

# ROLE OF *BATHYPLECTES CURCULIONIS* ( THOMSON ) (HYMENOPTERA : ICHNEUMONIDAE) IN CONTROLLING ALFALFA WEEVIL IN CENTRAL IRAQ

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## ABSTRACT

*Bathyplectes curculionis* ( Thomson ) is the sole parasitoid encountered in west Baghdad parasitising larvae of alfalfa weevil *Hypera postica* ( Gyllenhal) . Percent of parasitisation did not exceed 8% in 1989 and 1990 and overall rate of parasitisation was 5% . Additional reduction in percent of parasitisation caused by presence of the fungal pathogen *Erynia phytonomi*. High survival percent of weevil's larvae under the study conditions explains why this insect is a key pest of alfalfa. Suggestions were made to enhance the role of *B. curculionis* in controlling the weevil.

## INTRODUCTION

*Bathyploctes* spp . are some of the most important parasitoids yet introduced in biological control programe in some countries to regulate the population of alfalfa weevil ( AW ), *Hypera postica* ( Gyllenhal) . Efforts to implement biological control were initiated when *Bathyplectes curculionis* ( Thompson ) was first transfered from Europe and released in the U.S.A. in 1911 ( Chamberlin 1924 ) . Subsequently , the importance of this parasitoid as a widely distributed and effective biological control agent for AW has been well documented ( Hagan & Manglitz 1967 ; Hassan & Boush 1987 ) . *Bathyplectes anurus* ( Thompson ) , another parasitoid of AW larvae , was also transfered from Europe and released in stern U.S.A. and later became established ( Dysart & Day 1976 ; Hassan & Beush 1987 ) .

In a survey conducted in the Middle East , it was found that *B. curculionis* is widely distributed throughout Iraq , Iran , and Egypt , and most abundant in regions having hot , dry summer , with moderately cold winter : However , *B. anurus* is less geographically distributed than *B. curculionis* , and is most prevalent in regions having moderately warm summer and cold , to very cold winter ( Gonzales et . al . 1980 ) .

## Controlling of alfalfa weevil in central Iraq

The assessment of *Bathyplectes* spp. as a potential biological control agent should not only be considered in terms of percent parasitisation but also evaluated concerning the influence of parasitism on life history of AW larvae. Partell and pass ( 1978 ) indicated that larval parasitoids significantly altered growth and development of weevil larvae . *B. curculionis* and *B. anurus* caused 24 % and 29 % mortality respectively as compared to unparasitized controls . Under enzootic Erynia disease conditions , *Bathyplectes* spp . caused 47% mortality ( Hassan & Boush 199 ) in comparism to 19% mortality indicated by Harcourt *et. al.* ( 1977 ) .

This study was intended to determine the seasonal occurrence of *Bathyplectes* parasitoids and evaluate their roles in controlling AW in control Iraq , particularly with the presence of *E. phytonomi* .

### MATERIALS AND METHODS

Four fields of alfalfa located in west of Baghdad were chosen to establish test area . The sampling area in each field was restricted to 100 x 100 m .

To determine species weevil mortality factors , ten samples each consisted of 10 alfalfa stems for each field ( total 400 stems ) were taken once a week from the beginning of AW egg deposition late Feburway to the completion of adult development in March of 1989 and 1990 seasons . In the laboratory , all AW larvae were removed from the stems , counted , and then placed individually in ventilated caps with fresh alfalfa foliage . Larvae were examined daily for cocoon parasiteids or disease symptoms and were provided with fresh alfalfa . Parasitoids were identified in the cocoon stage ( Dysart & Day 1976 ) , and percent of parasitisation was based on larvae which were clearly parasitized and formed parasitoid cocoon . Larvae exhibiting symptoms of the fungal disease were separated by their color . The brown to tan diseased larvae were placed on wet filter paper in 3.5X1 cm . Sterile petri dish , held at 21C, and observed for the presence of conidial spores . Black larvae were examined readily as wet mount preparation to determine if resting spores were present. Mortality factors of prepupae were determined as previously described, and data recorded were added to those of larval observations.

### RESULTS AND DISCUSSION

*Bathyplectes curculionis* was the only insect parasitoid encountered in the area of study , and identification from other parasitoids was determined by the cocoon stage ( Dysart & Day 1976 ) . The extent of parasitism of AW larvae by this parasitoid was not identical during the study period in 1989 - 1990 as presented in Figure 1 . The highest number of parasitized larvae was found at the peak of AW density in March 17 , when the percent of parasitisation did not exceed 8 % . In general , parasitisation was relatively stable and averaged 5 - 8 % for the most of weevil's season . With the occurance of *E. phytonomi* , the percent of parasitisation was dropped to less than 1 % during the time of higher rate of AW infection in March 17 , 1990 .

Impact of *Erynia* disease on parasitoid development was fairly documented. Les & Allen ( 1983 ) observed that on epizootic of *E. phytonomi* occurred in Virginia at the time when *Bathyplogtes* spp. Larvae would normally have been emerging from host larvae. In this situation, large number of parasitoids died as a result of fungus - induced mortality of their host. Goh *et al.* ( 1989 ) found that epizootic of the fungus coincided with highest prevalence of parasitism by the second generation of *B. curculionis* in 1983 through 1986, and reduced survival of the parasitic wasp by more than 90%. In an experimental exclusion, Hassan and Boush observed that *E. phytonomi* reduced parasitisation rate by *Bathyplectes* spp. Only during the period of epizootic, and there was no significant reduction in overall rate of parasitisation in Wisconsin.

Although the fungus does not compete for host in sense of actively searching for *H. postica* larvae, as is the habit of *B. curculionis* adults, both organisms require immature AW larvae as a source of nutrients for survival. However, in this study, there was a plenty of host larvae to compete for by either the fungus or parasitoid. The survival percent of weevil's larvae was about 70% in March 17 when the highest rate of infection was recorded. This would suggest that the reduction in percent of parasitisation by *B. curculionis* is a result of direct infection rather than host competition for AW larvae by *E. phytonomi*. If weevil larvae is infected by the fungus, an immature larvae of *B. curculionis* in that AW larvae has no chance of completing its development.

However, other mortality, estimated about 25% of total larvae population reared in the laboratory, was recorded as the number of larvae failed to reach the adult stage and died without forming parasitoid cocoon or disease symptoms.

This mortality might be attributed to failure in technique, losses during the rearing procedure, shortage of food, genetic deformation, normal mortality, as well as influence of parasitism. *Bathyplectes* could alter growth, development, and food consumption of parasitised larvae ( Armbrust *et al.* 1970; Duodo & Davis 1974; Partell & pass 1978 ).

To assess the role of *B. curculionis* in controlling AW in central Iraq, overall rate of parasitisation through 1989 and 1990 seasons was no more than 5% of total *H. postica* population despite the fact that *B. curculionis* was the only parasitoid found. Comparatively, it plays better role in controlling AW in north America where the percent of parasitisation averaged 30-40% ( Berberet *et al.* 1978, 1980 ), and even at the presence of competitive parasitoid such as *B. anurus* ( Hassan & Boush 199 ).

In conclusion, since there is no key mortality factor for controlling AW in central Iraq, we suggest that the augmentation of parasitoid through the provision of food and shelter for adult parasitoid, as well as systematic cutting of alfalfa may enhance the role of *B. curculionis* in controlling AW.

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دور الطفيل *Bathyplectes curculionis* في مكافحة سوسة الجت في وسط العراق

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### الخلاصة

وجد أن *Bathyplectes curculionis* هو الطفيل الوحيد الذي يتطفل على يرقات سوسة الجت في غرب العاصمة بغداد . نسبة التطفل لم تزيد عن 8 % في عام 1989 و 1990 ومعدل التطفل بشكل عام 5 % من المجموع السكاني للسوسة . حدوث المسبب المرضي الفطري *Erynia phyttonomi* نتج عنه اختزال في نسبة التطفل . نسبة البقاء العالية ليرقات السوسة والوصول الى الطور البالغ باعداد كبيرة يفسر لماذا ان هذه الحشرة آفة رئيسية للجت .



