J. King Saud Univ., Vol. 9, *Agric. Sci.* (1), pp. 155-161 (A.H. 1417/1997)

Seasonal Activity of *Bathyplectes curculionis* (Thomson), (Hymenoptera: Ichneumonidae), an Endoparasite of the Egyptian Alfalfa Weevil (Coleoptera: Curculionidae) in Riyadh, Saudi Arabia

Ali M. Alsuhaibani

Department of Plant Protection, College of Agriculture, King Saud University, P.O. Box 2460, Riyadh 11451, Saudi Arabia

(Received 16/5/1416; accepted for publication 30/10/1416)

Abstract. The Egyptian alfalfa weevil, *Hypera brunneipennis* (Boheman) is the most important economic insect pest of alfalfa in Saudi Arabia. Larvae of this insect are responsible for doing most of the damage. They are attacked by the endoparasitic ichneumonid wasp, *Bathyplectes curculionis* (Thomson). In an experiment conducted at the Experimental and Research Station, College of Agriculture, King Saud University, Derab, Saudi Arabia, it was found that the population peaks of the parasite were nearly synchronized with the population peaks of the host insect. Also, the maximum incidence of parasitism occurred in March and did not surpass 11% and 16% in 1992-93 and 1993-94 seasons, respectively. In order to conserve *B. curculionis,* it is recommended that broad spectrum insecticides not be applied to alfalfa during March when this parasite is at its maximum activity.

Introduction

Alfalfa, *Medicago sativa* L. (Family Leguminosae) is the major fodder crop grown in Saudi Arabia. The production of alfalfa in the Kingdom exceeded 68 thousand hectares in 1992 [1, p.46]. The Egyptian alfalfa weevil, *Hypera brunneipennis* (Boheman), is considered the most desctructive and widely spread insect pest of alfalfa in Saudi Arabia [2]. Damage caused by the larvae of this pest reduces yield and quality of alfalfa hay [3].

The ichneumonid wasp, *Bathyplectes curculionis* (Thomson) is an important, effective, and widely distributed endoparasite of the alfalfa weevil larvae. The females of this parasitic wasp oviposit in alfalfa weevil larvae usually killing the host larvae after they spin their cocoons [4]. This endoparasite totally controls alfalfa weevil in some areas. Its importance as a biological control agent has been well documented [5-10]. Davis [11] for example, found that one adult *B. curculionis* per sweep per 25 weevil larvae in Utah produces about 60 percent parasitism, one adult: 45 larvae gives 50 percent parasitism and one adult: 100 larvae accounts for about 30 percent parasitism.

The objective of this study is to monitor the population fluctuation of the alfalfa weevil endoparasite throughout its seasonal activity. This will help to appropriately schedule the use of insecticides when (and if) necessary to inflict minimum injury to beneficial insects in alfalfa.

Materials and Methods

Samples of insects were collected from alfalfa field located at the Agricultural Experimental Research Station, King Saud University at Derab. A standard insect sweep net was employed to collect the insect samples from alfalfa. A total of 50 pendulum sweeps were collected weekly throughout the seasonal activity of the weevil. The sample were divided into five replications. The collected samples were transferred to the laboratory in cloth bags where the insect samples were immediately sorted out. The alfalfa weevil larvae were kept in semi-clear plastic cages (16.5 cm L × 16.5 cm W × 8.5 cm H) and the ventilation was allowed through openings on the sides of the cages that were covered with muslin. The alfalfa weevil larvae were fed fresh alfalfa foliage daily (and as necessary) until pupation occurred. The insect cages were kept at laboratory conditions (Temp. = 26°C and R.H. = 30-55%). The numbers of *B. curculionis* cocoons were counted and recorded and the percentages of parasitism were calculated. Compared with the dessection of larvae, the rearing method used in this study, proved reliable and needs less work [12].

Results and Discussion

The adult parasites start to emerge from their cocoons in January and the females oviposit in alfalfa weevil larvae. The maximum incidence of parasitism took place in March and did not exceed 11% and 16% in 1992-93 and 1993-94 seasons, respectively (Figs. 1 and 2). The parasite seems not to be effective enough to give satisfactory control of weevil larvae in Riyadh, Saudi Arabia. In Florida, for example, a maximum incidence of parasitism of 93% was reported by Munir and Sailer [5]. In previous studies on this parasite [13], it was found that two factors may seriously reduce the effectiveness of this parasite; the encapsulation of the parasite eggs by the

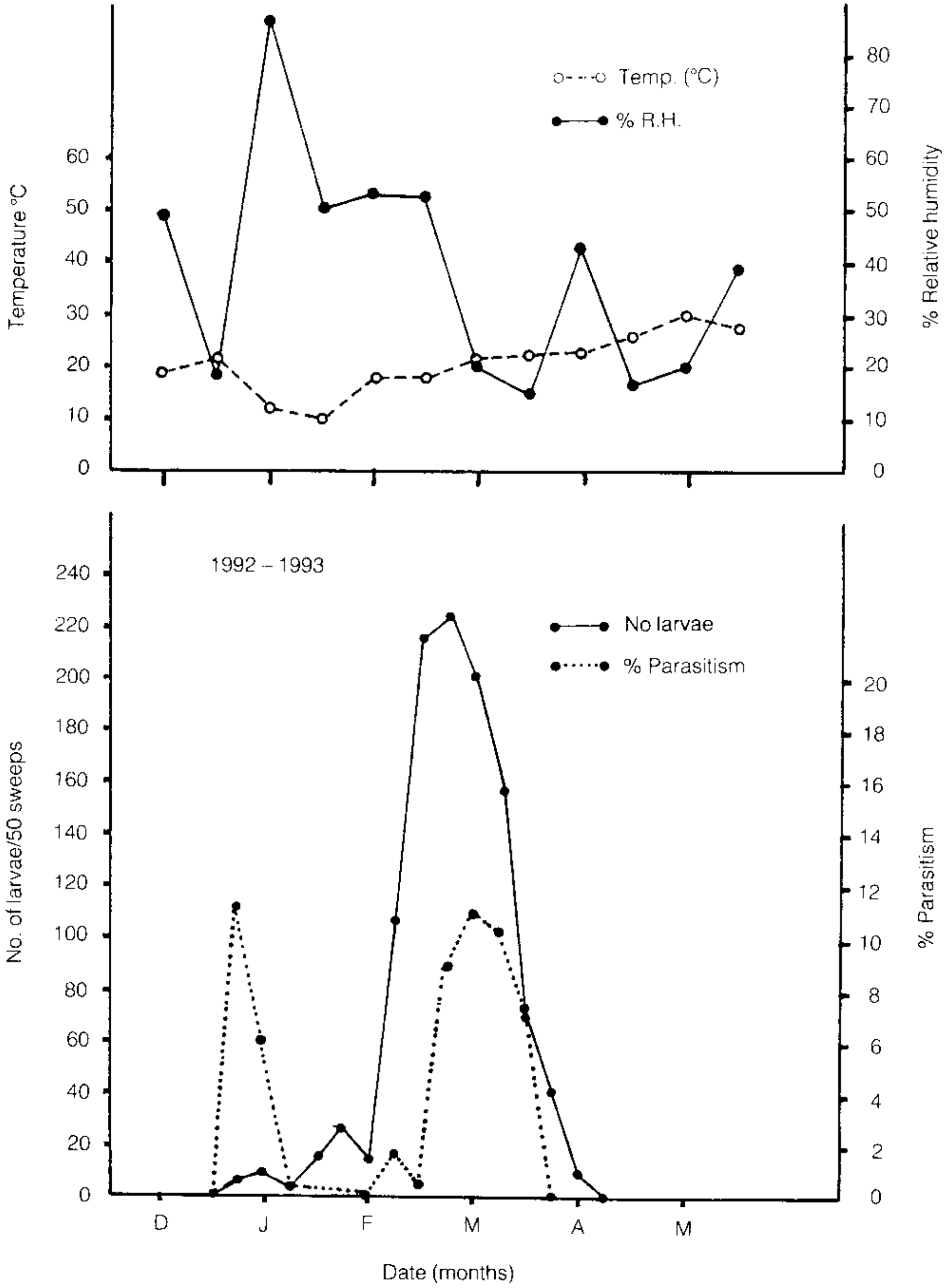

Fig. 1. Number of alfalfa weevil larvae per 50 sweeps and % parasitism for 1992-93 season.

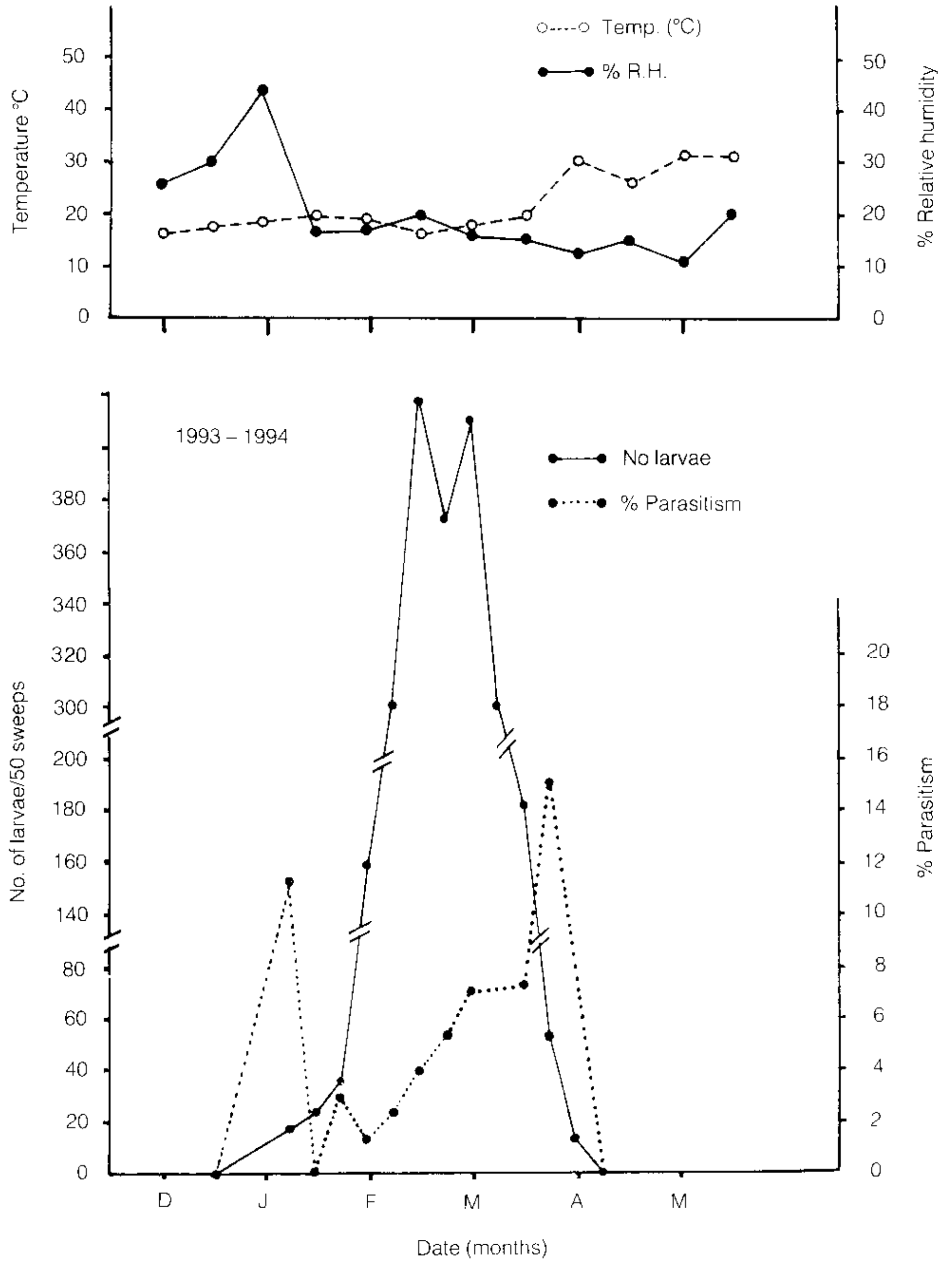

Fig. 2. Number of alfalfa weevil larvae per 50 sweeps and % parasitism for 1992-93 season.

host and the attack of parasite by hyperparasites. No hyperparasites were, however, noticed to emerge during the period of this study.

Aldryhim [2,14] found that the alfalfa weevils that reached the adult stage before February gave a second generation; whereas, those that reached the adult stage after the first week of February entered into aestivation. This corresponds somehow with what was found in this study (Figs. 1 and 2). Also, it seems that the parasite completes two generations attaining high levels of parasitization during March and synchronizing to some extent with the seasonal activity of the host insect. In addition, the second-generation cocoons of *B. curculionis* contained diapausing larvae that completed their development early in the next year. This was in agreement with what was found in previous reports on this parasite [9].

In 1992-93 season (Fig. 1), the number of alfalfa weevil larvae (host insect) were much lower when compared with 1993-94 season (Fig. 2). This could be attributed to the increase in the relative humidity in the former season (1992-93) which might trigger the infection of alfalfa weevil larvae and pupae with the fungal pathogen, *Entomophthora* sp. as occasionally happens under comparable conditions [9,15].

Because the effectiveness of *B. curculionis* is low, the introduction, evaluation and release of other species of *Bathyplectes* such as *B. corvina, B. anurus* and *B. stinostigma* seem to be necessary.

In order to conserve *B. curculionis* and other occurring beneficial insects in alfalfa, it is recommended that broad spectrum insecticides not be applied to alfalfa especially during maximum incidence of parasitism in March as far as the economic threshold of alfalfa weevil has not been reached.

References

[1] Ministry of Agriculture and Water, Department of Economic Studies and Statistics. *Agriculture Statistical Year Book,* Riyadh, Saudi Arabia, 8 (1993/94).

[2] Aldryhim, Y.N. and Elshafei, A. "Biology of *Hypera brunneipennis* (Boheman) (Coleoptera: Curculionidae) in the Central Province of Saudi Arabia." *J. King Saud Univ. Agric. Sci.* 3 (1991), 117-123.

[3] Hintz, T.R., Wilson, M.C., and Armbrust, E.J. "Impact of Alfalfa Weevil Larval Feeding on the Quality and Yield of First Cutting Alfalfa." *J. Econ. Entomol.,* 69 (1976), 749-754.

[4] Hagen, A.F. and Manglitz, G.R. "Parasitism of the Alfalfa Weevil in the Western Plains States from 1963 to 1966." *J. Econ. Entomol.,* 60 (1967), 1663-1666.

[5] Munir, B. and Sailer, R.I. "Observations on the Alfalfa Weevil and Its Larval Parasites at Gainesville, Florida." *Florida Entomol.,* 67 (1984), 499-503.

[6] Van den Bosch, R. "*Bathyplectes curculionis* as a Parasite of *Hypera brunneipennis.*" *J. Econ. Entomol.,* 46 (1953), 161-162.

[7] Duodu, Y.A. and Davis, D.W. 1974. "Selection of Alfalfa Weevil Larval Instars by, and Mortality due to, the Parasite *Bathyplectes curculionis.*" *Environ. Entomol.*, 3 (1974), 549-552.

[8] Berberet, R.C. and Gibson, W.P. "*Bathyplectes curculionis* in Oklahoma: Distribution and Effective Parasitism of the Alfalfa Weevil." *Ann. Entomol. Soc. Am.*, 69 (1976), 205-208.

[9] Clancy, D.W. "Biological Control of the Egyptian Alfalfa Weevil in California and Arizona." *J. Econ. Entomol.* 62 (1969), 209-213.

[10] Horn, D.J. 1968. "*Bathyplectes curculions,* a Parasite of the Alfalfa Weevil, in New York." *J. Econ. Entomol.*, 61 (1968), 1469-1470.

[11] Davis, D.W. "Parasite-prey Ratios Among Alfalfa Weevil Larvae of Northern Utah." *Environ. Entomol.*, 3 (1974), 1031-1032.

[12] Davis, D.W. "Insecticidal Control of the Alfalfa Weevil in Northern Utah and Some Resulting Effects on the Weevil Parasite *Bathyplectes curculionis.*" *J. Econ. Entomol.*, 63 (1970), 119-125.

[13] Berberet, R.C., Nuss, K.E., and Gibson, W.P. "Parasitism of the Alfalfa Weevil in the Southern Plains by *Bathyplectes* spp.1973-78." *J. Econ. Entomol.*, 71 (1978), 713-718.

[14] Aldryhim, Y.N. and Elshafei, A. "Seasonal Abundance of the Alfalfa Leaf Weevil, *Hypera brunneipennis* (Boh.), in the Central Province of Saudi Arabia." *J. King Saud Univ. Agric. Sec.*, 3, No. 2 (1991), 269-277.

[15] Puttler, B., Hostetter, D.L., Long, S.H., and Pinnell, R.E. "*Entomophthora phytonomi,* a Fungal Pathogen of the Alfalfa Weevil in the Mid-Great Plains." *Environ. Entomol.*, 7 (1978), 670-671.

النشاط الموسمي للطفيل الداخلي (باثيبلكتس كيور كيولونس) لسوسة ورق البرسيم (هيبرا برونيبنس) في مدينة الرياض، المملكة العربية السعودية

علي بن محمد السحيباني

قسم وقاية النبات، كلية الزراعية، جامعة الملك سعود،
الرياض، المملكة العربية السعودية

ملخص البحث. تعتبر سوسة ورق البرسيم من أهم الآفات الحشرية الاقتصادية على محصول البرسيم في المملكة العربية السعودية. تُهاجم اليرقة لهذه الحشرة والتي تسبب الجزء الأكبر من الضرر على البرسيم بواسطة طفيل داخلي من دبابير الأكنوموند. لقد أُجريت تجربة في محطة الأبحاث والتجارب الزراعية بديراب ـ الرياض، المملكة العربية السعودية ـ لدراسة النشاط الموسمي لهذا الطفيل. أظهرت نتائج هذه الدراسة أن أعلى نشاط موسمي لتعداد هذا الطفيل يتزامن مع أعلى نشاط موسمي لتعداد سوسة ورق البرسيم. كما وجد أن أعلى نسب للتطفل تحدث في شهر مارس (آذار) ولم تتعد تلك النسب ١١٪ و ١٦٪ في موسمي **١٩٩٢ ـ ١٩٩٣**م و **١٩٩٣ ـ ١٩٩٤**م، على التوالي وللمحافظة على هذا الطفيل فمن الضروري عدم استخدام المبيدات واسعة الطيف على البرسيم خلال شهر مارس (آذار) عندما يكون نشاط هذا الطفيل عند أعلى مستوى له مالم تصل أعداد يرقات سوسة ورق البرسيم إلى مستوى الحد الاقتصادي الحرج.