

EVALUATION OF SOME BIOINSECTICIDES AGAINST *BEMESIA TABACI* (GENN.) And EFFECT ON YIELD COMPONENT OF CUCUMBER

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Abstract

Bemisia tabaci (Genn.) is considered the main factor of yellow leaf curl virus for cucumbers and other crops such as tomato, pepper, aubergine, okra, soybean, cotton and ornamental plants. Field trials were conducted in Fayoum Governorate, district of Fayoum on four cucumber varieties in four transplantations dates; 1 / 3, 1 / 4, 1 / 9 and 1 / 10 / 2011 to study the efficiency of the bioinsecticides, Mycotal (*Verticillium lecanii*), Biosect (*Beauveria bassiana*) and their mixture as well as Capel 2 E.C against the second instar nymphs of the whitefly *B. tabaci*. Tested cucumber varieties were Medina, Amara, Dama and Maram.

In that concern, Dama variety proved to be less sensitive and the mean of reduction was (79.8%) and Amara was more sensitive showing reduction rate of (94.7%) in 1 / 3 / 2011.

INTRODUCTION

Cucumber (*Cucumis sativus* L.) is one of the most important vegetable crops cultivated in or outdoors plantations. Fayoum Governorate is one of the most important Governorates in planting vegetables either for export or consumption. *B. tabaci* (Genn.) is one of the most important pests attacking tomato plants. *B. tabaci* (Gennadius) (Hemiptera: Aleyrodidae), B and Q whiteflies, have been invading many parts of the world (Tsueda and Tsuchida 2011). Recently *Bemisia tabaci* is the main factor of tomato yellow leaf curl virus (TYLCV) transmit that severely invaded tomato, cucumber, eggplants and pepper. (Fargalla *et. al.*, 2011). (Rao *et. al.*, 2008) reported that cucurbit yellow stunting disorder virus (CYSDV) and the whitefly-transmitted closterovirus, affects extensively cucurbit crops in many warm and temperate areas of production worldwide.

In Egypt, *B. tabaci* can complete its development on 118 species of plants in 79 genera belong to 28 families, (Abd-Rabou, and Simmons, 2010). *B. tabaci* represents a complex of cryptic species that causes losses of many valuable crops. Even though there are differences in their ability to colonize hosts, transmit phyto virus and develop resistance to insecticides, (Fontes *et. al.*, 2012). Although extensive research about biological control of whitefly by parasitoids and predators has been conducted, entomopathogenic fungi can be considered as potential biological control agents, (Scorsetti *et. al.*, 2008).

The aim of this study was to control *B. tabaci* with entomopathogens as alternative to pesticides.

MATERIALS AND METHODS

The experiment were conducted in different sowing dates 1 / 3, 1 / 4 /, 1 / 9 and 1 / 10 / 2011. Four varieties of cucumber (Madena, Amera, Dama and Maram) were sown in foam trays under plastic tunnels in Seedling Section Unit, Department of Agriculture, Fayoum Governorate. The seedlings were transplanted at 30 days age. The area was divided into four equal replicates of (3 m x 80cm) per replicate for each treatment. Treated and untreated plots were arranged in a complete randomized block design, receiving routine agriculture practices. Tested biocides were Mycotal (*Verticillium lecanii*), Biosect (*Beauveria bassiana*), their mixture and Caple 2. The biocides were applied after 30 days from transplanting date. A motor of high pressure knapsack sprayer was used for applying the biocides, as a foliar treatment diluted with water as recommended, Mycotal 1g / l, Biosect, 2g / l, their mixture and Caple 2, 2.5 ml / liter water. To estimate the percentage of infestation with *B. tabaci* 15 leaves / replicate were collected at random. Sampling was done before spraying and after 3, 5, 7, 10 and 15 days early morning. Population density of the second instar nymphs was calculated by transplanting the plant leaves in paper bags to the laboratory for inspection with the aid of stereomicroscope. To evaluate of tested compounds against *B. tabaci*, population density currently estimated, calculated and corrected according to the formula of Henderson and Telton (1955). Data were analyzed by 1- way analysis of variance (ANOVA), analysis of variance and LSD values were obtained at 0.05 level, using SAS program (SAS Institute, 1988). Means were separated by Duncan's multiple range tests. Reduction and the mean reduction percentages were based on the overall mean population within 15 days.

Harvesting of fruits starting after 45 days from the transplanting date and ended after 90 days in all experiments. Before harvesting, ten plants from each replicate were randomly collected for average number of fruits / plant, fruit length (cm), fruit diameter (cm) and weight of fruit (gm).

RESULTS AND DISCUSSION

Data in tables 1- 4 show that cucumber was highly infested by *B. tabaci*. The infestation ranged between (45.5 to 90.0 nymphs / 15 leaves in different dates of cultivations. Lowest infestation occurred in variety Madena, ranged between 32.4 to

64.2 / 15 plant leaves in different cultivation dates, while Amera and Dama varieties had moderate infestations in this respect.

Concerning the cultivation date, lowest infestation occurred in 1/ 3/ 2011transplantation, while the highest one was reported in 1 / 10 / 2011, as presented in tables (1, 2, 3 and 4).

Statistical analysis of the obtained data show significant differences in the white fly infestations of the four testing varieties. The effect of different bio-insecticides on the population of the whitefly is presented in tables 1-4. All bio-insecticides significantly reduced the population density of the pest as compared with the untreated control. The results indicated a high and rapid reduction in insect density 3-15 days after spraying and the highest percent of reduction was in the mixture of (Micotal and Biosect), Biosect and Micotal showing (85.0, 90.2, 90.2 90.6 & 89.1, 90.2, 90.2, & 90.6 and 89.9, 92.1 92.0, 92.1 and 91.5, 91.7, 91.0, 90.4% reduction on Madena, Amera Dama, and Maram cultivars in four transplantation dates, respectively. A satisfactory reduction in *B. tabaci* density was recorded after spraying Caple 2 which achieved lower effect at the aforementioned times. The mean percents reduction were 72.3,75.8,77.8 & 77.2 & 83.8, 85.4, 87.1, 87.6 & 86.1, 86.7, 88.5, 88.1and85.9, 86.8, 87.9 & 88.4 % on the four cultivars in the four transplantation dates, respectively. The tested compounds could be arranged according to the general reduction in population density of the pest after 15 days in the following descending order: the mixture, Micotal, Biosect and Caple2.

Statistical analysis of the obtained data indicated a significant difference between the mixture and the other tested bio-insecticides after 3 days, while there was no significant difference between Mycotal and Biosect after 3days of application. However, there were no significant differences among the effect of all bio- insecticides used after 3 and 15 days of application. On the other hand, there were significant differences between the effect of each of the mixture, Micotal, Biosect used after 3 and 15 days of application and Caple 2, (Table 1).

As shown in tables (1-4), it is clear that the mixture of Micotal and biosect was the superior compound after 3 days of application, since it gave 94.7 reduction in *B. tabaci* population infesting cucumber that transplanted in 1 / 3 / 2011. Biosect came next in this respect followed by Micotal and Caple 2 which showed inferior efficacy among the tested bio-insecticides.

These results are in agreement with those obtained by Dattatray and Uttamrao (2009) who reported that significant differences among various treatments were observed after 3, 7 and 10 at days after spraying. All the treatments were superior over the control in reducing whitefly population.

Olleka *et. al.*, (2009) found that percent survival of *B. bassiana* were applied on second-instar nymphs of *B. tabaci*, ten days after inoculation with 1×10^8 conidia / ml, was 4.2+or-0.7, 9.6+or-0.4, 13.4+or-0.8, and 24.3+or-0.9% on cucumber, eggplant, tomato and cabbage, respectively. Average survival times of nymphs were also significantly influenced by host plant species. Survival times were 4.8 + or-0.15, 6.0+or-0.11, 5.7+or-0.13, and 6.2+or-0.08 days for nymphs reared on cucumber, eggplant, tomato, and cabbage, respectively.

Tandon *et. al.*, (2007) reported that several commercial formulations based on entomopathogenic fungi were developed for the control of sucking pests in different countries. Mycotrol and Botanigard based on *B. bassiana*, Mycotal based on *V. lecanii* and PFR-97 and Pae-Sin based on *Paecilomyces fumosoroseus* were developed for the control of whiteflies, aphids and thrips in USA, Europe and Brazil. In India. Oil formulations have been found to be more effective against target pests even under low RH and also possess a good shelf life.

Considering the dates of transplantation, it is obvious that transplanting cucumber in 1 / 3 / 2011 showed the lowest rate of infestation by the pest ranged between 32.4 and 45.5 adults / 15 plant leaves, (Table 1), while cucumber transplanted in 1 / 10 / 2011 showed the highest of infestation ranged between (64.2 and 77.5) adults / 15 leaves, (Table 4).

Regarding transplanted varieties, it is evident that Dama variety was more tolerant to the infestation of cucumber than the other varieties. However, the variety Amera was the most susceptible to whitefly infestation in 1 / 3 / 2011 transplantation, while Madena variety was more tolerant 1 / 4 / 2011 and 1 / 9 / 2011. It also clear to indicate that, Maram appeared more tolerant and Amera the most susceptible in 1 / 10 / 2011.

The effect of the bio-insecticide on the fruits / plant is shown in (Table 5). The results indicated that number of fruits was not affected by the date of transplantation. However, there were significant differences among varieties, Madena showed highest mean number of fruits / plant, ranged between 15.0 – 23.5, followed by Amera, 15.3 – 23.1, Dama, 15.0 – 23, and Maram 15.0 – 23.3.

The treatment with the mixture of Micotal and Biosect had the superior effect on the mean number of fruits, it showed a range of 21.5 – 23.5, 21.0 – 23.1, 21.0 – 23.0 and 21.0 – 23.3 fruits / plant in different varieties, Madena, Amera, Dama and

Maram, respectively, followed by biosect 23.0 - 21.0, 22.8 - 20.7, 22.6 - 20.5 and 22.7 - 20.3, Micotal, 22.8 - 20.4, 22.6 - 20.2, 22.5 - 20.0 and 22.6 - 20.0 and lately Caple 2, 21.4 - 20.8, 21.2 - 20.3, 21.0 - 20.1 and 21.2 - 20.0., respectively.

Average fruit length as shown in table (5), revealed that all bioinsecticides increased the cucumber fruits length compared with the untreated control. Among the tested bio-insecticides, the mixture of Micotal and Biosect significantly increased the fruit length, 13.8, 14.8, 12.8 and 17.8, cm. while in the untreated it was 12.8, 13.0, 11.5 and 15.7 for the varieties Madena, Amera, Dama and Maram, respectively.

Regarding the effect of the tested bio-insecticides on the fruit weight, all bio-insecticides slightly increased fruit weight compared with untreated control. The mixture revealed the highest increase, followed by Micotal, Biosect and Cable 2 (Table 5).

Slight increase was obtained in fruit diameter after treatment of all bio-insecticides. This increase proved significant in the variety Dama, ranged, 10.0 – 11.2, cm., and in Maram, 11.6 – 13.2 cm., The treatment of the mixture was superior, followed by Micotal, Biosect and Caple 2.

In conclusion, application of bio-insecticides had an additive effect on the binary induced an increase in cucumber yield. The obtained results showed the possibility to incorporate the approach into an integrated pest management strategy for the control of *B. tabaci* (Cuthbertson *et. al.*, 2005).

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تقييم فاعلية بعض المبيدات الحيوية علي الذبابة البيضاء ومكونات المحصول في الخيار

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يهدف هذا البحث لدراسة النشاط الحيوي لمتبقيات المستحضرات التجارية الحيوية وهي الميكوتال و البيوفلاي و المخلوط منهما و زيت كابل ٢ علي الطورالحوري الثاني لحشرة الذبابة البيضاء و أثر ذلك علي المكونات المحصولية للمحصول الأخضر. أجريت هذه الدراسة في تجارب حقلية علي أربعة أصناف من الخيار وهي مدينة - أميرة - داما - مارام خلال موسم ٢٠١١ في أربعة مواعيد مختلفة للزراعة بمحافظة الفيوم .

أوضحت النتائج أن مخلوط المبيدان الحيويان ميكوتال و البيوفلاي أظهرتا كفاءة عالية في مكافحة الذبابة البيضاء مما أدى إلي زيادة المحصول كما ونوعا، وتلاه البيوفلاي ثم الميكوتال وأخيرا زيت كابل ٢ علي الترتيب في مواعيد الزراعة المختلفة. وفي هذه الدراسة وجد أن صنف داما الأكثر مقاومة للذبابة البيضاء حيث كان متوسط الخفض في التعداد هو (٧٩,٨ %) بينما الصنف أميرة الأكثر حساسية (٩٤,٧ %) في ٢٠١١/٣/١ .

ولقد أظهرت النتائج أنه في زراعة ٢٠١١/٤/١ و ٢٠١١/٩/١ كان الصنف مدينة هو الأكثر مقاومة حيث كان متوسط الخفض في التعداد (٩١,٠ %) بينما الصنف مارام و أميرة الأكثر حساسية (٩٣,٥ %) و (٩٣,٤ %) علي الترتيب . وكان الصنف مارام الأكثر مقاومة (٩١,٥ %) من الصنف مدينة الأكثر حساسية (٩٢,٢ %) في الزراعة بتاريخ ٢٠١١/١٠/١ مع مخلوط كل من الميكوتال و البيوفلاي. كما وجد أن أفضل مواعيد الزراعة هي أول شهر مارس ثم بداية شهر سبتمبر من نفس العام.