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Seasonal Abundance of the Alfalfa Leaf Weevil, *Hypera brunneipennis* (Boh.), in the Central Province of Saudi Arabia

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Abstract. The population of the alfalfa leaf weevil, *Hypera brunneipennis* (Boh.), including adults, larvae and eggs was estimated using two methods; the sweep net and the single stem techniques. Observations were carried out during 1986-1987 and 1987-1988 seasons, at the Experimental and Research Station, College of Agriculture, King Saud University, Deirab, Saudi Arabia.

In the first year of study, adults, larvae, and eggs were first detected in an alfalfa field in mid October, late November, and mid December, respectively and reached their peak numbers during mid March, on 9 February, and on 5 January respectively. they disappeared in mid May, late April, and late March, respectively. The numbers of adults and larvae were significantly higher at the perimeter than in the center of the field and adult numbers were significantly higher at night than during day. Counts of larvae per stem and per 20 sweeps were highly correlated; however, there was no correlation between larval number per stem and stem length. The population density of larvae, using sweep nets, in the 1986-1987 and 1987-1988 seasons were highly correlated and the population patterns of both seasons were almost identical.

Introduction

The alfalfa leaf weevil, *Hypera brunneipennis* (Boh.), is the most important pest of alfalfa in Saudi Arabia as well as in many other countries. Damage caused by larvae reduced both yield and quality of the alfalfa crop [1,2].

Biological studies carried out by Aldryhim and Elshafei [3] revealed the presence of two annual generations for this pest in the Central Province of Saudi Arabia. Only one generation was recorded for the same insect in Egypt [4].

The major techniques that have been used to sample alfalfa weevils were square root, D-Vac, and single stem, which provide absolute estimate [5]. Presently, the single stem technique is more widely used in the integrated pest management to determine larval population density [6]. However, the sweep net is still more commonly used in Saudi Arabia to determine the population density of alfalfa pests.

The objectives of this research were to monitor the seasonal abundance and field distribution of *H. brunneipennis*. The results of such study are essential to develop an effective control program for this pest.

Materials and Methods

The persent study was conducted at the Experimental and Research Station, College of Agriculture, King Saud University, Deirab, during 1986-1987 and 1987-1988 seasons. Observations were carried out in an alfalfa field of about 10 ha, and 5 years in stand-age, bounded by a road from the east, by date palm trees from the south, by orchards and vinyards from the west, and by uncultivated grassland from the north. The field was under sprinkler irrigation and was watered daily.

The alfalfa field was divided into 20 blocks (36 × 83 m. each) in 5 rows, and each block was subdivided into three plots (12 × 83 m. each). Blocks of one row were separated from each other and from those of the neighboring row by medians (belts) of 14 m. wide.

To study the population density and field distribution of the alfalfa weevil at day and night, three plots were selected from the first block row (field perimeter) and three plots from the third block row (field center) for day sampling. Same selections were made for night sampling. All selections were randomly made.

In the first year of study samples were taken at weekly intervals using the sweep net for day and night sampling, and the single stem technique for day sampling only.

A standard sweep net, 12 inches in diameter, was used at the rate of 20 sweeps per plot. Day and night sampling were taken 2-3 hr after sunrise and sunset respectively. Samples of adults and larvae recovered in the sweep net for each plot were kept into a cloth bag and counted in the laboratory.

The single stem technique was used to sample alfalfa weevil larvae only at day time. In this technique, 10 alfalfa stems were taken at random from each plot at the perimeter and at the center of the field. Each stem was clipped at ground level, kept into a plastic bag, larvae were counted in the laboratory.

To determine the egg population, a random sample of 300-400 stems was taken at weekly intervals (from the same field) and carefully examined for oviposition punctures. They were then split open and the number of eggs per cluster were counted. The total number of eggs in each sample was converted to eggs per stem [7].

Data were analyzed using General Linear Model (GLM) at $P=0.05$ level and the correlation coefficients were also calculated [8].

Results

Adults of the alfalfa weevil started to reenter the alfalfa field in mid October after a period of aestivation. The very few adults present were only captured in night samples at the field perimeter. The population of returning adults fluctuated during the period from October to the end of December 1986. Adult populations remained low throughout January and February. This was followed by a sharp increase reaching a peak in mid March in samples taken from the field perimeter and at the end of the same month for those of the field center (Fig. 1).

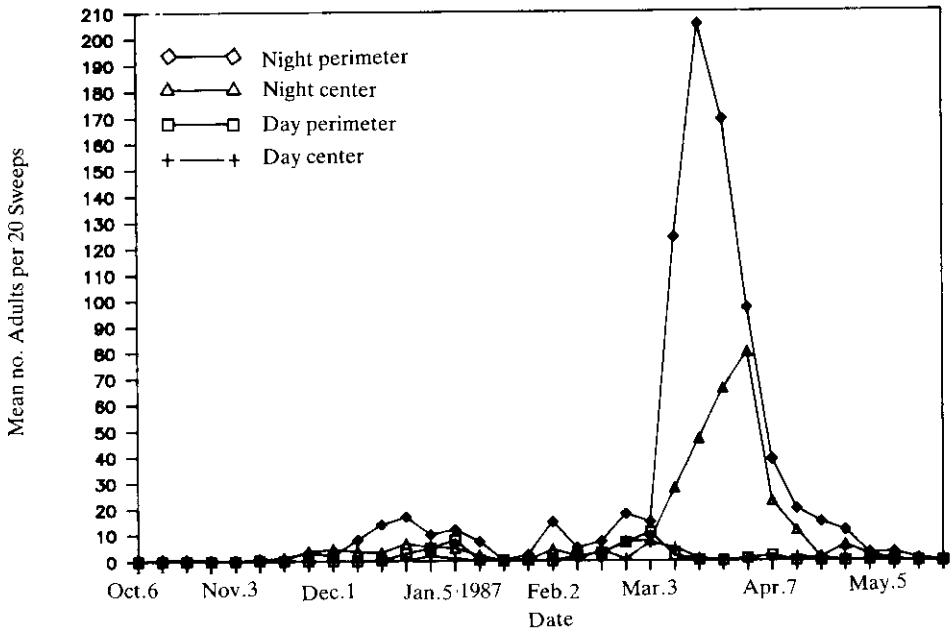

Fig. 1. Mean number of alfalfa weevil adults per 20 sweeps for the field perimeter and center: day and night samples.

The analysis of data indicated that the number of adults in night samples was significantly higher than in day samples. irrespective of the time of sampling, more adults were found in the field perimeter than in the field center (Fig. 1).

The larval numbers in sweeps and per stem were highly correlated ($r=0.95$). In early and late season, however, larvae were only found in sweep samples (Figs. 2 and 3). They first appeared in sweeping samples on 22 November 1986, and 3 weeks later in samples of single stem technique. Larvae in sweeps increased slightly throughout November, to late January. A sharp increase then followed, reaching a peak on 9

February. The larval population declined rapidly at the beginning of March 1987, and disappeared completely late in April (Fig. 2).

At the same sampling time, larval numbers in sweep samples taken from the perimeter of the field were significantly higher than those of the center. In the former case, more larvae were found in night than in day samples. However, there was no significant difference between larval numbers in day or night sweep samples taken from the center of the field (Fig. 2).

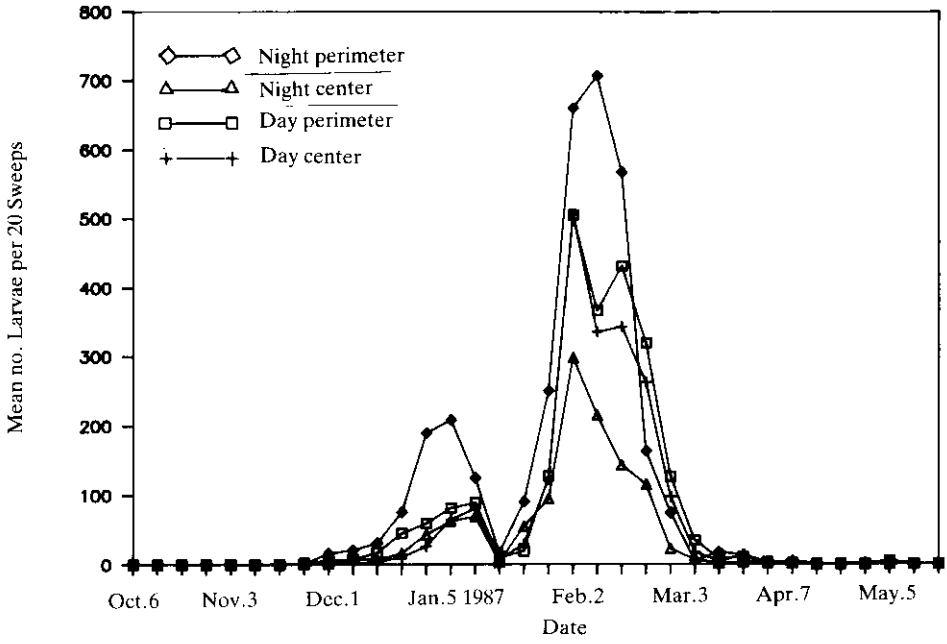

Fig. 2. Mean number of alfalfa weevil larvae per 20 sweeps for the field perimeter and center: day and night samples.

The larval numbers per stem at the perimeter or center of the field were not significantly different (Fig. 3). There was also no correlation between larval numbers per stem and the average stem length.

Larval population densities in sweeps for 1986-1987 and 1987-1988 seasons were correlated ($r = 0.92$). The dates of larval appearance and their peaks in both seasons were identical (Fig. 4).

Although larvae were present in small numbers on alfalfa since 22 November 1986, no eggs were observed in stems collected before mid December, 1986 (Fig. 5).

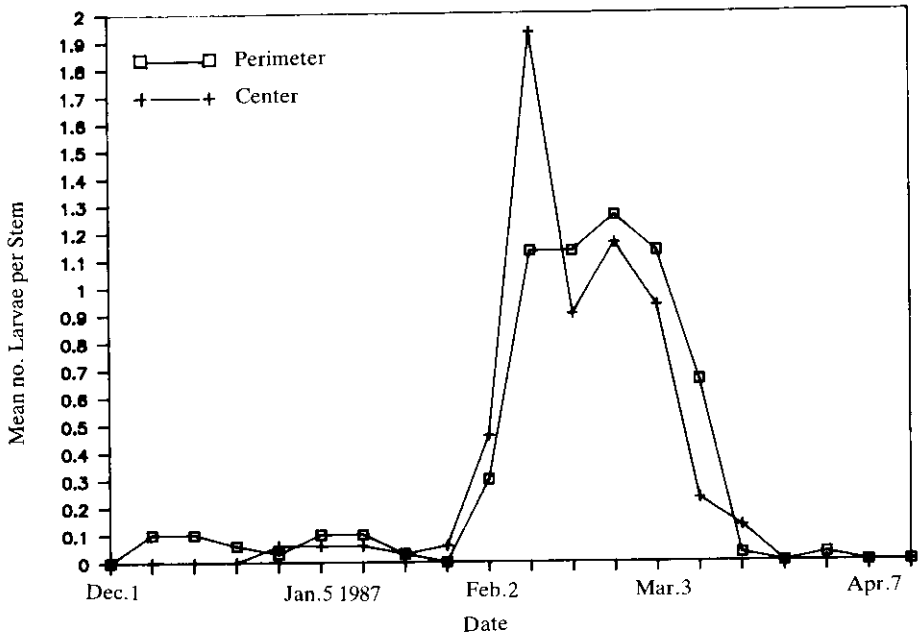

Fig. 3. Mean number of alfalfa weevil larvae per stem for the field perimeter and center during day time.

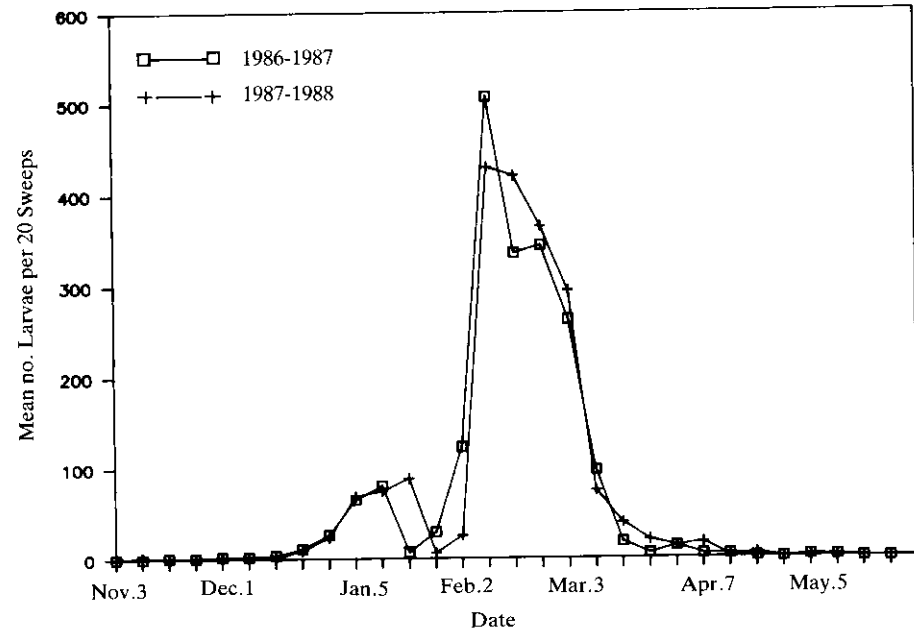

Fig. 4. Mean number of alfalfa weevil larvae per 20 sweeps for 1986-1987 and 1987-1988 seasons.

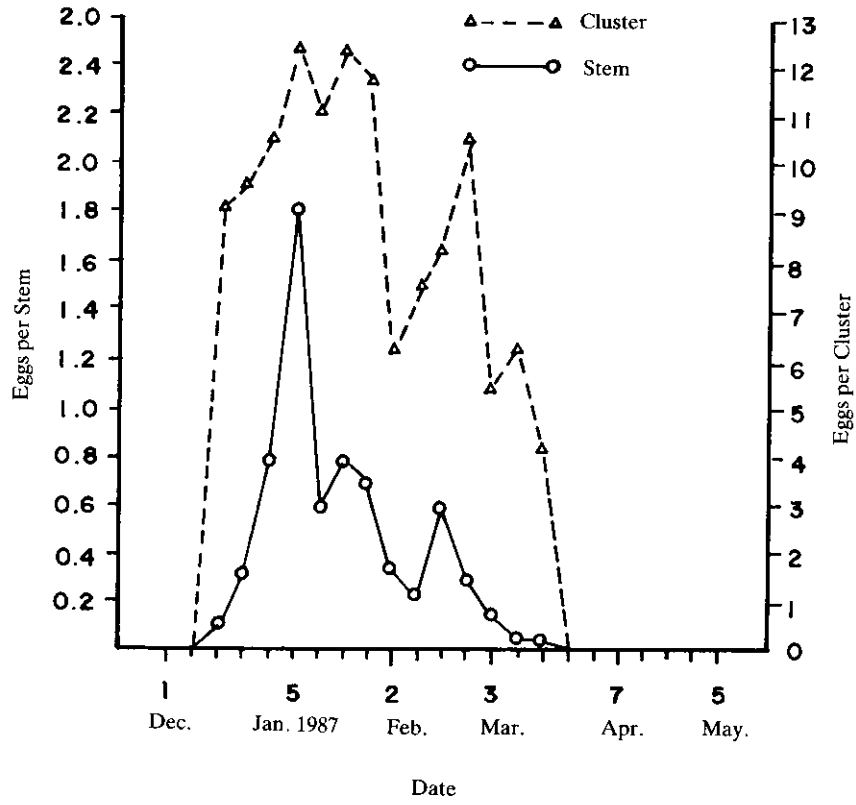

Fig. 5. Mean number of alfalfa weevil eggs per stem and per cluster.

The average highest number of eggs per stem was 1.8 eggs on 5 January 1987. No eggs were, however, collected beyond mid March.

The average number of eggs per cluster increased steadily to a peak of 12.5 by 5 January (Fig. 5). The highest number of eggs per cluster was 33, and was also recorded on 5 January. The number of eggs per cluster was correlated with the number of eggs per stem (r=79.6).

Discussion

The appearance of adults of the alfalfa weevil in mid October was not expected. Due to high temperature, after a long period of aestivation, the adults were probably forced to return back to the alfalfa fields at that time to seek nourishment and moisture.

Most adults were collected in night samples and a few in day samples. Under laboratory conditions, newly emerged adults were observed by the authors to remain active day and night for a few days after which adults become active only during night; therefore, some adults appeared in day time samples.

The study of the field distribution and time of activity of adults and larvae of this pest are important factors in the development of accurate sampling procedures, and aids in selection of appropriate application methods for effective control. Attention has been drawn out, nowadays, to the perimeter spray technique [9 and 10] in which application of insecticides is confined to the perimeter of alfalfa fields only to control the returning adults to the field from their aestivation sites. Furthermore, the fall perimeter spray technique may have another advantage over spring treatment since aestivated larval parasites *Bathyplectes* spp. would not be exposed to insecticides. Further investigations are required to justify the validity of the fall perimeter spray technique in this area.

The single stem technique has many advantages over sweep technique; it is more accurate and needs less effort [6]. At low larval population, however, the presence of larvae was not detectable by the single stem technique. It is recommended, therefore, to use the sweep net technique to determine when the alfalfa field would be colonized.

Since the peak numbers of eggs per stem and per cluster occurred in the first week of January, cutting of alfalfa plants in mid January would result in the removal of a considerable number of eggs, thereby inhibiting, and perhaps precluding, the larval peak numbers in February.

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دراسة الكثافة العددية لسوسة ورق البرسيم في المنطقة الوسطى المملكة العربية السعودية

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ملخص البحث. أجريت هذه الدراسة في محطة الأبحاث والتجارب الزراعية التابعة لكلية الزراعة جامعة الملك سعود بديراب في موسمي ١٩٨٦-١٩٨٧م و ١٩٨٧-١٩٨٨م لتقدير الكثافة العددية والتوزيع الحقلي لسوسة ورقة البرسيم. واستخدمت لهذا الغرض شبكة جمع الحشرات لتقدير أعداد اليرقات والحشرات الكاملة في الليل والنهار كما أخذت عينات من سيقان البرسيم وتم عد اليرقات والبيض على كل منها في النهار فقط.

في العام الأول من الدراسة بدء ظهور كل من الحشرات الكاملة واليرقات والبيض في منتصف أكتوبر ونهاية نوفمبر ومنتصف ديسمبر على التوالي. وقد سجلت أعلى كثافة عددية للأطوار السابقة الذكر في منتصف مارس، ٩ فبراير و ٥ يناير على التوالي. واختفت الأطوار السابقة من الحقل في منتصف مايو، في نهاية إبريل ومارس على التوالي. كانت أعداد الحشرات الكاملة واليرقات أكبر معنويًا في طرف الحقل عن وسط الحقل كما وجدت زيادة معنوية لأعداد الحشرات الكاملة في الليل عنه في النهار.

كما لوحظ توافق في تقدير الكثافة العددية لليرقات باستخدام طريقتي شبكة صيد الحشرات وطريقة أخذ السيقان. كما لوحظ تشابه منحنى أعداد اليرقات في موسمي ١٩٨٦-١٩٨٧م و ١٩٨٧-١٩٨٨م.