ECONOMIC INJURY LEVEL FOR THE TWO SPOTTED SPIDER MITE *TETRANYCUS URTICAE* KOCH
2-ON CUCUMBER UNDER PLASTIC HOUSE CONDITIONS

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Abstract

To estimate economic injury level "EIL" for the two spotted mite, *Tetranycus urticae* Koch on cucumber artificial infestation in general average rate 1, 2, 5 and 10 individual mite /inch^2 were achieved in four separate green plastic houses besides the control one. The experiment was carried out through the two successive seasons, 02-2003 and 03-2004 and with four replicates for each infestation rate, at private farms in Serapium district, Ismailia governorate. The effect of mite on crop yield was evaluated quantitatively. The effect of mite on crop quality was reflected on market's prices. Crop was harvested just after ripping and reaching the suitable marketing size (about 12 cm.long.), weighed and marketed. Management costs, including labour, acaricides and equipment renting price were calculated. Through the first season the yields were 2359, 2066, 1757, and 1323 kg./plastic house , representing 18,28.19,38.93 & 54.0 % reduction in yield under the infestations levels of 1, 2, 5 and 10 mites /inch ^{2} respectively, compared to that of uninfested plastic house that reached 2877 kg./ plastic house. The corresponding figures in the second season were 1843, 1571, 1272, and 1006 kg. / Plastic house representing 20.49, 32.23, 45.13, and 56.6% reductions in yield, compared with that of (2318 kg./ plastic house). Management costs were 171.58 and 157.9 LE throughout the two growing seasons 02-2003 and 03-2004, respectively. The respective fruit prices for kg were 1.1 and 0.92 L.E throughout the two growing seasons 02-2003 and 03-2004, respectively. Economic injury level (EIL) ranged from 1.31 to 1.52 mites /inch^2. These values of (EIL) could be used as a guideline in the profit of mite control management of cucumber plants under plastic house condition.

INTRODUCTION

Although cucumber plants are attacked by several pests, causing great damage, yet it is still preferable for the farmers as cash crop and for consumers as delicious vegetable (Radin and Drummond 1994, El-Maghraby *et al.* 1995, Bulut and Gocmen 2000, Boll *et al.* 2001, and Bichta Tomczyk 2002), Therefore the cultivated area with this crop steadily increases seasonally especially with the wide use of plastic houses.

However, this new technique of planting aggravates the problem of pests because of its high temperature and humidity conditions. Farmers generally rely on pesticide application to control pests of plastic houses, as the bio – control application is usually restricted during the fruit period. (Tommasini and Nicoli 1996 and Shipp and van houten 1996). Owing to the miss use of pesticides, pest problems become more complicated (Clarke *et al.,* 1994), because of the high cost of pest control, national pest management strategy is needed. Economic injury level (EIL) "The lowest number of insects that will cause economic damage, or the minimum number of insects that would reduce yield equal to the gain threshold." is the sufficient parameter economically& environmentally. This parameter may be varied from region to another and from season to season, but still as a good indicator for pest control.

The objective of this study is to establish an economic injury level (EIL) for the two spotted spider mite *Tetranycus urticae* Koch, the serious pest on cucumber, based on certain level of infestation, costs of the pest control and revenues of fruit marketing.

MATERIALS AND METHODS

Experiment was carried out at a private farm in Serapium district, Ismailia government, throughout the two growing seasons 02-2003 and 03 – 2004. Two weeks old, cucumber seedlings (Varity El Madena were transplanted on 20th November 2002 and on 23rd November 2003, under plastic houses, of 40 x 9 x 3.2 meters each. Plants were spaced 50cm apart 5 rows per plastic house. Each row was planted on both sides. Each plastic house contains about 700 plants. Normal agricultural treatments were practiced. Plants were exposed to artificial infestation by the mite, with general rates of infestation estimated by 1, 2, 5 and 10 *T. urticae* mite individuals /inch^2. *in* four separated plastic houses. Four replicates were used for each level of infestation, besides the control one that was treated with the recommended acaricides. Plants were checked every three days. Pest management's costs, for the control plastic house including labour, acaricides, and equipment renting prices were calculated. The ripping crop was harvested, weighed and marketed. The income (market value) was recorded. All obtained data were statistically analyzed. The economic injury level (EIL) of the two spotted spider mite was calculated according to the formula of Pedigo (1989) which is used for piercing – sucking pests.

EIL = C/V X b where

C = cost of pest management per area.

V = market value per unite.

b = yield loss/insect

N. B: b coefficient is obtained from statistical regression analyses of data by using experimental populations and measuring yield losses. The "b" coefficient can be obtained from the following expression:

Y= a + b x   where Y = yield area, a = constant (the y intercept) b = yield loss / insect and x = number of insets / area.

RESULTS AND DISCUSSION

Data presented in tables 1&2 showed that cucumber crop started ripping and reached the suitable size for marketing on the 4th and 7th of January and ended on the 13th and 17th of May throughout the two growing seasons 02-2003 and 03-2004, respectively. The crop was collected 30 times throughout 2003, and 28 times throughout 2004. Data obtained revealed that the mite affected the crop yield. This effect depended on the level of infestation that was in turn reflected on the total weight of marketable crop. Through the first season the crop yields were 2359, 2066, 1757, and 1323 kg./plastic house, representing 18,28.19,38.93 & 54.0 % reduction in yield under the infestations levels of 1,2,5 and 10 mites /inch ^{2}, respectively, compared with that of uninfested plastic house (zero mites/ inch ^{2}) that reached 2877 kg./ plastic house through 02/2003 . The yields through 03/2004 were 1843, 1571, 1272, and 1006 kg /plastic house representing 20.49, 32.23, 45.13, and 56.6 reduction, under the infestation levels of 1, 2, 5 and 10 mites /inch ^{2}, respectively, compared with that of uninfested plastic house that reached 2318 kg./plastic house.

(Hussey and Parr 1963) recorded that *Tetranychus urticae* caused 30% cucumber leaf surface damage that led in turn to yield loss.

In that management costs were 171.58 and 157.9 LE throughout the two growing seasons 02-2003 and 03-2004, respectively. The difference in such management costs during the two growing seasons referred to the variation in the number of acaricides' applications. Fruit price for kg were 1.1 and 0.92 L.E throughout the two growing seasons, respectively.

Based on current management and fruit price and by using Pidgo formula (1989) EIL = C/V X b, the economic injury level ranged from 1.3 to 1.52 mite individuals /inch^2. The aforementioned data revealed that the current management , fruit prices and EIL values were not widely varied and therefore, the obtained EIL value for the mite *T. urticae* could be used safely as a critical level for the control of this pest

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Table 1. Effect of certain levels of infestation with the two spotted spider mite on cucumber crop yield under plastic house conditions throughout the growing season 02 – 2003 in Ismailia Governorate

Date of cropping	Price kg/L.E	Control Yield/ plastic house kg	Level of infestation			
			$1/inch^{2*}$ Yield/ plastic house kg	$2/inch^{2*}$ Yield plastic house kg	$5/inch^{2*}$ Yield/ plastic house kg	$10/inch^{2*}$ Yield/ plastic house kg
4/1	1.35	34	34	25	31	21
11/1	1.35	80	61	61	50	38
17/1	1.20	88	63	69	47	31
22/1	1.00	70	53	51	44	33
25/1	1.00	99	86	63	73	55
29/1	1.00	32	31	23	25	19
3/2	1.00	63	39	21	30	23
6/2	1.00	56	43	45	39	28
9/2	1.10	76	51	59	44	31
12/2	1.10	81	48	61	36	27
14/2	1.25	90	91	69	73	51
18/2	1.25	100	96	72	77	61
20/2	1.20	152	115	103	89	68
26/2	1.35	128	123	93	111	83
29/2	1.30	107	101	83	93	71
4/3	1.25	126	121	91	90	69
10/3	1.25	129	118	96	77	59
13/3	1.30	154	121	108	91	69
20/3	1.25	159	138	111	92	73
25/3	0.85	137	114	103	74	53
28/3	0.80	89	63	76	57	43
1/4	0.80	89	77	73	53	39
3/4	0.80	128	114	99	75	57
8/4	0.70	131	128	96	76	59
10/4	0.70	65	46	49	28	24
15/4	0.70	102	64	81	53	39
22/4	0.70	73	53	60	19	16
29/4	0.60	108	97	81	73	59
6/5	0.50	85	45	23	23	15
13/5	0.60	46	25	21	14	9
		2877	2359	2066	1757	1323
LSD	322.012					

* Mites / $inch^2$

Table 2. Effect of certain levels of infestation with the two spotted spider mite on cucumber crop yield under plastic house conditions throughout the growing season 03 – 2004 in Ismailia Governorate

Date of cropping	Price kg/L.E	Control	Level of infestation			
			1/inch^{2}*	2/inch^{2}*	5/inch^{2}*	10/inch^{2}*
		Yield/ plastic house Kg	Yield/ plastic house kg	Yield/ plastic house kg	Yield/ plastic house kg	Yield/ plastic house kg
7/1	1.50	7.0	8.0	7.0	4.0	5.0
10/1	1.50	22.0	18.0	15.0	12.0	10.0
12/1	1.50	23.0	19.0	17.0	12.0	8.0
17/1	1.20	56.0	41.0	33.0	27.0	21.0
21/1	1.20	110.0	80.0	66.0	50.0	41.0
23/1	1.50	93.0	75.0	65.0	43.0	35.0
29/1	1.00	91.0	66.0	57.0	43.0	33.0
5/2	1.00	106.0	87.0	73.0	66.0	51.0
7/2	1.00	113.0	100.0	87.0	71.0	56.0
9/2	0.85	149.0	98.0	85.0	60.0	46.0
13/2	0.85	105.0	84.0	75.0	67.0	53.0
18/2	0.60	118.0	101.0	76.0	73.0	51.0
24/2	0.60	183.0	141.0	119.0	97.0	79.0
28/2	0.80	191.0	143.0	125.0	111.0	86.0
5/3	0.95	150.0	135.0	116.0	99.0	91.0
9/3	0.95	147.0	127.0	101.0	93.0	73.0
14/3	0.93	133.0	113.0	93.0	81.0	65.0
20/3	0.91	153.0	117.0	103.0	80.0	64.0
22/3	1.00	70.0	56.0	53.0	41.0	30.0
27/3	1.00	59.0	48.0	43.0	38.0	29.0
1/4	1.00	51.0	41.0	37.0	31.0	25.0
6/4	0.70	42.0	31.0	25.0	18.0	11.0
15/4	0.70	43.0	36.0	30.0	21.0	15.0
22/4	0.70	26.0	19.0	14.0	9.0	8.0
2/5	0.40	23.0	17.0	13.0	9.0	9.0
9/5	0.40	18.0	14.0	9.0	6.0	4.0
11/5	0.40	15.0	13.0	11.0	5.0	2.0
17/5	0.40	21.0	15.0	13.0	5.0	5.0
		2318	1843	1571	1272	1006
LSD		244.446				

* Mites / inch^{2}

حد الضرر الاقتصادى للعنكبوت الأحمر ذو البقعتين تترانكس يورتيكا
(٢) على الخيار تحت ظروف الزراعة المحمية

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إستخدمت أربعة مستويات للاصابة بالعنكبوت الأحمر ١ و ٢ و٥ و١٠ – فـردا/بوصــة مربعة بالاضافة إلى المقارنة الخالية من الاصابة لتقدير حد الضرر الاقتصادى للعنكبوت الأحمـر على نباتات الخيار المنزرعة تحت الصوب فى مزرعة خاصة بمنطقة سرابيوم بمحافظة الإسماعيلية خلال موسمى ٠٢ –٢٠٠٣ و ٠٣– ٢٠٠٤ .

تم دراسة تأثير العنكبوت الأحمر على كمية المحصول أما التأثير على جــودة المحصـول فينعكس على سعر البيع. تم جمع المحصول بمجرد النضج وبلوغه الحجم المناسب للتسويق (متوسط الطول ١٠سم) ثم الوزن والتسويق٠ ثم حساب تكاليف المكافحة (تشمل أجور عمال وثمن المبيـدات الأكاروسية وايجار موتور الرش) . وزن المحصول الذى تـم الحصــول عليــه ٢٣٥٩، ٢٠٦٦، ١٧٥٧، ١٣٢٣ لكل صوبة تمثل ١٨ ، ٢٨,١٩ ، ٣٨,٩٣ ، ٥٤ % نقصا فى المحصـول مقارنــة بمحصول الصوبة الخالية من الاصابة (٢٨٧٧ كيلو جرام) ، تحت مستويات الاصابة بـالعنكبوت الأحمر ١ ، ٢ ، ٥ ، ١٠ فرد عنكبوت/ البوصة المربعة على الترتيب خـلال موسـم النمـو ٠٢– ٢٠٠٣،بينما كان وزن المحصول الذى تم الحصول عليه ١٨٤٣ ، ١٥٧١ ، ١٢٧٢ ، ١٠٠٦ كيلو جرام لكل صوبة تمثل ٢٠,٤٩ ، ٣٢,٢٣ ، ٤٥,١٣ ، ٥٦,٦ % نقصـا فـى المحصـول مقارنــة بمحصول الصوبة الخالية من الاصابة (٢٣١٨ كيلو جرام)تحت مستويات الاصابة بالعنكبوت الأحمر ١ ، ٢ ، ٥ ، ١٠ فرد عنكبوت/ البوصة المربعة على الترتيب خلال موسم النمو ٠٣–٢٠٠٤

بلغت تكاليف المكافحة ١٧١,٥٨ جنيه مصرى خلال الموسم ٠٢ –٢٠٠٣ فى حين بلغـت ١٥٧,٢٩ جنيه مصرى خلال الموسم ٠٣–٢٠٠٤ . بلغ متوسط سعر الكيلــو ثمـار ١,٠١ جنيـه ، ٠,٩٢ جنيه خلال موسم ٢٠٠٢-٢٠٠٣-٢٠٠٤ على الترتيب. ترواح حـد الضــرر الاقتصــادى للعنكبوت على نباتات الخيار المنزرعة فى الصوب ما بين ١,٣١– ١,٥٣ فرد عنكبــوت / بوصــة مربعة . يمكن الاستدلال بهذه القيمة كحد ربح مكافحة العنكبوت الاحمر على نباتات الخيار المنزرع تحت الصوب.

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