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SIDE EFFECT OF CERTAIN PESTICIDES ON THE OCCURRENCE OF THE ENTOMOPATHOGENIC FUNGI *(Beauveria bassaina*) AND *(Meterizhium anisopliae*)

Asmaa A. Kamel[1*]; A.M.M. Sayed[2] and S.A. Ahmed[3]

1. Experts sector, Minist. Justice, Abbassia, Cairo, Egypt.
2. Inst. Plant Prot. Res., Cent. Agric. Research, Ismailia, Egypt.
3. Dept. Plant Prod., Fac. Environ. Agric. Sci., Arish Univ., Egypt.

ABSTRACT

The susceptibility of two selected fungi *Beauveria bassiana and Metarhizium anisopliae* was performed to certain registered pesticides. The pesticides, commonly used in the experimental area were applied at their recommend concentrations. There were singnificant difference between the tested pesteicide on the growth of *B. bassiana* and *M. anisopliae.* The fungicides, cosidal WP 77% achieved the most inhibition effect to the radial growth of both fungi i.e *B. Bassiana* and *M. anisopliae* of 90.79 and 90.74% growth reduction, respectively. The lowest effect was recorded by each of the herbicides Stomp Extra on *B. Bassiana* 57.41% and the fungicide, Super Royl on *M. anisopliae* (49.88%) growth reduction. From the obtained results, can recommend the pesticides that cause the lowest toxicity effect on the two entomopathogenic to use agents in integrated pest management program.

Key words: Entomopathogenic fungi, pesticides, *Beauveria bassiana*, *Metarhizhium ansoilpae,* certain pesticides, side effect.

INTRODUCTION

The use of chemicals for pest control has given rise to insecticides resistance, outbreaks of secondary pests usually held in check by natural predators, safety hazards for humans and domestic animals, contamination of ground water, and decreased biodiversity. These chemical products are becoming unacceptable for large-scale use, and increasingly there is a focus on finding alternatives for pest control, warrant for a change in control tactics to find environmentally sound alternatives for pest control. Insecticides resistance and the demand for reduced chemical inputs in agriculture have provided an impetus to the development of alternative forms of pest microbial control. Biological control offers an attractive alternative or supplement to the use of chemical pesticides **(Lacey *et al.,* 2001; Chandler *et al*., 2011).**

The discovering, development and use of insect pathogens as classical, conservation and augmentative biological control agents have included a number of successes **(Ravensberg, 2011; Glare and Moran-Diez *et al*., 2016).** Successful microbial control system deponds on some basic principles. The establishment of such a system requires a survey of the biocontrol agent existing naturally in the insects, or in the agriculture soils followed by selecting the agents that capable to depress pest population.

An understanding of the parameters that determine the diversity and distribution of entomopathogenic species in the soil would help to identify those species best suited to a particular environment and improve

*** Corresponding author: Tel.:** +201287633164
E-mail address: asmaakamel_155 @yahoo.com

biological control efficacy. The presence of certain entomopathogens species can be considered as an indicator of their ability to survive in that environment. This information is useful for the selection of biocontrol agents because the indigenous dominant species are generally the most suitable candidates **(Meyling and Eilenberg, 2007)**.

Fungal diseases of insects are common and widespread and contribute to the natural regulation of insect populations. Many insect pathogens (bacterial and viral pathogens of insects) must be eaten to infect their host but most fungal pathogens infect by contact and directly penetrate the insect cuticle (**Inglis *et al*., 2001**). Even though members of the mitosporic pathogenic fungi, especially *Beauveria* and *Metarhizium* strains are widely used to control whiteflies, aphids, thrips, and other insect pests in agroecosystems, only a few have been tested to control acarines **(Chandler *et al*., 2000).**

Metarhizium anisopliae is referred to as the "Green muscardine fungi" because of the green colour of its spores. Over 200 species of insects and arthropods are known to be attacked by *M. anisopliae,* and like *B. bassiana*, it has been commercially formulated *e.g.* Bioblast® (EcoScience Corporation, East Brunswick, NJ), Green Muscle® (Becker Underwood, South Africa, Ashwood, RSA) and has been used to control a variety of insect pests such as termites, mosquitoes and other arthropods **(Shah and Pell, 2003).** *Beauveria* and *Metarhizium* are important entomopathogenic hyphomycetes that have been known and used widely to control a variety of pests. Each species forms about 33.9% of the mycoinsecticides produced **(Meyling *et al*., 2009; Khain *et al*., 2012; Parsa *et al*., 2013).**

We believe that insights gained from these studies will lead to the effective use of these promising microbial agents. Therefore, the present research aimed to study the side effect of certain recommended pesticides on the two popular fungi *Beauveria bassiana* and *Metarhizium anisopliae*

MATERIALS AND METHODS

Chemical Used

The following compounds were used throughout in this study at their recommend concentrations (Table 1).

Toxicological Procedures

To determine the toxicity of the tested pesticides on the two entomopathogenic fungi, *B. bassiana* and *M. anisopliae*, the technique of **Pachamuthu *et al.* (1999)** was employed. The tested pesticides were assessed in the laboratory by adding the pesticide to the growth medium of the fungi. When the growth medium of the fungi became cooled sufficiently, recommended concentration of each pesticide was added to 100 ml of media.

The flasks containing the pesticide-amended media were then hand–shaken and rolled on the clean bench to ensure the uniform mixing of pesticides with the media. Approximately 15 ml of media amended with insecticides was poured into petri dish and allowed to solidify at room temperature under the table top horizontal laminar flow.

Approximately 1cm in diameter each of fungus was placed in the centre of treated petri dish, which was then sealed with celltope. Untreated media was used as the control.

Three replicates of each treatment and control were incubated in the dark at 25 ± 2°C.

The linear growth of each culture was measured, after growth of fungus completed in the control. The averages diameter of colonies (cm) and the percentage of growth rate of each fungus to the corresponding control were calculated.

Table (1): The tested pesticides, their trade name, active ingredients contents and applied concentrations.

Trade name	Active ingredient	Chemical name	Recommended concentration g or ml/100 liter water
Acaricides			
Abroch 5% SC	Fenpyroximate (5% SC)	*ter*t-butyl(*E*)-4-[(1,3-dimethyl-5 phenoxypyrazol-4yl) methylenaminooxymethyl] benzoate	50 ml
Abalone 1.8% EC	Abamectin (1.8 % EC)	(1R,4S,5′S,6S,6′R,8R,12S,13S,20R,21R,24S)-21,22-dihydroxy-6′-isopropyl-5′,11,13,22-tetramethyl-2-oxo-(3,7,19-trioxatetracyclo[15.6.1.14,8.020,24]pentacosa-10,14,16,22-tetraene)-6-spiro-2′-(5′,6′-dihydro-2′H-pyran)-12-yl 2,6-dideoxy-4-O-(2,6-dideoxy-3-O-methyl-α-L-arabino-hexopyranosyl)-3-O-methyl-α-L-arabino-hexopyranoside	40 ml
Fungicides			
Cosidal WP 77%	Copper hydroxide	$CU(OH)_2$	406.0 gm
Topsin M	Thiofanat methyl (70% WP)	dimethyl [1,2-phenylenebis(iminocarbonothioyl)] bis[carbamate]	100 g
Insecticides			
Actellic	Pirmifos methyl (50% EC)	O-[2-(diethylamino)-6-methyl-4-pyrimidinyl] O,O-dimethyl phosphorothioate	375 ml
Super Royal oil	Mineral oil (95% EC)	O-dimethyl phosphorothioate	1500 ml
Herbicides			
Round up 48% WSC	Pirmifos methyl (50% EC)	O-[2-(diethylamino)-6-methyl-4-pyrimidinyl] O,O-dimethyl phosphorothioate	1250 ml
Stomp Extra 45.5% CS	Pendimthalin (95% EC)	3,4-Dimethyl-2,6-dinitro-N-pentan-3-yl-aniline	750 ml
Nematicides			
Fydate 24% SL	Oxamyl	Methyl 2-(dimethylamino)-N-[(methylcarbamoyl)oxy]-2-oxoethanimidothioate	1500 ml
Nemacap 10% EC	Ethoprophos	1-(ethoxy-propylsulfanylphosphoryl)sulfanyl propane	1250 ml

Data analysis

All analysis were performed using QL-Micro 2016 Excel – Stat software for statistical data processing.

RESULTS AND DISCUSSION

A number of pesticides commonly used in the areas under consideration are tested to clarify their effect on the growth of the fungi *Beauveria bassiana* and *Metarhizium anisopliae* (Table 2).

There were singnificant difference between the tested pesteicide on the growth of *Beauveria bassiana* ($F_{9,89}$ =9.37, P< 0.001) and *Metarhizium anisopliae* ($F_{9,\ 89}$= 7.94, P<0.001).

Results in Table 2 and illustrated in Figure 1**,** show that the fungicides topsin, Cosidal WP 77% acheived the most inhibition effect to the radial growth of the fungus *B. Bassiana* of 94.44 and 90.79% growth reduction, respectively.

The descendingly order of the other tested pesticides was the herbicide, roundup caused reduction 76.67%, the insecticide actellic 68.52%, nematicide fydate 67.53%, nemacap 63.33%, abalone 62.94%, abroch, super royal oil 61.85% and 59.76% and stomp extra 57.41% growth reduction of *B. Bassiana*.

Regarding the fungus *M. anisopliae*, the highest percentage reduction in the fungal growth was achieved by each of the fungicide cosidal 90.74% and abroch as 85.19% growth reduction, followed by fungicide topsin 84.31% and insecticide abalone 82.72. The effect of other pesticides was as follow nemacap (72.06%), round up (63.02%), fydate (61.27%) and stomp extra (57.78%) and actellic 51.36% growth reductions. The fungicide, Super Royl caused the lowest effect (49.88%).

The results of this investigation were largely in agreement with those obtained by **El-Adawy *et al.* (2001)**. It is obvious that many pesticides may be cause great damage to the microbial l agents. Further, the use of pesticides can lead to secondary pest problems in the field. From the obtained results, we can recommend the pesticides that cause the lowest toxicity effect on the entomopathogenic agents to use integrated pest management program.

The use of entomopathogen isolates obtained in studied regions against the economically significant pests in our country may be possible as effective biological control agents in the future.

There are great opportunities to use entomopathogens agents in biological control approaches that can improve environmental stability and, efficacy. These results could aid decision-making as to whether or not a particular cultivated or natural soil is suitable for using entomopathogens as a pest control measure and for selecting the microbial agent species best suited to a particular soil.

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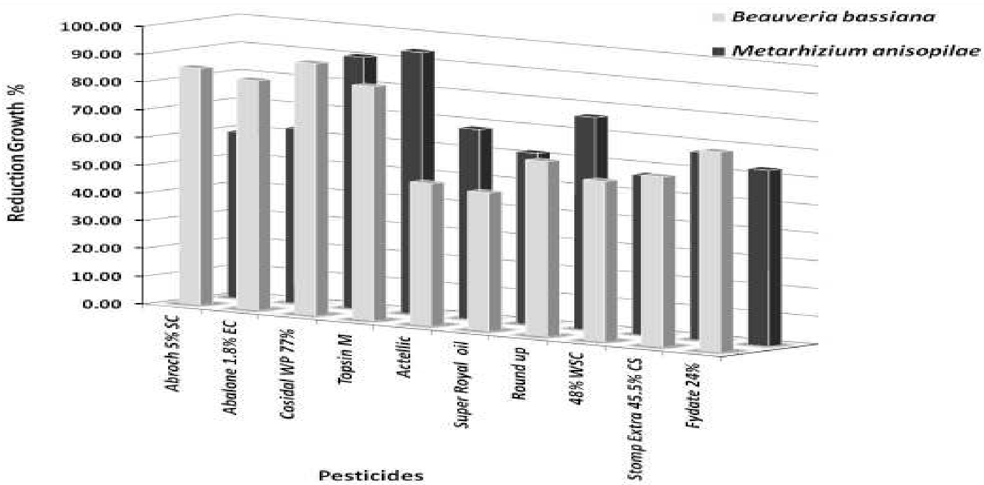
Table (2): Effect of certain pesticides on the growth of the two isolated fungi *Beauveria bassiana* and *Metarhizium anisopliae.*

Pesticides	Organasim			
	Beauveria bassiana		*Metarhizium anisopliae*	
	Mean of radial growth cm ± se	Growth reduction (%)	Mean of radial growth cm ± se	Growth reduction(%)
Acaricides				
Abroch 5% SC	5.38±0.07	59.76	7.67±1.20	85.19
Abalone 1.8% EC	5.66±0.33	62.94	7.44±0.88	82.72
Fungicides				
Cosidal WP 77%	8.17±0.45	90.79	8.17±0.44	90.74
Topsin M	8.50±0.38	94.44	7.59±0.73	84.31
Insecticides				
Actellic	6.17±0.67	68.52	4.62±1.53	51.36
Super Royal oil	5.57±0.84	61.85	4.49±0.13	49.88
Herbicides				
Round up 48% WSC	6.90±0.95	76.67	5.67±0.53	63.02
Stomp Extra 45.5% CS	5.17±0.52	57.41	5.20±0.35	57.78
Nematicides				
Fydate 24% SL	6.08±0.22	67.53	5.51±1.00	61.27
Nemacap 10% EC	5.70±0.39	63.33	6.49±0.54	72.06
Control	9.00		9.00	
LSD	1.49		1.30	



Reduction Growth (%)

Fig. 1. Effect of different pesticides treatments on the growth of *B. bassiana* and *M. anisopliae*.

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الملخص العربى

التأثير الجانبي لبعض المبيدات الكيماوية الشائعة الاستخدام فى منطقه الدراسة على نمو الفطريات الممرضة الحشرات beauveria bassiana وmetabolism absolute

أسماء أحمد كامل[١]، عاطف محمود محمد سيد[٢]، سيد على أحمد[٣]

١- مصلحة الخبراء، وزارة العدل، مصر.
٢- معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الإسماعيلية، مصر.
٣- قسم الإنتاج النباتى، كلية العلوم الزراعية البيئية، جامعه العريش، مصر.

أوضحت التجارب أن أكثر المبيدات تثبيطاً للنمو وسبب نقصاً قوياً فى النمو بلغ حوالى ٩٠,٧٩% للفطر b.bassiana و٩٠,٧٤% للفطر m.anisopliae، بينما مبيد الحشائش ستومب اكسترا والمبيد الفطرى سوبر رويال كانت أقل المبيدات تأثير على نمو الفطرين ٤٩,٨٨% و٥٧,٤١% على الترتيب. لذا فمن الأهمية عند استخدام المبيدات الكيماوية أن نتجنب تلك المبيدات التى توثر بالسلب على نمو الكائنات النافعة وبالتالي تعطى استراتيجية صنع القرار فرصة استخدام مثل هذه المسببات الممرضة للحشرات كعوامل مكافحة فعالة فى برنامج المكافحة المتكاملة للآفات.

الكلمات الإسترشادية: الفطريات الممرضة للحشرات، حشرة *Beauveria bassiana*، حشرة*Metarhizhium ansoilpae*، مبيدات كيماوية، التأثير الجانبى.

المحكمـــــون:
١- أ.د. محمد نجيب البسيونى أستاذ الحشرات الاقتصادية، كلية العلوم الزراعية البيئية، جامعة العريش، مصر.
٢- أ.د.عبدالله محمـد المرسى أستاذ الحشرات الاقتصادية، معهد بحوث وقاية النباتات، مركز البحوث الزراعية، الإسماعيلية، مصر.