 and 30) adult predators per Soybean plant seedling, respectively, Table (2) & Fig. (1).The average number of the mite predators at the three levels released (10, 20 and 30) adults female predators per Soybean plants seedling, respectively, were 32, 43 & 59 predators/ plant, respectively, in 3rd week of

April, while, in the 2nd and 3rd released the high average number of the mite predators at the three levels released were 38, 58.67 & 77 predators/ plant and 56.53, 86.66 & 126.3 adult female predators /Soybean plant seedling at the three levels released (10, 20 and 30), respectively, at the 4th week of May and Jun, respectively. The total average number of the mite predators' population was 34.1, 51.6 and 70.1 adult female predators per soybean plants seedling, respectively, Table (1).

Table 1: Evaluation the efficiency of the predatory mite, *Phytoseiulus persimilis* (A - H) against spider mite, *Tetranychus urticae* on Soybean plant crop at Beni-Suif Governorate.

Source	Application inspection	April				May				June				Mean
		1	2	3	4	1	2	3	4	1	2	3	4	
Mite Counts	Control	99	120	180	201	250	280	311	315	36	401	440	452	284.08
	10	50	48	57.4	77.1	64.5	51	52.5	64.2	55	56.2	54	68.5	58.20
	20	30.5	31	37.3	56.4	30.2	30	28.4	35.9	33.7	34	29.5	39	34.65
	30	23	21	23	30	16.2	13	12.5	17.2	13.8	14	10.3	15.3	17.44
	Sanmite	20	20.5	34	65.2	30.4	25	39.3	64.6	30	26	41.8	81.2	39.83
Reduction percentage %	10	49.1	60.5	67.2	60.74	64	65	67.55	61	60.5	64.4	69.2	61.3	62.55
	20	63.4	72.5	78.1	70.6	70	73	78.4	71.6	67.9	70.6	77	70.5	70
	30	76.1	84	87.5	86	81.2	86.3	88	83.2	79.5	82.2	89	83.1	83.84
	Sanmite	80.2	89	86	68.5	82	85.8	80.2	66.6	81	85.5	79	60.2	78.66

Relationship between the Release Rate and Predator Count:

Data in Table (2) and Fig (1) showed that the relation between the release rate and predator count, the total number of predator population was high significantly increased when the predator level increased from 10 to 30 individuals, the regression line values of release rate ($R=0.321$) and the regression coefficient values of release rate ($R= 0.403$) and the partial regression values ($F= 75.37$, $P < 0.0001$ and $EV = 87.6\%$).

Table 2: The mean number of *Phytoseiulus persimilis* on Soybean plants crop after difference of level releases at Beni-Suef Governorate season 2018.

Application Inspection	April				May				June				Mean
	1	2	3	4	1	2	3	4	1	2	3	4	
10	13.33	18.67	32	31	19	25	37	38	38.7	45.33	53	56.56	34.1
20	21	32	43	41.33	28.7	38.3	54.7	58.67	62	69.67	83	86.66	51.6
30	28	38	59	57.67	39.7	51	75.3	77	79.7	96.3	123.7	126.3	70.1

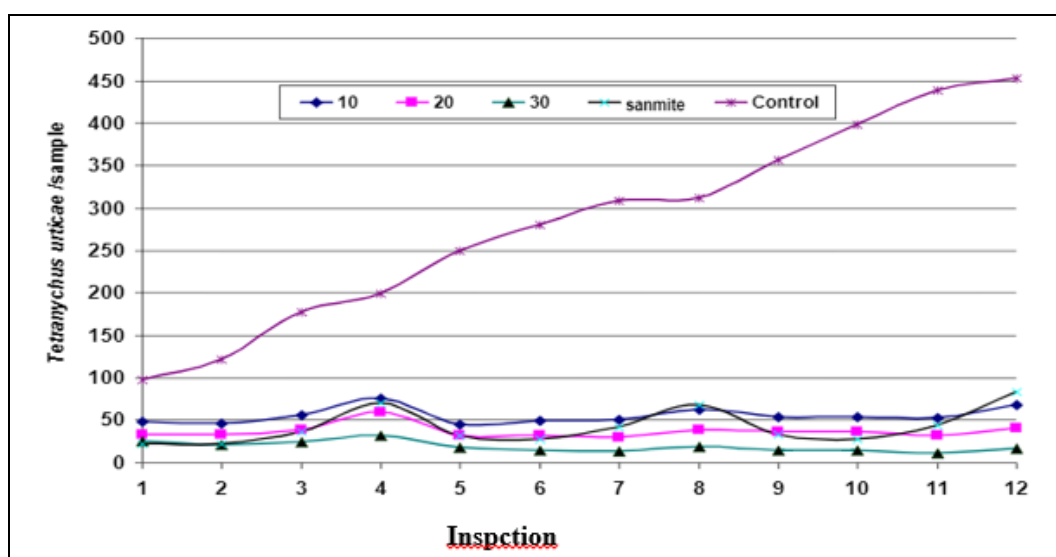


Fig. 1. Mean number of *Tetranychus urticae* per sample over time.

Relationship between the Release Rate and Percent Reduction:

Data presented in Tables (3&4) and Fig. (2) show that, the relation between release rate the predator mite, *P. persimilis* and the percent redaction the population of *T. urticae*. The redaction percentage of the spider mite population by the predatory mite *P. persimilis* was highly significant; the regression Lin values of redaction rate (R= 0.802), and the regression coefficient values of release rate (R= 0.004), the partial regression values (F= 56.31, P < 0.0001& EV= 84.07%). Greenhouse experiments were conducted in Turkey by Karut and Dokera (2015) to determine the effectiveness of single and combined releases of Turkish populations of two predatory mite species, *P. persimilis* and *Neoseiulus californicus* (McGregor), for control of two spotted spider mite *T. urticae* on Soybean plant. The authors concluded that releasing *N. californicus* either alone or in combination with *P. persimilis* did not show any improvement in controlling to *T. urticae* on greenhouse Soybean plants when compared to the release of *P. persimilis* alone. In conclusion: The Soybean plants cultivar in Beni-Suef, was relatively much infested to the spider mite, using the predatory *P. persimilis* at (30 individual) released was the best control method among the other methods tested for controlling the spider mite using the chemical compound as there was no significant difference between them.

Table (3): Relation between release rate and predator population

Source	Simple regression				Partial regression				
	a	b	R ²	P	b	P	F	P	EV %
Rate	12.13	1.851	0.312	0.0004	1.851	<.0001			
Release	7.046	21.06	0.403	<.0001	21.06	<.0001			
Inspection	24.88	9.711	0.161	0.0153	9.711	<.0001	75.37	<.0001	87.6

Table 4: Relation between release rate and reduction percentages

Source	Simple regression				Partial regression				
	a	b	R ₂	P	b	P	F	P	EV %
Rate	50.32	1.066	0.802	<.0001	1.066	<.0001			
Release	70.06	0.785	0.004	0.7022	0.785	0.357	56.31	<.0001	84.07
Inspection	67.57	1.624	0.035	0.2752	1.624	0.012			

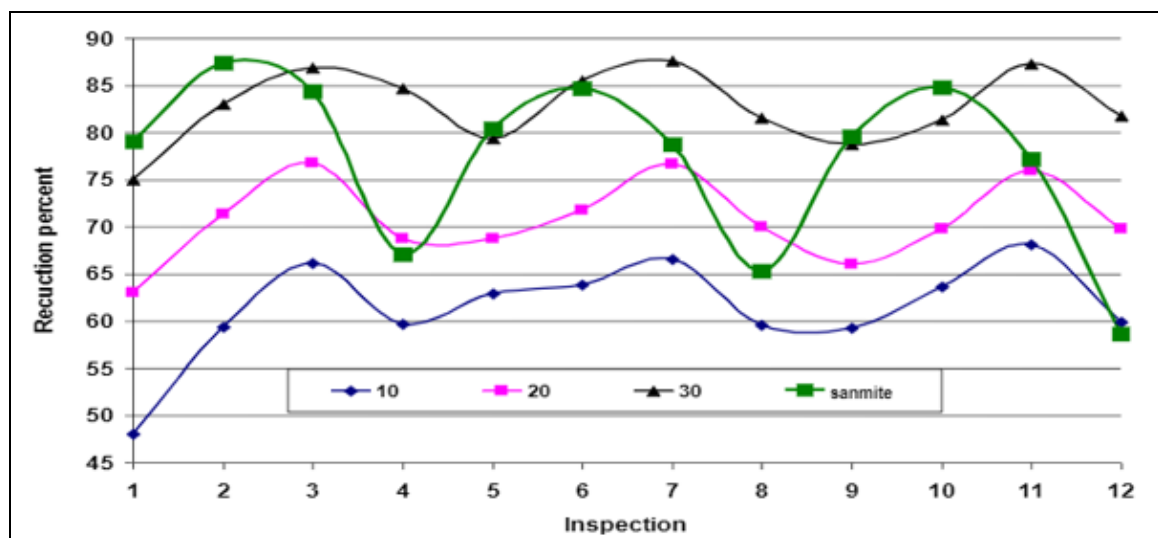


Fig. 2. Reduction percentages due to different tratments.

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ARABIC SUMMARY

استخدام المفترس الاكاروسي *Phytoseiulus persimilis* Athias-Henriot والمبيد الاكاروسي سانميت WP%20 في مكافحة العنكبوت الاحمر ذو البقعتين *Tetranychus urticae* Koch على نباتات الفول الصويا بمحافظة بني سويف - مصر

سهام علي عزالدين احمد - حسين عبد الحميد عزوز - اميرة الدسوقي مصباح - دعاء عبد المقصود ابوالعطا
معهد بحوث وقاية النباتات - مركز البحوث الزراعية - الدقى - جيزة - مصر

اجريت هذه الدراسة لتقييم استخدام المفترس الاكاروسي *Phytoseiulus persimilis* المنتمي لعائلة *Phytoseiulus* مع استخدام المبيد الاكاروسي سانميت WP%20 في مكافحة العنكبوت الاحمر ذو البقعتين *Tetranychus urticae* على نباتات الفول الصويا بمحافظة بني سويف في موسم 2018. ولقد اوضحت النتائج المتحصل عليها ان تعداد العنكبوت الاحمر العادي قد تأثر بصورة معنوية عند استخدام المفترس الاكاروسي بمعدلات اطلاق مختلفة حيث وجد انه عند اطلاق الاكاروس المفترس بمعدل 30 فرد لكل نبات فول صويا اعطي نسبة خفض في تعداد العنكبوت الاحمر مقدارها 83.84% يليها المبيد الاكاروسي سانميت بنسبة خفض مقداره 78.66% بينما معدلات الاطلاق للمفترس 20 و 10 افراد ادي الي خفض التعداد بنسبه 72% و 62.55% علي الترتيب وعلي هذا الاساس يمكن التوصية باستخدام معدل اطلاق المفترس الاكاروسي 30 فرد للنبات لمكافحة العنكبوت الاحمر *T. urticae* علي نبات الفول الصويا