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**EXPERIMENTAL EFFECT OF EMPUSA MUSCAE
COHN., FUNGUS ON THE LARVAE OF MUSCA
DOMESTICA LINN., (DIPTERA: MUSCIDAE)**
(With One Table)

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(Received at 12/4/1995)

التأثير التجريبي لفطر الأمبوزاماسكا على يرقات

الذبابه المنزليه ماسكادومستيكا

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أختبر تأثير إضافة العسل كمنبه للتغذية على فطر الإمبروزاماسكا ليرقات الذبابه المنزليه (الأعمار الثلاثة) تحت الظروف العمليه. اتضح من النتائج أن تركيز العسل ١٢٥٪ المضاف يزيد التأثير الضار مع ١٢٥٪ من معلق الفطر ، ومعدل الموت يتراوح ما بين ٩٥-١٠٠٪ في الأعمار المختلفه بعد ثلاثة أيام من المعامله. هذه المستويات من الموت كانت مرتفعه أكثر مما سجل بفعل الفطر دون إضافة العسل بعد نفس الفتره. وإضافه العسل بتركيز مرتفع ٢٥٪ للفطر يقلل هذا التأثير. نهايه فترة الموت لليرقات المعامله كانت مبكره كثيرا في حاله إضافه العسل عن عدم اضافته. من النتائج التي توصل إليها أن القيمه في حاله تطبيق فطر الأمبوزاماسكا للمكافحه الحيويه للذباب المنزلي في البيئه والمنازل.

SUMMARY

Effect of the addition of honey as a feeding stimulant to *Empusa muscae*, cohn. fungus suspension was tested under laboratory conditions on larvae (Three instars) of *Musca domestica*, Linn. Results obtained showed that a honey concentration of 0.125% increased the pathogenic effect of a 0.125% fungal suspension on larvae of three instars inducing rate of mortalities ranging between 95-100% in the different instars after three days from treatment. These levels of mortality were higher than those reported for the *Empusa muscae*, Cohn. fungus suspension alone the same period. However, the addition of honey at higher concentration (0.25% decreased this effect. The end mortalities among the treated larvae were obtained much earlier in the case of adding honey than without it. It is concluded that obtained results may be of value in case of application of *Empusa muscae* fungus for the biological control of *Musca domestica*, Linn. in the environment and houses.

Keywords: *Empusa Muscae*, Cohn fungus and larvae of *musca domestica*, Linn.

INTRODUCTION

Musca domestica Linn., the common house fly, or rather its larva, has been reported many times as causing human intestinal myiasis. Human infection must take place through drinking or eating contaminated liquids or foods (ROBBERT, 1955).

The first description of *Empusa muscae*, Cohn. fungus, commonly found infecting the house fly, *Musca domestica*, Linn. was that given by DEGEER in 1782. About a century ago, COHN (1855) gave it the name *Empusa muscae*, as it stands today as the type species of the genus infecting flies. Flies are usually found indoors, they attach themselves to the walls and ceilings of houses and other buildings in the life like position. Close inspection of flies killed with the fungus usually reveals on the wall or windowpane distinct halo of discharged spores encircling the insect.

The aim of this study is to report the results of experiments conducted to determine the age of Muscoid larvae infected most readily, the effective dose of the pathogen for maximum mortality of the host population; and to evaluate the feasibility of further studies of the potential of this fungus as an agent of biological control of *Musca domestica*, Linn.

MATERIAL and METHODS

A laboratory mass rearing of *Musca domestica* Linn., provided the required numbers of experimental lar-

vae. Consequently 450 larvae of each instar were tested as follows:-

a) 150 larvae were fed on honey with a suspension of the commercial preparation fungus (*Empusa muscae*, Cohn from the department of biological control in Carolina university) in a concentration of 0.125% (0.5×10^4 viable Zoospores/100 ml) + 0.125% honey.

b) 150 larvae were fed on similar diet with the same concentration of *Empusa muscae*, Cohn. + 0.25% honey.

c) The remaining 150 larvae were fed similar diet treated with fungus (0.125%) alone without the addition of honey, and these represented the control.

In every case, each Petri dish contained 20-30 larvae according to the larval instar. Treated honey foods were provided for 48 hours, after which new untreated honey foods were given daily. Mortality was recorded once each day.

RESULTS

Data obtained are summarized in Table (1). In case of 1st instar, 40% of the larvae fed on the diet contaminated with fungus suspension alone died within the first 24 hours after ingestion. Mortality among these larvae increased to 55% and 80% on the second and third days, respectively. When larvae of the same instar were fed on diet treated with the same suspension, mixed within 0.125% honey, mortality rate increased to 45, 74 and 85% on the first three days after in-

gestion, respectively. However, a more honey concentration (0.250%) decreased the effectiveness since the mortality rates were 30, 53 and 82% on the three days, respectively. The 2nd instar larvae treated with fungal concentration alone gave 58% and 80% mortality on the second and third days after treatment, respectively. Addition of 0.125% honey to the suspension increased the respective percentage to 95 and 100%, while the addition of 0.25% honey induced lower values in the same time intervals; 75% and 90% respectively.

Mortality rate for the 3rd instar larvae treated with the suspension alone were 58%, on the second day treatment. Addition of 0.125% honey increased these rates to 90%, while excess of the honey concentration (0.250%) decreased them to 60%.

The above results indicate that the addition of honey at a concentration of 0.125% to fungus suspension (Zoospores of *Empusa muscae*, Cohn.) increased the efficacy of this pathogen against the larvae of *Musca domestica*, Linn. It increased mortality on the second day after treatment by about 30.7% as compared with mortality caused by the suspension alone. Statistical analysis indicated that the difference in effect between the suspension alone and its mixture with 0.125% honey was highly significant while that reported for the suspension alone and its mixture with 0.250% honey was non-significant. However, the difference in mortality

induced by the two mixtures was significant at 0.05.

Furthermore, results obtained (Table 1) show that with the concentration 0.125% fungal suspension + 0.250% honey, the end-mortality of the first instar larvae was reached in 6 days after treatment, and in 4 days only after treatment with the suspension mixed with 0.125% fungal suspension and 0.125% honey, while in case of the suspension alone it was reached after 14 days. This trend applies to all three instars tested.

DISCUSSION

In the present study, it was found that the addition of honey at a concentration of 0.125% as feeding stimulant, to a low concentration of fungus suspension (0.5×10^4 viable Zoospores/100 ml) increased the pathogenic effect of this suspension to larvae of all three instars of *Musca domestica*, Linn. The average rate of mortality among larvae of these instars reached 55.6%, 48 hours after application of this concentration alone. The addition of 0.125% honey to it increased this rate to 86.3% (Table 1).

An opposite result was obtained by adding a higher concentration of honey 0.25%. In this case, the rate of larval mortality did not increase above the level reported for the *Empusa muscae* fungus concentration alone and in some cases 3rd instar it decreased below this level. This phenomenon is probably induced by more formation of H₂O₂ by the de-

fence mechanism system of larvae treated with higher concentration of honey. Accordingly, it increased the resistance of these larvae to the *Empusa muscae* fungus suspension.

It was also found that the end mortality of larvae of the different instars was attained comparatively earlier in case of applying the fungus suspension mixed with 0.125% honey, and for earlier in both cases than when applying the fungus suspension alone. These results agree with those obtained by JARONSKI, 1983; SWEENEY, 1983 on mosqui-

toes and cherry, *et al.*, 1992 on the mustard beetle.

It could be concluded that the results obtained may be of value in the field of biological control with *Empusa muscae* fungus against *Musca domestica*, Linn. larvae or possible other Dipterous insects. The addition of honey at a low concentration (0.125%) to *Empusa muscae* fungus preparations seem to give better results in shorter time. It is also expected that the amount of pathogenic material used may be decreased.

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Table 1: Mortality, End - mortality and time for three instar larvae of Musca domestica linn treated with fungus (Empusa muscae) suspension alone 0.125% or mixture with honey (0.125% and 0.250%) .

Larval instars	First			Second			Third			Mean \pm S.E						
	% larval mortality on three days after treatment	% of End-mortality and days	% days	% larval mortality on three days after treatment	% of End-mortality and days	% days	% larval mortality on three days after treatment	% of End-mortality and days	% days	% larval mortality on three days after treatment	% of End mortality and days	% days				
0.125% fungus suspension	40	80	99	35	58	80	27	54	82	100	23	34.0	55.6	81.0	99.66	19
												1.2	0.77	1.3	1.1	2.7
0.125% fungus susp. + 0.125% honey	45	74	95	39	75	100	25	90	95	100	5	36.0	86.3	93.3	98.66	4
												1.5	1.88	1.6	0.19	0.81
0.125% fungus susp. + 0.250% honey	30	53	82	36	75	90	14	60	88	100	8	26.0	62.6	90.0	98.33	7
												2.1	1.77	0.80	1.6	1.72