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MASS PRODUCTION OF THE PHYTOSEIID PREDATOR, *PHYTOSEIULUS MACROPILIS* (ACARI : PHYTOSEIIDAE)

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Abstract

A method for mass production of the phytoseiid predator, *Phytoseiulus macropilis* (Banks) (Acari : Phytoseiidae) under a net greenhouse was described. About 4 million motile stages of the predator could be obtained when the predator was reared on bean plants, *Phaseolus vulgaris* (L.) infested with the two-spotted spider mite, *Tetranychus urticae* Koch (Acari : Tetranychidae) in a 6.5 x 25 m net greenhouse from late November 2000 to early January 2001. The produced predators were released on several strawberry fields at Ismailia Governorate for controlling the two-spotted spider mites. The production procedures is described.

INTRODUCTION

The extensive use of biological control for mite management pests is one of the main goals in the Egyptian agriculture policy. This policy requires the selection of most effective biological control agents which is suitable for mass production. Many trials were carried out in Egypt to control the two-spotted spider mite *Tetranychus urticae* Koch (Acari : Tetranychidae) by releasing of certain species of phytoseiids (Acari : Phytoseiidae) (Osman & Zohdy, 1976; Rasmy & Ellaithy, 1988; Heikal & Wahba, 1992; Heikal & Mowafi, 1998 and Heikal & Ibrahim, 2001). However, most published methods for rearing the phytoseiid predators in Egypt seemed to be suitable for laboratory studies or limited releases. In a previous publication, Heikal (2001) described two preliminary methods for mass production of the phytoseiid, *Phytoseiulus macropilis* (Banks) during different year seasons. The obtained results encouraged the continuity of studies for mass production of *P. macropilis* under a net greenhouse. The results of this study are reported here in.

MATERIALS AND METHODS

Source of the prey and predator : The initial inoculations of the prey and the predator populations were obtained from stock cultures maintained in two separated greenhouses belonging to Plant Protection Research Institute at Dokki district (Giza Governorate).

Two special net greenhouses were established at the Agricultural Research Station at Ismailia Governorate for this purpose. Each of the greenhouse dimensions were 6.5 m (width) by 25 m (length) and 2.5 m height, with a trapped-door in one side. Roof and all sides of the greenhouse were covered with dark net plastic (500 mesh). The soil of each greenhouse was well-ploughed, fertilized and treated with the recommended fungicides according to the standard commercial practices. Kidney bean seeds, *Phaseolus vulgaris* (L.) (var. Giza 3) were planted in late September, 2000 by using the double-row per bed method. The planting consisted of five beds each 25 m long. About sixty plants were grown in each bed side. Plants were watered as required using a rubber tube nozzle system. When bean seedlings reached about two weeks old, leaves infested with *T. urticae* were distributed over the new foliages. The two-spotted spider mite moved off the infested leaves to the bean seedlings. 2-3 days later, the dried bean leaves were removed. When the spider mite population reached a reasonable level (*i.e.* 40-50 motile stages/leaflet), bean plants in one greenhouse (the predator greenhouse)were inoculated with bean leaves containing the predator's individuals. The other greenhouse was kept as source of *T. urticae*. Bean plants in each greenhouse were monitored twice a week for the following purposes :

- To determine irrigation needs.
- To apply the required fertilizers.
- To observe the other pests or predators contamination.
- To keep the predator-prey ratios (in the predator greenhouse) with suitable status.

Ten leaflets per bed were sampled weekly where both the predator and prey motile stages were counted using a hand lens (20X) to determine the predator-prey ratio. When the number of spider mite was few (less than 10 individuals of prey per predator), heavy infested leaves with *T. urticae* were presented from the prey greenhouse and distributed over the bean foliage to augment the prey density. If too many spider

mites were present (more than 25 motile stages per one predator), additional predator individuals from the Dokki stock culture were distributed over the bean foliage. Ideal spider mite : predator [*Metaseiulus occidentalis* (Nesbitt] ratio was between 20 to 40 spider mite per one predator (Hoy *et al.*, 1982). The predator yield was also estimated using randomized samples of twenty leaflets/bed were weekly collected and directly examined by the hand lens where the predator motile stages were counted. Numbers of the plants present and leaflets per plant were also estimated. By this way, the predator yield (population) was nearly evaluated every week in the predator greenhouse. Weekly average temperature and relative humidity in Ismailia Governorate from late (2000) to 2*nd* week of January (2001) were recorded.

RESULTS AND DISCUSSION

Data of mass production of the predatory mite, *P. macropilis* are presented in Table 1. The population of the predator increased gradually after the predator inoculation, where the average numbers of the predators/leaflet were 1.9, 5.4, 13.1, 21.2, 29.0 and 40.8 after 1, 2, 3, 4, 5 and six weeks from the predator's inoculation date, respectively. Accordingly, the obtained yield of the predator in the greenhouse increased towards the end of the production period. Therefore, about 4,000,000 predator motile stages could be produced after 6 weeks of rearing the predator in a 6.5 x 25 m greenhouse area. The predator-prey ratios seemed to be suitable during the first three weeks of predator rearing period; however, the supplement of additional prey individuals thereafter was not sufficient as a result of shortage of the spider mite population in its production greenhouse.

The produced predator moving stages were used for release in Ismailia strawberry plantations during December 2000 to January 2001. The predators in one line were harvested every several days for release. To reduce spider mites on the collected leaflets, bean plants in the desired line usually left without adding additional *T. urticae* about 7 to 10 days before the collecting date to reduce its density in the release area.

The following procedures were important to get the ultimate prey and predator production in both greenhouses :

Table 1. Estimated yield of the predatory mite *P. macropilis* in the greenhouse at different inspection dates.

Inspection Date	Avg. no. mites/leaflet*		Estimated no. of *P. macropilis* in the greenhouse	Predator : prey ratio	Weekly average :	
	P. macropilis **	*T. urticae* **			Temp. °C	R.H. %
Nov. 29, 2000***	-	43.6	-	-	17.6	54.4
Dec., 5	1.9	38.3	188100	1:20	17.0	53.1
Dec., 12	5.4	43.7	534600	1:8.1	16.4	52.0
Dec., 19	13.1	68.1	1923900	1:5.6	15.9	50.1
Dec., 25	21.2	102.5	1296900	1:4.8	15.4	49.5
Jan. 2, 2001	29.0	142.1	2871000	1:4.9	15.1	52.1
Jan. 9	40.8	74.6	4039000	1:1.9	15.3	55.3

* Based on 50 leaflets per inspection date.

** Motile stages

*** Date of predator inoculation.

- Good preparation of the greenhouse soil before planting by well ploughing of soil to increase soil ventilation and by adding suitable amount of organic matters to increase soil fertility (Heikal, 2001).
- Applying the required fertilizers (according to the normal agricultural recommendation) and also by removing bean flowers to obtain the best bean foliage.
- Avoidance of contamination with other predators or pests (Heikal & Moussa, 1997).
- Frequence monitoring the predator-prey densities to keep them in the suitable level by adding supplementary prey or predator individuals as required.

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إنتاج المفترس الأكاروسي *Phytoseiulus macropilis* (Banks) على نطاق واسع

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تم وصف طريقة لإنتاج المفترس الأكاروسي *Phytoseiulus macropilis* على نطاق واسع تحت ظروف صوبة مغطاة بالشبك البلاستيك. وقد أمكن إنتاج حوالى ٤ مليون فرد متحرك للمفترس عند تربيته على نباتات الفاصوليا المصابة بالعنكبوت الأحمر *Tetranychus urticae* Koch داخل صوبة بلاستيك أبعادها ٦,٥ × ٢٥ متر وإرتفاع حوالى ٢ متر فى الفترة من نوفمبر ٢٠٠٠ حتى يناير ٢٠٠١ . وقد تم إستخدام أفراد المفترس التى تم إنتاجها فى الإطلاق على زراعات الفراولة بمحافظة الإسماعيلية لمكافحة العنكبوت الأحمر.