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TWO *Beauveria spp*. AS PROMISSING BIOLOGICAL CONTROL CANDIDATES FOR CONTROLLING COTTON APHIDS (*Aphis gossypii*) GLOVER.

El-Nagar, M.E.[1]; Hoda A. Ahmed[2]; Hoda A.Salem[2] and Heba Y. El-Sayed[1]

1. Plant Protection Research Institute, ARC, Dokki, Giza, Cairo.

2. Zoology Department , Faculty of Science, Mansoura University.

ABSTRACT

The pathogenicity of two species of entomopathogenic fungi ,*Beauveria bassiana* and *B.brongniaretii* against *Aphis gossypii* was examined under laboratory conditions. Data revealed that pathogenicity effect on nymphs and adults were very high and varied according to the conidia concentrations and periods after infection . The LC_{50} values of *B.bassiana* and *B.brongniartii* against adults were $2.443x10^3$ conidia /ml and $3.118x10^3$ conidia/ml respectively. Also, the LC_{50} values of the tested entomopathogenic fungi against nymphs were $2.279x10^3$ conidia/ml and $1.955x10^3$ conidia/ml, respectively.The accumulative mortality percentages of A.gossypii after treatment with different concentrations of each pathogen at different time intervals were conducted.

INTRODUCTION

The Cotton Aphid ,*Aphis gossypii* is a serious pest having a very wide host range. It is a serious pest on cotton ,watermelons ,cucumbers ,cantaloupes ,squash ,pumpkin ,asparagus ,pepper,eggplant and okra. Cotton aphids feeon the underside of leaves ,or on growing tip of vines, sucking nutrients from the plant. The foliage becomes chlorotic and dies prematurely. In addition ,they secrete a great deal of honey dew which provides a substrate for growth of sooty molds, so, the quality of fruit may be impaired. Moreover, cotton aphid effectively transmits polyviruses ,such as cucumber mosaic virus ,water melon mosaic virus 2,and Zucchini yellow mosaic virus (Capinera,2005).

Chemical control has been confounded by development of insecticides resistance in aphid population ,serious suppresion in natural enemies population ,residual contamination toxicity and environmental pollution .So, the need to replace the commonly used pesticides with less toxic alternatives became more urgent in the last decade. One of the most important alternatives is microbial pesticides which depends on living organisms or their toxins. *Beauveria spp.* Are found world-wide in the soil and insect cadaver ,and they were found to be controlling agents for a number of crop pests (Rombach*,et al*.1986 ;Marcandier and Khachatourians ,1987 and Bekheit and Abo El Abbas,2001).

The present study was carried out to evaluate the effectiveness of *B.bassiana* and *B.brongniartii* against cotton aphid *A.gossypii*.

MATERIALS AND METHODS

1.Tested Biocides: Wettable powders of both *B. bassiana* (Biovar) and *B. brongniartii* were obtained from Insect Pathogen Production Unit at Plant Protection Research Institute ,ARC,Ministry of Agriculture,Cairo.

2.Rearing of *A.gossypii:* The strain of cotton aphid was obtained from the farm of faculty of Agriculture ,Mansoura University, and had been known to be free from insecticidal contamination. The stock culture of aphids was maintained on squash (*Cucurbita pepo* L.) (2-3 weeks old)planted in small pots (15 cm3)and kept under plastic green house conditions of 27±5C^0 ,70±10 RH.and (10:14(L:D)).For ventilation ,nylon mesh was glued over holes cut in tops and two sides of the plastic green house. Plants were changed as needed once or twice per week. The transfer of aphids from old plants to new ones was carried out by allawing aphid to over voluntarily from detached leaves placed on new plants or by artists, brush.

3.Bioassay Procedure: Squash leaf discs for bioassays were outlined with a plastic vial (7 cm diameter)and cut with a sterile scalpel, then immersed in 70% alcohol for 2s ,sterile distilled water for 2s,5% sodium hypochlorite for 90s,followed by rinsing in 3 changes of sterile dist. Water for a total of 120s to avoid contamination by saprophytic organisms (Claire *et al.,*1997)Discs then dried rapidly on sterile filter paper and transferred to 10 cm Petri dishes containing moisted filter paper. The top side of the leaf discs were placed against the filter paper. The tested insects (adults and nymphs)were surface sterilized in 1% sodium hypochlorite solution for 30s and washed in dist water.Each ten individuals of the same age were transfered to a petri dish to be considered as one replicate (each concentration had three replicates and one replicate sprayed only with water and 0.05 aquous tween 80 to be considered as control).In case of testing the susceptibility of nymphal stage,the adults were allawed to lay nymphs on the surface of host leaves for a period of 24 hrs, then the parents were removed. Nymphs were treated with the biopesticides when reaching the age of two days.The insects were sprayed with fungal suspensions of tested concentrations of 8,6.4, 4.8 and 3.2 x10^3 conidia/ml for adults and 6.4 ,4.8, 3.2 and 1.6 x10^3 conidia/ml for nymphs with adding 0.05% aquous Tween, then lids of petri dishes were sealed to maintain saturated humidity and placed in an incubator at 25±1C^0, 75±7 RH. And photoperiod 16:8 hrs (L:D).Data was recorded daily and the experiment continued for 7 days. The leaf discs of squash can be replaced by fresh sterile ones after first 3 days of the treatment to provide a source of food.

At the end of this period, mortality percentages were estimated and corrected using Abbott’s formula (1925) and subjected to probit analysis by Finney’method (1971).

RESULTS AND DISCUSSION

I-Virulence of the entomopathogenic fungi on *A. gossypii:*

Data in Table (1 and 2), Fig.(1,2,3and4) indicated that accumulated mortality percentages increased with increasing the time intervals after treatment with all tested fungi against both adults and nymphs of cotton aphids. Increasing tested concentration resulted in an increase in mortality percentage. The lower concentration of both *B. bassiana* and *B. brongniartii* cause70% and 53.33%mortality of adults after five days post treatment, respectively. While, the higher concentration of both *B. bassiana* and *B. brongniartii* cause 100% mortality after five days post treatment. The difference in mortality with tested concentrations is due to the distribution of conidia on the insect cuticle which may be related to both the chemistry, particularly cuticular lipids, of the cuticle and the topography, particularly setae and epicuticle folds **(Sosa-Gomez *et al.,* 1997).**

Table (1):Efficiency of the tested entomopathogenic fungi against adults of cotton aphid *A.gossypii* under laboratory conditions of 25 ± 1 C^0 , 75 ± 7% RH.

No.	Treatment	Conc.(x10^{3}conidia/ml)	Mortality %at indicated day after treatment.		
			3 day	5 day	7day
1.	***B. bassiana***	8	73. 33	100. 00	100. 00
		6.4	60. 00	96. 66	96. 66
		4.8	66. 66	93. 33	93. 33
		3.2	46. 66	70. 00	70. 00
2.	***B. brongniartii***	8	50. 00	100. 00	100. 00
		6.4	56. 66	96. 66	96. 66
		4.8	56. 66	83. 33	83. 33
		3.2	26. 66	53. 33	53. 33

Table (2): Efficiency of the tested entomopathogenic fungi against Nymphs of cotton aphid *A.gossypii* under laboratory conditions of 25 ± 1 C^0 , 75 ± 7% RH.

No.	Treatment	Conc.(conidiax10^3/ml)	Mortality %at indicated day after treatment.		
			3 day	5 day	7day
1.	***B. bassiana***	6.4	43. 33	90. 00	96. 66
		4.8	26. 66	70. 00	80. 00
		3.2	16. 66	53. 33	53. 33
		1.6	20. 00	33. 33	40. 00
2.	***B. brongniartii***	6.4	46. 66	93 . 33	96. 66
		4.8	43. 33	76 . 66	86. 66
		3.2	26. 66	56. 66	60. 00
		1.6	16. 66	40. 00	46. 66

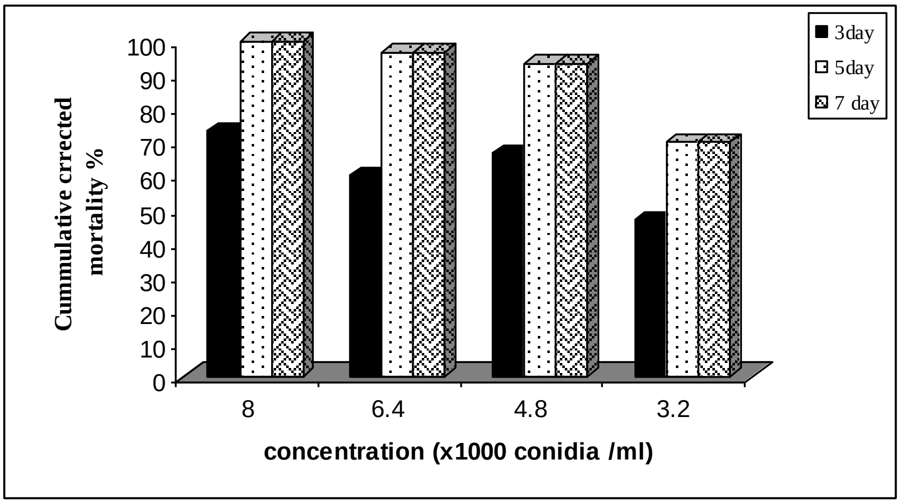

Fig. (1): Virulence of entomopathogenic fungi *Beauveria bassiana* against cotton aphids, *A. gossypii* adults

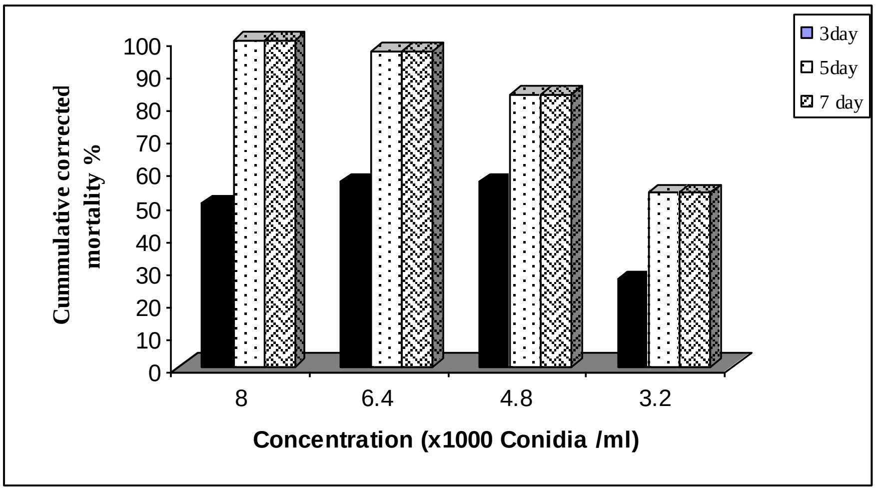

Fig. (2): Virulence of entomopathogenic fungi *Beauveria brongniartii* against cotton aphids, *A. gossypii* adults

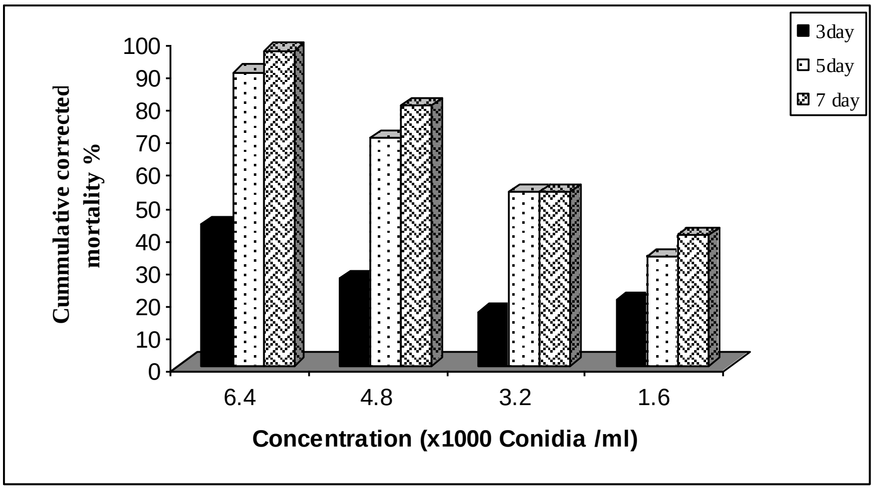

Fig. (3): Virulence of entomopathogenic fungi *Beauveria bassiana* against cotton aphids, *A. gossypii* nymphs.

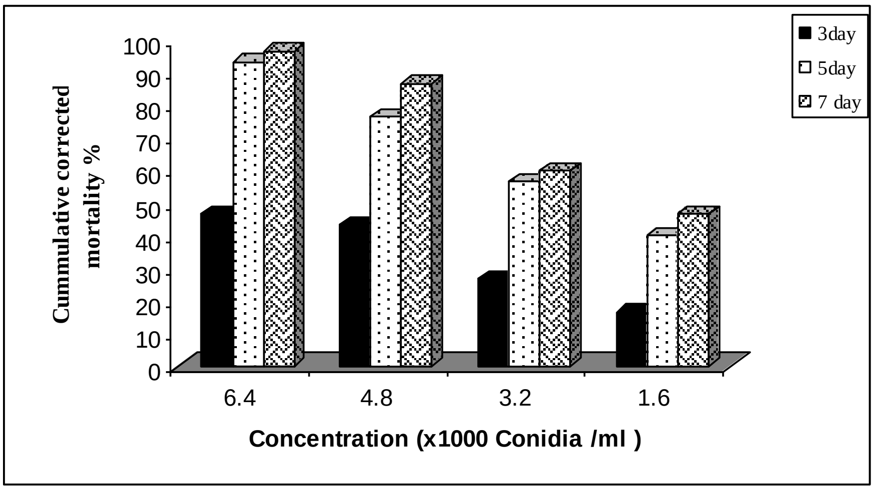

Fig. (4): Virulence of entomopathogenic fungi *Beauveria brongniartii* against cotton aphids, *A. gossypii* nymphs.

II-Efficiency of the entomopathogenic fungi on *A. gossypii:*

Data indicated that *B.bassiana* was more effective against adult aphids than *B. brongniartii* wheares ,the LC_{50} of them was 2.443 $x10^3$ conidia/ml and 3.118 $x10^3$ conidia/ml, respectively. While*, B. brongniartii* was more effective to nymphal stages than *B. bassiana* whereas LC_{50} of them was 2.279 $x10^3$ and 1.955 $x10^3$ conidia/ml, respectively .Ther were differences in virulence of the tested fungi on cotton aphid, these differences exemplified variation existed in entomopathogenic fungi even when insect hosts were the same bioassayed species. This agreed with Ekesi *et al.* (2000) who evaluated the pathogenicity of four isolates of *B. bassiana* and *M. anisopliae* to apterous adult *Aphis craccivora* in laboratory with 4 concentrations of conidia. They found that all fungal isolates to be pathogenic to the insect but their virulence varied among species and isolates within species.

This phenomena was discussed by St. Leger (1995) who mentioned that there were several broad classes of pathogenicity genes. Other pathogenicity genes may encode enzymes that allowed fungus to overcome their host barriers. Therefore, extensive genetic variations in pathogenicity waits characterization at the molecular level.The results therefore demonstrated that *B. bassiana* and *B. brongniartii* are pathogenic to cotton aphids A. gossypii and therefore promise good biological control against this serious insect . Also, the nature of spore play a pronounced role in producing infection . This agreed with (Dilon and Charnley, 1985) who indicated that spores with faster germination rates might have a great potential for infection by reducing potential for desiccation , effects of other organisms, or less during molting while on the insect cuticle .

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نوعان من فطر البيوفاريا يبشران بالخير فى المكافحة البيولوجية لمن القطن

محمود السيد النجار [١]، هدى عبد الحسيب أحمد [٢] ، هدى عبد العزيز سالم [٢] و هبة يوسف السيد [١]

١- معهد بحوث وقاية النبات- مركز البحوث الزراعية- الدقى – الجيزة- مصر.
٢- كلية العلوم- جامعة المنصورة.

تم اختبار الكفاءة المرضية لنوعين من البيوفاريا ، بيوفاريا باسيانا و بيوفاريا برونجنيارتى على من القطن و ذلك فى الأجواء المعملية. أظهرت النتائج أن التاثيرات المرضية على كل من الحوريات والأطوار البالغة كانت كبيرة جدا وقد اختلف مدى التاثير باختلاف تركيز الكونيدات فى المعاملة وفترة ما بعد الأصابة . تم تقدير قيمة التركيز النصف المميت لكل من الفطرين ضد الأطوار البالغة من المن فكانت ٢,٤٤٣ x ١٠^{٣} و ٣,١١٨ x ١٠^{٣} كونيدة / مل على الترتيب ايضا تم تقدير قيمة التركيز النصف المميت لكل من الفطرين ضد أطوار الحوريات فكانت ٢,٢٧٩ x ١٠^{٣} و ١,٩٥٥ x ١٠^{٣} كونيدة / مل.تم ايضا حساب نسبة الموت التراكمى للمن المعامل بتركيزات مختلفة من الفطريات المختبرة خلال فترات زمنية مختلفة.