

EFFECT OF SOME BIO-INSECTICIDE (BIOFLY-BEMBISTOP), PLANT EXTRACT (ASHOK), INSECTICIDE (SELECRON), PREDATOR, IG (DESOLEKEN), AND NATURAL OIL ON QUALITY CHARACTERS OF TOMATO PLANTS AND CHEMICAL CHARACTERS OF TOMATO FRUITS

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ABSTRACT

One cultivar of tomato plant "Castle Roach" cultivated at Fayoum Governorate to evaluate the effect of some bio-insecticides, insecticides, predator, IG and Natur'l oil on tomato fruits contents of chlorophyll "A", "B", carotene, lycopene and some quality properties.

Data indicated that Selecron 72 %, Ashok (plant extract) and Bembostop (bio-insecticide) showed the highest contents of carotene and lycopene concentration (0.61, 0.61 and 0.6 mg/100 g fresh weight) for carotene, and (1.1, 1.03 and 0.99 mg/100 g fresh weight) for lycopene, respectively at last stage of ripeness, canning stage (red). On the other hand, the Selecron 72 %, Ashok, Desoleken (IG) enhanced the highest number of fruits/plant (29 ± 4.4 , 24.67 ± 10.8 and 17.67 ± 1.7 , respectively). While Bembostop, Selecron 72 % and *Caranus africana* (predator) favoured highest fruit weight (56.93 ± 11.95 , 53.35 ± 32.9 and 52.45 ± 25.1 g, respectively). There were no significant differences between the concentration of chlorophyll "A", "B", carotene and lycopene in the three stages of ripeness at all treatments.

INTRODUCTION

Tomato (*Lycopersicon esculentum* L.) is an important vegetable crop in Egypt. Tomato plants are attacked by whitefly [*Bemisia tabaci* (Genn.)], causing big damage both in quantity and quality (Iskander, 1992). So, tomato plant must be sprayed with insecticide of low toxicity, bio-insecticide, predator, Natur'l oil, or plant extract. The ripeness stage of tomato fruits are : a) mature, green, b) breaker (appearance of pink colour), c) light pink (equal amount of green and pink), d) dark pink (no green, entirely pink), and at last e) canning (red) colour (Abdel-Kader *et al.*, 1968).

The stage of single fruits were averaged three days for each sample to obtain a ripeness stage.

Chlorophyll "B" is formed from chlorophyll "A", and the carotenoid pigments include total carotene and lycopene which increased gradually in concentration, during the stages of ripening progress (Wagih, 1974). Meredith

and Purecell (1966) found that the lycopene content in some varieties of tomato was 0.82 mg/100 gm fresh weight.

Therefore, the aim of this work is to determine the effect of applying Bembestop (bio-insecticide), Ashok (plant extract), Biofly (bio-insecticide), Natur'l oil 93 %, Desoleken, *Caranus africana* (predator) and Selecron (insecticide) on the :

- a) concentrations of chlorophyll "A", "b", carotene and lycopene during three ripeness stages [mature green, light pink, and canning (red)].
- b) The no. of days pre-flowering, no. of flowers/plant, no. of fruits/plant, fruit size (height and diameter) and fruit weight.

MATERIAL AND METHODS

1- Experiments :

Field experiments were carried out during the seasons of the year 2001 at Fayoum Governorate. Tomato was transplanted on first August. An area of two feddan was cultivated with the "Castle Roach" cultivar of tomato, this area was divided into plots of about 125 m² each, the necessary agricultural practices were followed out except treatments. Each treatment and control was replicated four times in completely randomized blocks design.

2- The treatments were as follow :

- a- Bembestop 48 % (bio-insecticide) at rate 125 ml/100 L water.
- b- Ashok (plant extract) at rate 187.5 ml/100 L water.
- c- Biofly (*Beauveria bassiana*) 30×10^6 cells/ml at rate 100 ml/100 L water.
- d- Natur'l oil (93 % EC) at rate 625 ml/100 L water.
- e- Desoleken 70 % at rate 132 ml/100 L water.
- f- *Caranus africana* (predator) at rate one adult/plant.
- g- Selecron 72 % EC (profenofos) at rate 187.5 ml/100 L water.
- h- The control (sprayed with water only).

3- Growth parameters :

- a- No. of days from transplanting to the appearance of the first flower was recorded.
- b- No. of flowers per plant were counted daily for three plants of each treatment.
- c- At the last stage of ripeness (canning), the fruits were collected at random, and counted for each plant.
- d- The size of fruits (height, diameter), and the weight were measured for each treatment for canning stage.

4- Determination of pigments in fruits :

a- Extraction and separation of pigments was carried as follow :

From the three stages of ripeness for each treatment, one kg of tomato fruits was cut, and a 5 g homogenized for 5 min. in blender together with 100 ml. acetone : hexane (6 : 4) and 0.1 g magnesium carbonate, then the homogenate was filtered and the residue was washed with 25 ml portions of

acetone then with 25 ml hexane and transferred to separating funnel. The pigments were separated according to the method of A.O.A.C. (1965).

b- Colorimetric determination :

- 1- Colorimetric determination of carotene pigment was carried out for the whole extract in 1 cm glass cuvette at two wave lengths 450 mu and 471 mu. The blank was [hexane : acetone (9 : 1)].
- 2- Colorimetric determination of lycopene was carried at 450 mu, 471 mu, and 510 mu.

The contents of both pigments (carotene and lycopene) were calculated from the following equation :

$$C = \frac{E_2 e_1 - E_1 e_2}{e_2 - e_1 e_2}$$

where :

e_1 = Extinction coefficient of carotene by wave length 450 mu = 2500

e_2 = Extinction coefficient of carotene by wave length 471 mu = 2179

e_1 = Extinction coefficient of lycopene by wave length 471 mu = 2381

e_2 = Extinction coefficient of lycopene by wave length 450 mu = 1780

E_2 = Optical density of tomato extract in hexane- acetone by wave length 471 mu.

E_1 = Optical density of tomato extract in hexane- acetone by wave length 450 mu.

3- Determination of chlorophyll "A" and "B" :

Tomato extract was carried out colorimetrically at 400, 645 and 662 mu.

The formula of Nybom (1955) was used for the determination of chlorophyll "A", and "b" from the following equations :

•Concentration of chlorophyll "A" = 9.78 .o.D. at 662 - 0.99 .o.D. at 645.

•Concentration of chlorophyll "B" = 21.4 .o.D. at 645 - 4.65 .o.D. at 662.

Data were recorded and statistically analysed (Senedecor, 1961).

RESULTS AND DISCUSSION

1-The effect of different treatments on chlorophyll "A" and "B" contents :

Results presented in Table (1) show the concentration of chlorophyll "A" and "B" through the three stages of ripeness [mature green, light pink and canning (red)]. The highest concentration of chlorophyll "A" in the first stage (mature green) was Selecron 72 % (2.99 mg/100 g fresh weight), followed by *Caranus africana* (2.9 mg/100 g fresh weight), Ashok (2.64 mg/100 g), Natur'l oil (2.52 mg/100 g), Desoleken (2.46/100 g), Bembistop (2.35 mg/100 g) and the lowest one Biofly (2.29 mg/100 g fresh weight), respectively. All treatments increased compared to control by ratios of 113.6 %, 107.1 %, 88.6 %, 80.0 %, 75.7 %, 67.99 % and 63.6 % for Selecron, predator, Ashok, Natur'l oil, Desoleken, Bembistop and Biofly, respectively. The concentration of chlorophyll "A" was decreased gradually as the stages of ripening

progressed in different treatments (Wagih, 1974). They became 0.1, 0.18, 0.18, 0.15, 0.18, 0.17, 0.16 and 0.11 mg/100 g fresh weight) for canning (red) stage by decreasing ratio (92.85 %, 92.34 %, 93.18 %, 93.45 %, 92.86 %, 93.1 %, 94.48 % and 96.32 %) for control, Bembistop, Ashok, Biofly, Natur'l oil, Desoleken, *Caranus africana*, and selecron, respectively from the first stage (mature green). So, the sharp drop in chlorophyll "A" content of the fruit is an indication of the early ripening especially in the case of Seleccion.

It is well known that chlorophyll "B" is formed from chlorophyll "A" by the breakdown of it.

The *Caranus africana* gave the highest concentration of chlorophyll "B" in the first stage of ripeness (5.7 mg/100 g fresh weight), followed by Ashok (5.06 mg/100 g), Natur'l oil (4.8 mg/100 g), Desoleken (4.69 mg/100 g), Bembistop (4.47 mg/100 g), Seleccion (4.36 mg/100 g) and the lowest control was Biofly treatment (4.21 mg/100 g fresh weight). These contents were decreased during the stages of ripeness by ratio (91.43 %, 92.39 %, 93.28 %, 93.11 %, 92.92 %, 93.18 %, 94.39 % and 91.51 %) for control, Bembistop, Ashok, Biofly, Natur'l oil, Desoleken, *caranus africana*, and Seleccion, respectively at last stage of ripeness (red).

2- Effect of different treatment on carotene and lycopene content in the three stages of ripeness :

The carotenoid pigments included total carotenes and lycopene. Carotene consider as the provitamin "A" which oxidized to retene by carotene oxidase, then reduced to vitamin "A" by alcohol dehydrogenase, and it consist of condense of units of isoprene and phytol alcohol, phytol alcohol found in the composition of chlorophyll. Three hypothesis have been proposed to account for this synthetic relationship. One proposed that carotenoids were involved in chlorophyll synthesis, another, that phytol was a precursor in carotenoid synthesis, and the third, that both phytol and carotenoids were synthesized by common pathway (Ramirez and Tomes, 1964). The first theory of biogenesis of the carotenoid in tomato juices was advanced by Porter and Lincoln (1950).

Data in Table (2) was showed the concentration of carotene and lycopene which increased as the stages of ripening progressed in different treatments. The relative of concentration of carotene for each treatment to control in the first stage (mature green) were (168 %, 156 %, 152 %, 144 %, 140 %, 124 % and 112 %) for Ashok, Desoleken, Bembistop, Seleccion, Biofly, *Caranus africana*, and Natur'l oil, respectively. On the other hand, the concentration of carotene increased gradually through three stages, by ratio (60.00 %, 57.89 %, 45.24 %, 25.71 %, 57.14 %, 51.60 % and 69.44 %) in the canning stage for control, Bembistop, Ashok, Biofly, Natur'l oil, *Caranus africana*, and Seleccion; except in the case of Desoleken the concentration of carotene was decreased by ratio (10.2 %) of the original concentration.

Table (1): Chlorophyll (A), and (B) contents of the fruits of tomato variety "Castle Roach" in different treatments (mg/100 g fresh weight) during three stages of ripening (mature green, light pink and canning red).

Treatments	Rate/fed.	Chlorophyll "A"						Chlorophyll "B"					
		Mature green	Light pink	Canning red	Mature green	Light pink	Canning red	Mature green	Light pink	Canning red			
Control	water (400 L/fed.)	1.40	1.00	0.10	3.50	2.50	0.30						
Bembistop 48 %	125 ml/100 L water	2.35	1.23	0.18	4.47	2.35	0.34						
Ashok (plant extract)	187.5 ml/100 L water	2.64	1.12	0.18	5.06	2.05	0.34						
Biofly	100 ml/100 L water	2.29	1.14	0.15	4.21	2.25	0.29						
Natural oil 93 % EC	625 ml/100 L water	2.52	1.23	0.18	4.80	2.27	0.34						
Desoleken 76 %	132 ml/100 L water	2.46	1.12	0.17	4.69	2.60	0.32						
Caranus africana	One adult predator/plant	2.90	1.06	0.16	5.70	2.01	0.32						
Selecron 72 % EC	187.5 ml/100 L water	2.69	1.30	0.11	4.36	2.31	0.37						
		F = 0.077			F = 0.022			F _{0.05} = 2.66			F _{0.01} = 4.03		

Wagih (1974) found that the total carotene in the two varieties (Money Maker and Pearl Harbour) of tomato were 0.58 and 0.65 mg/100 g fresh weight at the last stage (red) and the lycopene content (0.89 and 0.97 mg/100 g fresh weight, respectively. The concentration of lycopene at the last stage (red) were (1.10, 1.03, 0.99, 0.88, 0.81, 0.77, 0.69 and 0.68 mg/100 g fresh weight) for Selecron, Ashok, Bembistop, Natur'l oil, *Caranus africana*, Biofly, Desoleken and control), respectively by increasing ratio of the first stage (83.33 %, 80.70 %, 52.31 %, 29.41 %, 12.50 %, 30.51 %, 16.95 % and 51.10 % for the previous treatments, respectively.

Meredith and Purecell (1966) found that the lycopene content in some varieties of tomato fruits was 0.82 mg/100 g fresh weight. Yamaguchi *et al.* (1960) gave figures of 0.21, 0.41, 0.78 and 0.82 mg/100 g fresh weight for lycopene in tomato fruits. Higher figures were recorded in the late stage of ripening, while low one were found in the early stage of ripeness. There were no significant difference between the concentration of chlorophyll "A", "B", carotene and lycopene of three stages of ripeness and treatments.

3- Effect the treatments on flowering, setting of plant, size of fruits, and weight of fruit :

Results given in Table (3) showed that :

a) The number of days from transplanting to appearance of flowers average between 60-68 days between all treatments and control except in the case of Selecron (50 days). The highest number of flowers in the case of *Caranus africana* and Desoleken (10.6±4.59 and 10.4±3.5 flowers/plant), and the lowest one on Biofly (5.0±2.28) and control (5.6±2.69 flowers/plant). El-Beltagy *et al.* (1979) found taht significant increase in yield occurred by several treatment of growth regulators.

b) The highest number of fruits which set on the plant in case of Selecron (29.0±9.42) followed by Ashok (24.67±10.87), Desoleken (17.67±1.7), Biofly (15.67±2.64), Bembistop (15.5±3.07), Natur'l oil (14.67±6.65), and the lowest one *Caranus africana* (13.67±3.07). Kravchenko (1981) found that the no. of fruits/plant and per truss were the major variable affecting yield.

The fruit height was increased by treatments compared with control (3.5±0.37 cm), and its average between 4-5 cm through treatments. Also, the fruit diameter was bigger than control (2.16±0.17 cm) and it was averaged from 2.17 to 3.83 cm between treatments.

The Bembistop treatment gave the highest height of fruit (56.93±11.95 gm), followed with Selecron (53.35±32.9 g), *Caranus africana* (52.45±25.1 g), Natur'l oil (40.35±13.85 g), Biofly (36.4±11.69 g), Ashok (35.23±11.4 g) and the lowest one Desoleken (32.57±5.34 g).

Sweting and Grogson (1972) found that the application of GA3 produced tomato fruit of at least 50 % larger in size and fresh weight when compared with control.

From the previous results, it can be concluded that Selecron 72 %, Bembistop and Ashok were the best treatments which gave the highest concentration of carotene and lycopene, no. of fruits per plant and weight of fruit.

Table (2): Carotene and lycopene content of the fruits of tomato variety "Castle Roach" in different treatments (mg/100 g fresh weight) during three stages of ripening (mature green, light pink and canning red).

Treatments	Rate/fed.	Ripening score					
		B-Carotene			Lycopene		
		Mature green	Light pink	Canning red	Mature green	Light pink	Canning red
Control	water (400 L/fed.)	0.25	0.32	0.40	0.45	0.50	0.68
Bembistop 48 %	125 ml/100 L water	0.38	0.35	0.60	0.65	0.55	0.99
Ashok (plant extract)	187.5 ml/100 L water	0.42	0.34	0.61	0.57	0.73	1.03
Biofly	100 ml/100 L water	0.35	0.36	0.44	0.59	0.60	0.77
Natural oil 93 % EC	625 ml/100 L water	0.28	0.40	0.44	0.68	0.70	0.88
Desoleken 76 %	132 ml/100 L water	0.39	0.33	0.35	0.59	0.67	0.69
Caranus africana	One adult predator/plant	0.31	0.37	0.47	0.72	0.77	0.81
Selecron 72 % EC	187.5 ml/100 L water	0.36	0.53	0.61	0.60	0.72	1.10
		F = 0.093			F = 0.9488		

Table (3): Effect of different treatments on time of flowering, no. of flowers per plant, no. of fruits per plant, no. of fruits per plant, fruit size (height, diameter) and fruit weight of tomato plant (Castlr Roach variety).

Treatments	Rates	No. of days until flowering	No. of flowers per plant	No. of fruits per plant	Fruit height (in cm)	Fruit diameter (in cm)	Fruit weight (in gram)
Control	water (400 L/fed.)	60	5.6±2.69	14.67±3.07	3.50±0.37	2.16±0.17	33.00±1.90
Bembistop 48 %	125 ml/100 L water	65	9.8±0.74	15.50±3.07	5.00±0.82	2.63±0.41	56.93±11.95
Ashok (plant extract)	187.5 ml/100 L water	62	8.0±0.65	24.67±10.87	4.83±0.85	2.80±0.21	35.23±11.4
Biofly	100 ml/100 L water	65	5.0±2.28	15.67±2.64	4.00±0.41	3.00±0.82	36.40±11.69
Natural oil 93 % EC	625 ml/100 L water	65	8.60±6.65	14.67±6.65	4.90±0.74	3.83±0.82	40.35±13.85
Desoleken 76 %	132 ml/100 L water	65	10.4±3.50	17.67±1.70	4.33±0.47	2.17±0.24	32.57±5.34
Caranus africana	One adult predator/plant	68	10.6±4.59	13.67±3.09	4.67±0.62	3.00±0.35	52.45±25.1
Selecron 72 % EC	187.5 ml/100 L water	50	9.4±2.65	29.0±9.42	4.50±0.41	2.17±0.24	53.35±32.9

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تأثير بعض المبيدات الحيوية (بيوفلاي، بيمبيستوب)، المستخلص النباتي (أشوك)، مبيد (سيليكرون)، ومفترس حشري، زيت طبيعي، ديسولكين على صفات الجودة لثمار الطماطم وبعض الصفات الكيميائية لثمار الطماطم
سعاد على إبراهيم
معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الدقى-الجيزة، مصر.

زرع صنف الطماطم "كاسل روك" فى محافظة الفيوم فى أول أغسطس ٢٠٠١ وذلك لتقدير تأثير بعض المعاملات الحيوية (بيوفلاي، بيمبيستوب)، المستخلص النباتي (أشوك)، مبيد السليكرون ٧٢ %، المفترس الحشري *Caranus africana*، زيت طبيعي، ديسولكين على محتوى نباتات الطماطم من الكلوروفيل أ و ب، الكاروتين، الليكوبين، بعض صفات الجودة للثمار (وقت الإزهار، عدد الثمار/نبات، حجم الثمرة، الارتفاع والقطر، وزن الثمرة). ودلت النتائج على

- ١- أعطى السليكرون ٧٢ %، أشوك، بيمبيستوب أحسن النتائج لتركيز الكاروتين، الليكوبين. وكان تركيز الكاروتين (٠,٦١، ٠,٦١، ٠,٦٠ مجم/١٠٠ جم طماطم طازجة) على الترتيب، بينما كان تركيز الليكوبين (١,١٠، ١,٠٣، ٠,٩٩ مجم/١٠٠ جم طماطم طازجة) على الترتيب وذلك فى اخر مراحل النمو (الأحمر).
- ٢- من ناحية أخرى، أعطى السليكرون ٧٢ %، أشوك، ديسولكين أعلى عدد ثمار/نبات طماطم (٤,٤±٢٩، ٤,٦٧±٢٤,٨٧، ١,٧±١٧,٦٧) على الترتيب.
- ٣- أعطى بيمبيستوب، سيليكرون ٧٢ %، المفترس أعلى وزن للثمرة (١١,٩٥±٥٦,٩٣، ٣٢,٩±٥٣,٣٥، ٢٥,١±٥٢,٤٥ جرام) على الترتيب. ولا يوجد فرق معنوي بين تركيز الكلوروفيل أ، ب، الكاروتين، الليكوبين فى ثلاث مراحل للنمو فى جميع المعاملات.