



## THE EFFICIENCY OF THE ENTOMOPATHOGENIC FUNGUS BEAUVERIA BASSIANA ON SUNN PEST INSECT *EURYGASTER* *INTEGRICEPS* PUT (HEMIPTERA: SCUTELLARIDAE) IN IRAQ

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### ABSTRACT

*Eurygaster integriceps* (Hemiptera: Scutelleridae) is one of the most serious pest of wheat and other cereal crops in the Middle East including Iraq. One potential control strategy is to use entomopathogenic fungi such as *Beauveria bassiana* to control this pest. Naturally infested Sunn pests in Kurdistan were collected and brought to laboratory. Isolates of fungi were selected for further analysis in the laboratory. Four concentrations of the fungus were utilized (1x10<sup>5</sup>, 1 x 10<sup>6</sup>, 1x10<sup>7</sup>, 1x10<sup>8</sup> spores /ml). The effect of different concentrations on mortality was tested under laboratory conditions for the three stages: the egg third instars nymphs and adults of sunn pest. Five replicated /treatments were made each consisting of 5 insect of each insect stage. The results of this study showed that the egg mortality increased with advanced period and with the increasing of concentrations. The maximum mortality was detected after 15 days: 47%, 62%; 79% and 91% for the concentration of 1x10<sup>5</sup>, 1 x 10<sup>6</sup>, 1x10<sup>7</sup>, 1x10<sup>8</sup> spores /ml respectively. Similar trend was found in the third instars and adults. The estimations of maximum mortality of the third instars after 15 days were 68%, 71.2%, 78.5%, and 91.9% respective while the corresponding estimations in adult were 50.4%, 57.8%, 63.2%, and 80.3%. These results confirmed the effectiveness of these fungi to control the Sunn pest, *E. integriceps*.

**KEYWORDS:** *Beauveria bassiana*; Sunn pest; Biological control mortality.

### INTRODUCTION

Biological control is a method of controlling pests such as insects, mites, weeds and plant diseases using other organisms (Flint *et al.*, 1998). There are three strategies of biological pest control: importation, in which a natural enemy of a pest is introduced; augmentation, in which locally-occurring natural enemies are bred and released to improve control; and conservation, in which measures are taken to increase natural enemies (FFTC, 2016). The agents of biological control include predators, parasitoids, and pathogens. The Biological control could have side-effects on biodiversity as a result of predation, parasitism, pathogenicity, competition, or other attacks on non-target species, especially when a species is introduced without understanding of the possible consequences (Sanda and Sunusi, 2014). Biological control is an alternative method of controlling insect pest in the agriculture field and is not an additional method, which cannot be used with combination of other insect control programs especially chemical control method. The natural enemies are also affected with pesticides and chemicals; hence for the successful of biological control program, the field should be devoid of pesticides (Edgington *et al.*, 2006).

Sunn pest, *Eurygaster integriceps* Puton, is one of the dominant wheat and barley bugs in Europe, North Africa, the Middle East and Iraq (Brown, 1962 and Rassipour *et al.*, 1996). They can survive or hibernate in high altitudes and harsh wintering regions (Zwolfer, 1930; Critchley, 1998). During spring and early summer, the pest spends about three months feeding on wheat and barley in the fields. Then they will migrate overwintering period to the foothills of mountains for the rest (Brown, 1962). The

prevention of Sunn pest damage depends on using the chemical control methods (Javahery, 1995). However, these methods were not convinced because of many reasons: such as: increasing of the Sunn pest populations which resulted in periodic outbreaks in Iraq from 2001-2004 (Hamma *et al.*, 2007). Besides the Sunn pest outbreaks that have occurred three times in Iran during the period of 1963 to 1993 (Javahery, 1995). Second the chemical control is expensive (Javahery, 1995). Third, the natural enemies of Sunn pest could be affected by chemical control (Kinaci *et al.*, 1998). Hence the using of entomopathogenic fungi, *Beauveria bassiana* represents an alternative to chemical pesticides. The aim of the current study is to evaluate the effectiveness of entomopathogenic fungi, *Beauveria bassiana* to eliminate the Sunn pest under laboratory conditions.

### MATERIALS & METHODS

#### Obtaining the Fungus

Dead Sunn pest were collected from their hibernating sites in North of Iraq. A growth media was prepared from Potato Dextrose agar (Difco co.) by dissolving 39 gms in a liter of water. The mixture was autoclaved from 40 minutes at 121 c under pressure of 1.5 kg /cm<sup>2</sup>. The mixture was poured into destringed 3ed petri dishes .After cooling, the petri dishes were placed upside down in the refrigerator until being used .To get the pathogen , 5 dead insects/petri dishes were placed over the media and left in an incubator with 25 ±1 and 70% relative humidity, for one week ,during which the fungus grew over the media.

**Testing the pathogenicity of the fungus**

Spores of the fungus obtained from the culture media as described above were added to one liter of water to make four suspensions with 4 spore concentrations ( $1 \times 10^5$ ,  $1 \times 10^6$ ,  $1 \times 10^7$ ,  $1 \times 10^8$  spores /ml).

**Statistical analysis**

Data of the virulence test for the Isolates were analyzed using the SAS. One way analysis of variance was used. Least significant differences test was performed to assess the differences among mortalities.  $P < 0.05$  considered significant. The mortality was adjusted according to abbot equation (Abbot, 1925).

**RESULTS & DISCUSSION**

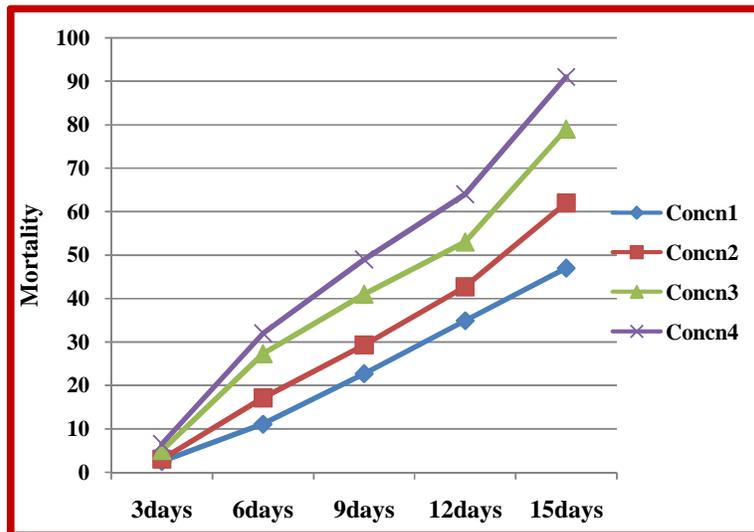
**Pathogenicity studies**

In this study, results revealed that all concentrations of the isolates showed pathogenicity to *E. integriceps*. The mortality of the eggs of sunn pest (Table 1) (Figure 1)

increased gradually along with increasing the concentration and period. The estimations of mortality of the eggs of sunn pest for the concentration of  $1 \times 10^5$  spores /ml were 2.5%, 11.1%, 22.7%, 34.9, and 47% for the periods of 3, 6, 9, 12, and 15 days. The corresponding estimations for the concentration  $1 \times 10^8$  were 6.5%, 32%, 49%, 64%, and 91%. These results illustrated the association between the concentration and period to increasing the mortality. Similar trend was shown in the mortality of the third instars nymphs (Table 2, Figure 2) and adults (Table 3, Figure 3). The estimations of mortality in the third instars nymphs for the concentrate of  $1 \times 10^8$  were 3%, 44%, 69%, 77.1% and 91.9% for the periods of 3, 6, 9, 12, and 15 days. In regards with the mortality in adults, the estimations were 0%, 30.6%, 48.2%, 64.3%, and 80.3%. In conclusion: These results confirmed the effectiveness of these fungi to control the Sunn pest, *E. integriceps*.

**TABLE 1:** Means of mortality percentage according to the concentrations in the eggs of sunn pes.

Concentration spores /ml	Days				
	3	6	9	12	15
$1 \times 10^5$	2.5	11.1	22.7	34.9	47
$1 \times 10^6$	3.0	17.1	29.3	42.7	62
$1 \times 10^7$	5.0	27.3	41	53	79
$1 \times 10^8$	6.5	32	49	64	91
LSD	0.012	2.33	3.55	3.77	5.16



**FIGURE 1:** The cumulative mortality in the eggs of sunn pes in different concentrations and periods

**TABLE 2:** Means of mortality according to concentrations in the third instars nymphs of sunn pes.

Concentration spores /ml	Days				
	3	6	9	12	15
$1 \times 10^5$	0	28.2	37	50	68
$1 \times 10^6$	0	34	44.2	57.4	71.2
$1 \times 10^7$	1	38.7	51	67	78.5
$1 \times 10^8$	3	44	69	77.1	91.9
LSD	-	2.13	5.55	4.77	6.16

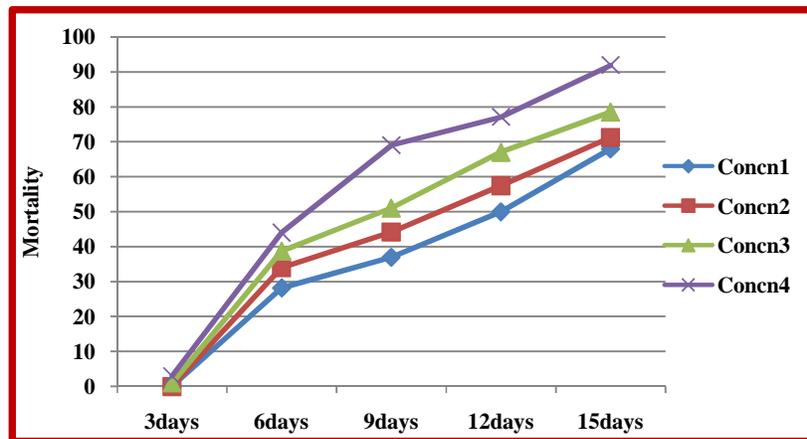


FIGURE 2: The cumulative mortality in the third instars nymphs of sunn pes in different concentrations and periods

TABLE 3: Means of mortality according to the concentration in the adult of sunn pes

Concentration spores /ml	Days				
	3	6	9	12	15
1 x 10 <sup>5</sup>	0	17.8	29.1	41.3	50.4
1 x 10 <sup>6</sup>	0	24.2	28.6	44.5	57.8
1 x 10 <sup>7</sup>	0	27.3	38.7	59.6	63.2
1 x 10 <sup>8</sup>	0	30.6	48.2	64.3	80.3
LSD	-	4.66	5.15	2.01	3.16

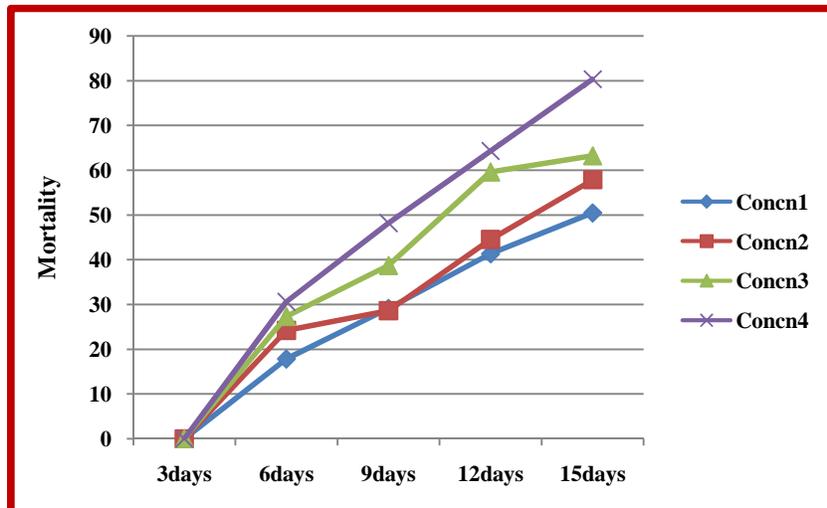


FIGURE 3: The cumulative mortality in the adults of sunn pes in different concentrations and periods

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