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Field evaluation of some entomopathogenic fungi and the pesticide Dominant and its combinations on Myzus persicae and their effect on growth and yield of cold pepper

ABSTRACT

A field evaluation test of the compatibility effect of the pesticide Dominante with different concentrations of *T. longibrachiatum* and *M.anisopliae* spore suspensions on the mortality rate of various stages of green peach on the cold pepper showed the superiority of the treatment M9 (*M.anisopliae* 10^{10} + Dominante (0.5 g/L)) followed by T9 (*T. longibrachiatum* 10^{10} + Dominate (0.5 g/L)) with mortality rate reached to 100 and 99.1%, respectively, after 7 days from the treatment. The results showed that the highest values of plant height, root length and dry weight of shoot and root systems were recorded at treatments T6 (*T. longibrachiatum* 10^{10} + Dominante (0.25 g/L)) and T5 (*T. longibrachiatum* 10^{8} + Dominante (0.25g /L)), as the height of the plant reached (34.33 and 32,) cm respectively, the length of the root system reached to (16 and 14) cm, respectively, while the dry weights of the shoot system were (7.81and 7.69) g and the dry root weights were (5.89 and 5.22) g, respectively, compared with the lowest values for these makers in the control which were 17.12 cm, 7.73 cm, 2.89 g and 3.71 g, respectively. The results also showed the compatibility effect of the pesticide Dominante with different concentrations of the *T.longibrachiatum* and *M.anisopliae* spores on the number and weight of the of cold pepper fruits under the conditions of green peach insect *Myzus persicae*. The treatments T6 (*T.longibrachiatum* 10^{10} + Dominante (0.25 g/L)) and T5(*T.longibrachiatum* 10^{8}+Dominante (0.25 g/L)) were recorded the highest number of fruits reached (20.33 and 18.33) fruits, respectively, compared with the lowest fruits number 8.63 in the control, while the highest fruit weight were 609.17 and 588.5g in treatments M3 (*M.anisopliae* 10^{10}) and T6 (*T. longibrachiatum* 10^{10} + Dominante (0.25 g/L)), respectively, compared with the lowest fruits weight 244 g in the control.

INTRODUCTION

The green peach aphid, *Myzus persicae*, is an economically important insect that infects a wide range of plant hosts, it spreads in different regions of the world. The insect attacks the lower surface of the leaves of the host plant and depletes nutrients by absorbing the plant juice, causing wilting, yellowing and wrinkling of the leaves and the tender parts of the plant, this insect secretes the honeydew, which causes dust accumulation on the plant leaves, leading to hinders the photosynthesis process, in addition to attracting other insects such as ants, flies and wasps (Mansour, 2017). Aphids are usually controlled by using various chemical pesticides, but owing to environmental risks and negatives associated with the use of these chemicals, researchers tended to search for other methods that are safer for the environment, humans, animals and natural enemies,

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one of these methods is the introduction of modern pesticides as part of the integrated control against agricultural pests (Samada and Tambunan, 2020).

The idea of using microorganisms, including fungi for insect pests control within integrated management programs that include the use of chemical and biological agents together is one of the most promising strategies in pest control (Prabha et al., 2016).

More than 700 species of fungi have been recorded on insects, but only a few of them showed their ability to resist economically important insects such as Lepidoptera, Hemiptera and Homoptera (Qu et al., 2018). Tracy et al. (2018) mentioned that fungi are one of the most important organisms that parasitize insects, as they have the ability to infect these insects, causing them diseases. Entomopathogenic fungi are characterized by being one of the most common and easiest to distinguish insect pathogens, and the wide range of their terrestrial and aquatic hosts in addition, their ability to form spores that resist unsuitable conditions. Through these characteristics, entomopathogenic fungi can reach the epidemiological level if their activity is not closely related to environmental conditions such as temperature and relative humidity.

Due to the wide family range of the green peach, *Myzus persicae* and its transmission to various types of viral diseases and the damage it causes to plants, in addition to the modern trend of environmentally safe biological control against the pests. The productive and vegetative characteristics of the crop, this study aimed at the integrated control of this insect by using combinations of pathogenic fungi and the chemical pesticide Domnite on different stages of the green aphid in the field and studying the effect of these combinations on the productive and vegetative characteristics of the cold pepper.

MATERIALS AND METHODS

The chemical pesticide used in the experiment

The pesticide Dominate 20% (produced by the American company WLLOWOOD), was used in the present study. The active substance of Dominate is Dinotefuran 20% WDG from the group of new organic neonicotinoids.

Entompathogenic fungi

Biological control agents, *Trichoderma longibrachiatum* and *Metarhizium anisopliae* isolated from diseased green peach insects which identified morphologically and molecularly according to a previous study (AL-Shindah et al..,2022) were used. These two fungi were used in three concentrations, including 10^6, 10^8, and 10^{10} CFU (Colony Forming Units)/ml individually and with the pesticide Dominate, as shown in Table (1).

Table (1): Treatments of the field evaluation experiment

Entomopathogenic fungi (CFU) + Dominate (g/L)	Treatment code
T. longibrachiatum10^6	T1
T. longibrachiatum 10^8	T2
T. longibrachiatum 10^{10}	T3
T. longibrachiatum 10^6 + Dominate 0.25	T4
T. longibrachiatum 10^8 + Dominate 0.25	T5
T. longibrachiatum10^{10} + Dominate 0.25	T6
T. longibrachiatum10^6 + Dominate 0.5	T7
T. longibrachiatum 10^8+ Dominate 0.5	T8
T. longibrachiatum 10^{10}+ Dominate 0.5	T9
M.anisopliae10^6	M1
M.anisopliae 10^8	M2
M.anisopliae 10^{10}	M3
M.anisopliae10^6 + Dominate 0.25	M4
M.anisopliae 10^8+ + Dominate 0.25	M5
M.anisopliae 10^{10}+ + Dominate 0.25	M6
M.anisopliae10^6 + Dominate 0.5	M7
M.anisopliae10^8 + Dominate 0.5	M8
M.anisopliae10^{10} + Dominate 0.5	M9
Dominate 0.25	C 0.5
Dominate 0.5	C 1
Control	C 0

Preparing the greenhouse

This experiment was carried out in the greenhouse of the College of Agriculture - Tikrit University. All agricultural processes were accomplished according to Al-Shindah (2018).

Insect rearing

Samples of radish plant infected with a green peach insect were brought from Al-Naameh area in Salah Al-Din governorate. Infected plants were replanted in sterilized plastic pots in the laboratory, taking into account watering them and constantly bringing samples for the purpose of obtaining the insect's adults continuously in order to release them into the plastic house (Mohammed, 2012). Insects were diagnosed in the Natural History Museum - University of Baghdad by book No. 492.

Cultivation of cold pepper and the infection with a green peach insect

The seeds of cold pepper (Charisma cultivar) produced by the Spanish company Vito, were planted in a cork tray containing commercial peatmoss, with one seed in each part, and covered with a light layer of peatmoss, then seeds were watered until germination and seedlings reached a height of 15 cm. The field was irrigated a day before planting, then the seedlings were transported into the greenhouse, the seedlings were planted on two lines for one terrace, with a distance of 30 cm between one seedling and another within the same line, exchanged with the plants of the second line and 40 cm between the two lines on a terrace.

The crop service processes, including irrigation, (which were carried out immediately after the completion of the seedlings, and continued irrigation according to the plants' needs) , greenhouse ventilation, and weed control, in addition to closing the greenhouse doors with velvet cloth to prevent entry of other insects, finally, adults of the aphids were released for reproduction from the farm of the insect that had been reared (Mohammed, 2012).

Field experiment

Dominant spraying treatments and biological control agents were carried out separately and with combinations. The plants were divided every 3 seedlings, on which identification cards were recorded (treatments codes).

Between each group of seedlings, a pair of plants was left so that there would be no interference between the effect of pesticides during spraying. Three replicates were made for each treatment according to Table (1). A 2-liter manual sprayer was used, The entire plant was sprayed with the treatment solution at a rate of 30 ml per plant, and the results of the time period were recorded after (1, 2, 3, 7) days after the treatment date. The total number of insects on a plant was calculated before and after the treatment by direct counting method, then the results were recorded and the corrected mortality rate was calculated according to the Abbott equation as follows (Abbott, 1925):

Corrected mortality rate = % mortality rate in treatment - mortality rate in control / 100 - mortality rate in control × 100

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Plant height

The height of the plants and their root length at the end of the season were measured by taking three plants from each treatment randomly and separating the root from the shoot system then measured using the measuring tape.

Estimation of shoot and root systems dry weights

The dry weight of the shoot and root systems was calculated after the plants were take off from the soil at the end of the season. The roots were washed well with water to get rid of the stuck soil and separate the shoot system from the root system, then dried in the sun until weight stabled, The average weight of shoot and root systems (g) was calculated.

Estimation of yield weight

The weight of pepper yield for all treatments and their replicates was estimated at three harvesting times by a mechanical balance.

STATISTICAL ANALYSIS

The experiments were carried out according to a completely randomized design. The analysis of variance was conducted using the SPSS program, and the comparison of means was conducted according to the Least Significant Deference (LSD) test at the 0.05 probability level (Al-Sahoki and Waheeb, 1990).

RESULTS AND DISCUSSION

Field evaluation of the Dominante compatibility with different concentrations of *T. longibrachiatum* and *M.anisopliae* spore suspensions on the mortality percentage of green peach on the cold pepper

The results of Table (2) show that the treatment of M9 (*M.anisopliae* 10^{10} + Dominante (0.5 g/L)) and T9 (*T. longibrachiatum* 10^{10} + Dominante 0.5g/L)) was superior on other treatments in the highest mortality rate, which reached 83.59, 83.36% m respectively, followed by treatments M8 (*M.anisopliae* 10^{8} + Dominante (0.5 g/L)) and T8 (*T. longibrachiatum* 10^{8} + Dominante (0.5 g/L)) in causing the mortality rate, reaching 78.31 and 76.99%, respectively, while the lowest mortality rate 22.36% was recorded in T1 (*T. longibrachiatum* 10^{6}). 7-day period achieved the highest mortality rate of 73.01%, compared to the first day resulting in 38.84%. The results of the statistical analysis indicated that there were significant differences between the treatments. For the interaction between treatments and the time period, the results indicated that the best interaction in causing the highest mortality rate was in M9 (*M.anisopliae* 10^{10} + Dominante (0.5 g/L)) and T9 (*T. longibrachiatum* 10^{10} + Dominante (0.5 g/L)) treatment.)) resulting in 100, 99.1%, respectively, after 7 days of the treatment. While the lowest mortality rate was in the interaction of the M1 (*M.anisopliae* 10^{6}) and T1 (*T. longibrachiatum* 10^{6}), which reached to 13.54 and 13.33%, respectively, after a day of treatment.

Table (2): Field evaluation of the Dominante compatibility with the *T. longibrachiatum* and *M.anisopliae* on the mortality percentage of green peach on cold pepper

Treatment	Corrected mortality percentage (%)				Average (Treatment)
	Time				
	24h	48h	72h	7 days	
T1	13.33	21.11	24.63	30.38	22.36
T2	23.1	36.89	40.92	48.23	37.28
T3	26.1	43.65	47.28	69.23	46.56
T4	33.99	43.5	51.12	71.29	49.97
T5	42.18	49.99	57.94	74.49	56.15
T6	47.04	53.74	64.27	77.27	60.58
T7	51.4	59.1	73.1	83.57	66.79
T8	57	66.56	88.16	96.26	76.9
T9	64.25	76.98	93.1	99.1	83.35
M1	13.54	23.33	27.66	33.53	24.51
M2	21.66	35.79	43.95	49.73	37.78
M3	26.26	46.88	49.66	70.83	48.41
M4	34.32	43.96	52.37	72.58	50.81
M5	43.51	51.82	59.67	78.24	58.31
M6	47.18	55.6	62.62	79.1	61.13
M7	50.47	63.03	73.43	86.03	68.24
M8	57.31	70.63	88.62	96.71	78.32
M9	63.62	77.48	93.29	100	83.59
C 0.5	23.89	44.33	52.8	63.5	46.13
C 1	36.67	54.72	66.73	80.1	59.56
Average (Time)	38.84	50.95	60.57	73.01	
LSD; $_{0.05}$	Treatments 7.75,		Time 9.32		Treatments × Time 12.61

It was clear from the results that the pesticide Dominante can be compatible with the entomopathogenic fungi *T. longibrachiatum* and *M.anisopliae* and can be mixed together in the integrated control of green peach for the purpose of obtaining a better result in the control. The reason for the increase in the mortality rate when mixing the pesticide with the two fungi is that the

these fungi lead to strengthen the effect of the pesticide, as the mixing process has a synergistic effect because both fungi weaken the insect by degrading them of insect chitin, which is exposed to the entry of the pesticide and the spores of the fungus then parasites on it. Some studies have shown that some isolates of the fungus *T. longibrachiatum* produce chitinase enzyme on the agar medium containing colloidal chitin as a source of carbon and nitrogen (Viswanathan et al., 2003).

When the pathogenic fungus enters the insect tissues, with the secretion of chitinase, this will lead to the destruction of the insect cell walls, causing damage and the emergence of pathological symptoms (Brant et al., 1978). These results are consistent with Muhammad (2012) in his study on the effect of the pesticides Flash and Aster and the spore suspension of the fungus *T.harzianum* with the suspension of the bacteria *P.fluorescens* on the average mortality rate of a green peach on the radish plant, Flash with *T.harzianum* gave the highest mortality rate of 78.3% after 7 days of treatment, while mortality rate was 86.7% in the mixture of Aster with *T.harzianum* after 7 days of treatment.

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Vegetative characteristics

Table (3) shows the compatibility effect of Dominante with different concentrations of spores suspension of *T. longibrachiatum* and *M.anisopliae*. The table shows all treatments superior on control in all vegetative growth characteristics represented by plant height, root length and dry weight of the root and shoot systems. The highest plants height were recorded in T6 (*T. longibrachiatum* 10^{10} + Dominante (0.25 g/L)), T5 (*T. longibrachiatum* 10^{8} + Dominante (0.25 g/L)), and T4 (*T. longibrachiatum* 10^{6} + Dominante (0.25 g/L)), which reached to (34.33, 32, 30.66)cm respectively. T6(*T. longibrachiatum* 10^{10}+Dominante (0.25 g/L)) , T5(*T. longibrachiatum* 10^{8}+Dominante (0.25 g/L)) and T4(*T. longibrachiatum* 10^{6}+Dominante (0.25 g/L)) showed the highest root length of (16 , 14, 13.33) cm respectively, while T6 (*T. longibrachiatum* 10^{10} + Dominante (0.25 g/L)) ,T5 (*T. longibrachiatum* 10^{8} + Dominante (0.25 g/L)) and T4 (*T. longibrachiatum* 10^{6} + Dominante (0.25 g/L)) showed the highest dry weight, reaching (7.81 , 7.69, 7.36) g for shoot system and (5.89, 5.22, 5.11) g for the root system, respectively

Table (3): The effect of compatibility of the pesticide Dominante with *T. longibrachiatum* and *M.anisopliae* on the vegetative growth of cold pepper

Treatments	Plant height (cm)	Root length (cm)	Root system dry weight (g)	Shoot system dry weight (g)
T1	25	12.33	4.12	6.78
T2	27	12.86	4.47	7.03
T3	28.33	13.06	4.81	7.16
T4	30.66	13.33	5.11	7.36
T5	32	14	5.22	7.69
T6	34.33	16	5.89	7.81
T7	22.33	11.11	4.24	6.33
T8	24.33	11.66	4.31	6.44
T9	25.33	12	4.04	6.65
M1	20.06	9.21	3.26	3.69
M2	20.83	9.66	3.77	4.29
M3	21.66	10.66	4.0	4.86
M4	22.33	10	4.02	5.92
M5	22.66	11.0	4.11	6.03
M6	23	11.13	4.21	6.18
M7	20.66	9.07	3.12	5.18
M8	21.72	9.15	3.31	5.31
M9	22.46	9.66	3.22	5.84
C0.5	21.66	9.32	3.12	4.29
C1	20.05	9.03	3.0	3.99
C 0	17.12	7.73	2.89	3.71
LSD; $_{0.05}$	2.81	1.76	1.02	1.57

Yield weight

Figure (1) shows the effect of the compatibility of Dominante with different concentrations of spores suspension of *T. longibrachiatum* and *M.anisopliae* on the number of cold pepper fruits under conditions of infection with green peach, *Myzus persicae*. It is noted from this figure that all the fungi treatments with all their concentrations and combinations with the pesticide were significantly superior in the number of cold pepper fruits compared to the control (non-treated). T6 (*T. longibrachiatum* 10^{10}+Dominate (0.25g/L)), T5 (*T.longibrachiatum* 10^{8}+Dominante (0.25 g/L)), T4 (*T. longibrachiatum* 10^{6}+Dominante (0.25 g/L)) and T3 (*T.longibrachiatum* 10^{10}) showed the highest number of fruits reached (20.33, 18.33, 18, 17.3) fruits, respectively. While the lowest number of fruits recorded in M9 (Dominante (0.5 g/L)+ *M.anisopliae* 10^{10}), M8 (Dominante (0.5 g/L)+ *M.anisopliae* 10^{8}) and M7 (Dominante (0.5 g/L)+ *M.anisopliae* 10^{6}) resulting in (10.33, 10.33, 10) fruits, respectively. Figure (2) shows the effect of the compatibility of Dominante with different concentrations of spores suspension of *T. longibrachiatum* and *M.anisopliae* on the cold pepper fruits weight under conditions of infection with green peach. It is noted from this figure that all the fungal treatments with and combinations with the pesticide were significantly superior in the weight of cold pepper fruits compared to the control (non-treated). M3 (*M.anisopliae*10^{10}), T6 (*T. longibrachiatum* 10^{10}+Dominante (0.25 g/L)), T5 (*T.longibrachiatum* 10^{8}+Dominante (0.25 g/L)), T4 (*T. longibrachiatum* 10^{6}+Dominante (0.25 g/L)) outperformed in fruits weight, which reached (609.17, 588.5, 571.8, 553.93,) g, respectively.

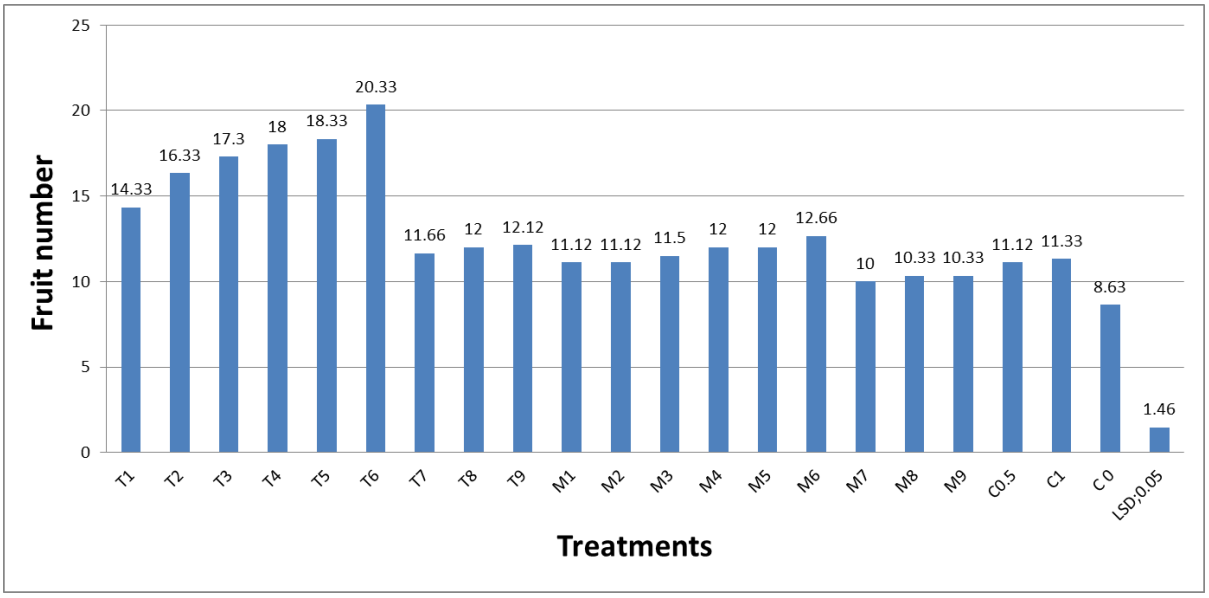

Figure (1): The compatibility effect of Dominante with different concentrations of suspended spores of the fungi *T. longibrachiatum* and *M.anisopliae* on the number of cold pepper fruits under conditions of green peach infection

(T1,T2T3= *T. longibrachiatum* 10^{6},10^{8},10^{10}; T4,T5,T6= *T. longibrachiatum* 10^{6},10^{8},10^{10}+Dominante (0.25);T7,T8,T9= *T. longibrachiatum* 10^{6},10^{8},10^{10}+Dominante (0. 5) (M1,M2,M3= *M.anisopliae* 10^{6},10^{8},10^{10}; M4,M5,M6= *M.anisopliae* 10^{6},10^{8},10^{10}+Dominante (0.25);M7,M8,M9= *M.anisopliae* 10^{6},10^{8},10^{10}+Dominante (0. 5), C 0.5=+Dominate (0. 25), C 1= +Dominante (0. 5), Co=Control).

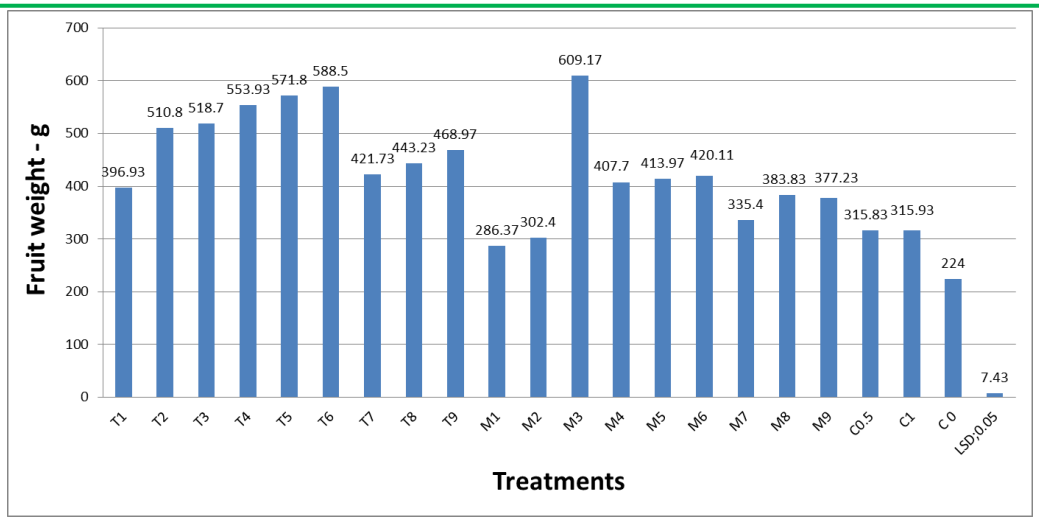

Figure (2): The compatibility effect of Dominante with different concentrations of suspended spores of the fungi *T. longibrachiatum* and *M.anisopliae* on the weight of pepper fruits under conditions of green peach infection

(T1,T2T3= *T. longibrachiatum* 10^6,10^8,10^{10}; T4,T5,T6= *T. longibrachiatum* 10^6,10^8,10^{10}+Dominante (0.25);T7,T8,T9= *T. longibrachiatum* 10^6,10^8,10^{10}+Dominante (0. 5) (M1,M2,M3= *M.anisopliae* 10^6,10^8,10^{10}; M4,M5,M6= *M.anisopliae* 10^6,10^8,10^{10}+Dominante (0.25);M7,M8,M9= *M.anisopliae* 10^6,10^8,10^{10}+Dominante (0. 5), C 0.5=+Dominante (0. 25), C 1= +Dominante (0. 5), Co=Control).

These results are in agreement with many previous studies indicating that the fungus *Trichoderma*.spp has the ability to secrete substances that stimulate growth or help in the availability of nutrients (Rui-Xia et al., 2015) , other previous studies (Bjorkman et al. 1995, Harman 2000, Fracchia et al. 1998) showed, some isolates of the fungus *Trichoderma*.spp were able to increase the availability of some plant nutrients and produce the hormone ethylene that stimulates plant growth. The fungus *Trichoderma*.spp has a positive effect in increasing the various parameters of plant growth treated with it by stimulating and encouraging plant growth even in the absence of pathogens (Zheng and Shetty, 2000 and Aboud et al., 2002). The use of *T. longibrachiatum* for pests control leads to a decrease in the insect infestation. The higher the number of fungal spores leading to the higher mortality rate. As a result of the green aphid's reduction, this in turn encourages plant growth. Anwar et al. (2016) in his study on the effect of *T. longibrachiatum* on the adults and nymphs of the whitefly *Bemisla tabaci* reported that the percentage of insect mortality increases with the increase in the concentration of fungus spores, in 4 x 10^4 conidia /ml, the mortality rate for adults were 5, 10 and 20% after 96, 120 and 144 hours then increased at the concentration 4 x 10^8 conidia/ml reached 18, 25 and 40% after 96, 120 and 144 hours. Bal et al. (2008) showed that the fungus *T. harzianum* contributes to stimulating lettuce growth, which increases the synthesis of the organic mass in the plant. The positive effect of this fungus on the plant may be due to its ability to produce substances similar to auxins and gibberellins that stimulate plant growth, in addition, The fungus gives the plant the ability to withstand environmental stresses such as drought, which in turn will provide the ability to control pathogens (Al-Shammari, 2013). The results of the our study are in agreement with the study of Lombardi et al. (2020) who using strains of *Trichoderma* fungus on roots and spraying on leaves, the results recorded the superiority of *T. harzianum* strains T22, TH1, and *T. virens* strain GV41, which significantly enhanced the total yield of strawberry plants resulting in 35, 38 and 29%, an increase yield over the control, respectively. It was also found that strains T22 and TH1 significantly increase the number of fruits per plant by 17 and 39%, respectively, while a lower effect (6%) was observed in the present of *T. virens* strain GV41, in addition, all treatments of *Trichoderma* slightly enhanced root length, wet root weight and root dry weight, while GV41 showed the highest increase in root length which was 11%, wet root weight (17%) and root dry weight (21%). In the same time, there is no negative effect or fungal disease was observed on plants or fruits that were subjected to biological treatments of *Trichoderma* fungus. Inoculation of grapes with the fungus *T. harzianum*

led to an increase in the content of polyphenols and antioxidants in grapes (Pascale et al., 2017). In study of Sharma et al., (2017)indicated that the volatile substances released by the plant inoculated with some fungal isolates prevented the infection of insects and herbivores from feeding on them or attracting their predators.

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التقييم الحقلي لمكافحة حشرة من الخوخ الاخضر *Myzus persicae* بالفطرين *Trichoderma longibrachiatum* و *Metarhizium anisopliae* والمبيد Dominant وتأثيرها على الصفات الانتاجية والخضرية لنبات الفلفل البارد

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الكلمات المفتاحية:
الفطريات الممرضة للحشرات ، Trichoderma longibrachiatum, Metarhizium anisopliae, المقاومة الحيوية ، من الخوخ الاخضر ، المبيد دومينيت.

الخلاصة

اظهرت نتائج اختبار التقييم الحقلي لتأثير توافقية المبيد Dominante مع تراكيز مختلفة من عالق ابواغ الفطرين *T. longibrachiatum* و *M.anisopliae* في نسبة قتل الأطوار المختلفة لحشرة من الخوخ الاخضر على نبات الفلفل البارد تفوق معاملة الخلط M9 (*M.anisopliae* 10^{10}+Dominante (0. 5)) تليها المعاملة T9(*T. longibrachiatum* (10^{10}+Dominate (0.5)) إذ بلغت نسبة القتل بعد 7 ايام 100, 99.1% على التوالي . وبينت نتائج الصفات الخضرية للمعاملات تاثير توافقية المبيد Dominante مع تراكيز مختلفة من عالق ابواغ الفطرين *T. longibrachiatum* و *M.anisopliae* في طول النبات والوزن الجاف لنبات الفلفل البارد , اذ بينت النتائج ان اعلى قيم لارتفاع النبات وطول المجموع الجذري والوزن الجاف للمجموع الخضري والجذري سجلت عند المعاملة T6(*T. longibrachiatum* (10^{10}+Dominante (0.25)) وT5((*T. longibrachiatum* 10^{8}+Dominante (0.25)) و T4((*T. longibrachiatum* 10^{6}+Dominante (0.25)) اذ بلغ ارتفاع النبات (34.33 , 32 , 30.66) سم على التوالي , وطول المجموع الجذري (16 , 14 , 13.33) سم على التوالي , والوزن الجاف للمجموع الخضري بلغ (7.81 , 7.69 , 7.36) غم على التوالي والوزن الجاف للمجموع الجذري بلغ (5.89, 5.22 , 5.11) غم على التوالي . واشارت نتائج تاثير توافقية المبيد Dominante مع تراكيز مختلفة من عالق ابواغ الفطرين *T. longibrachiatum* و *M.anisopliae* في عدد ووزن ثمار نبات الفلفل البارد تحت ظروف الاصابة بحشرة من الخوخ الاخضر *Myzus persicae* ان المعاملات T6 (*T. longibrachiatum* 10^{10}+Dominante (0.25)) وT5 (*T. T.longibrachiatum* (10^{8}+Dominante (0.25)) و T4((*T. longibrachiatum* 10^{6}+Dominante (0.25)) وT3 (*T.longibrachiatum* 10^{10}) وT2 (*T.longibrachiatum* 10^{8}) و T1(*T.longibrachiatum* 10^{6}) سجلت اعلى عدد ثمار اذ بلغ (20.33 , 18.33, 18 , 17.3 , 16.33 , 14.33) ثمرة على التوالي وسجلت اعلى وزن للثمار في معاملات M3 (*M.anisopliae*10^{10}) وT6 (*T. longibrachiatum* 10^{10}+Dominante (0.25)) وT5 (*T. T.longibrachiatum* 10^{8}+Dominante (0.25)) و T4 (*T. longibrachiatum* (10^{6}+Dominante (0.25)) وT3(*T.longibrachiatum* 10^{10}) و T2 (*T.longibrachiatum* 10^{8}) اذ بلغ (609.17 , 588.5 , 571.8 , 553.93 , 518.7 , 510.8) غم على التوالي .