J. King Saud Univ., Vol. 12, *Agric. Sci.* (1), pp.61-67, Riyadh (1420/2000)

A Preliminary Report on the Asiatic Garden Beetle, *Maladera castanea* (Coleoptera: Scarabaeidae) in Gassim

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(Received 5/11/1418; accepted for publication 28 / 10 /1419)

Abstract. Seasonal activity of *Maladera castanea* (Arrow) was monitored for three years in Gassim, Kingdom of Saudi Arabia. Large numbers of adults: 2141, 2616 and 2637 were captured in a light trap in 1995, 1996 and 1997, respectively. Adult insects started to appear in the trap in March of each year. Numbers increased gradually until a peak was reached in September in the years 1995 and 1996 and in August, 1997. The numbers then fell off in October of each year until no beetles were found later on. The seasonal pattern of *M. castanea* indicates an increasing trend with the years, where populations increased by 22.2 and 23.2% in 1996 and 1997, respectively, compared with that of 1995. Defoliation by adults was evident on seedlings of stone and pome fruits. White grubs sporadically infested lawns, alfalfa, wheat crop residues, soybean plants and rhodes grass. Larval population densities were estimated in soils under alfalfa, rhodes grass, wheat crop residues and weeds.

Introduction

The Asiatic garden beetle, *Maladera castanea* (Arrow), (Coleoptra: Scarabaeidae, Melolonthinae), belongs to the rose chafers group which are described as slender, tan, long legged, brown beetles that feed on the flowers and foliage of roses, grapes and various other plants. The larvae are small white grubs which occur and develop in light soils around root systems and often do serious damage to turfgrass, lawn, golf courses [1, p.365], and small fruits in the USA [2,pp. 60-61]. The larvae may also feed on the roots causing a great deal of damage to pastures and such crops as corn, small grains and potatoes.

In Gassim, Saudi Arabia, the Asiatic garden beetle was first detected in 1991, in Bureidah and Onayzah areas. The white grubs were found causing damage to soybean plants in experimental plots at Onayzah Agriculture Experiment station. In Meleida area

the grubs were extracted from the soil under alfalfa and graminaceous weeds. Infestations were found in lawn at sport arenas in some localities. Adults were attracted in large numbers to lights, and their damage to foliage of many stone, pome and ornamental seedlings was recorded at the orchard of the College of Agriculture Experimental Farm.

Owing to the growing importance of *M. castanea* in Gassim, and perhaps other parts of the Kingdom of Saudi Arabia, this study was carried out with the objective of investigating the incidence of *M. castanea*, monitor its seasonal occurrence, and hosts attacked.

Materials and Methods

The study was conducted at the College of Agriculture and Veterinary Medicine Research Center, at Meleida, Saudi Arabia. A Robinson light trap was used for monitoring *M. castanea* adults, for three years (1995-1997). The trap was placed in the center of the farm near an orchard in which citrus, stone, pome, date palm and ornamentals are the main grown trees. The main crops grown nearby include wheat, alfalfa and rhodes grass. The trap was operated on daily basis from sunset to sunrise and trapped insects were collected twice weekly, *M. castanea* adults sorted out, counted and recorded. Seedlings and trees in the orchard and the vicinity were randomly inspected for beetle damage, and results were recorded. To investigate larval incidence, three samples, one square foot each, were collected randomly in early winter 1997 and 1998, from soil under weeds (fallow), alfalfa, wheat crop residues and rhodes grass. This was repeated three times, making a total of 36 samples collected from the four locations each year. Samples were taken apart and examined for presence of white grubs. Data were transformed to $\sqrt{x+1}$ before analysis of variance and means were separated using Duncan's multiple range test.

Results

The weekly numbers of *M. castanea* adults captured in the light trap during 1995-1997 are shown in Fig. 1. In total, 2141, 2616and 2637 individuals were captured during 1995,1996 and 1997, respectively. Total beetle catches varied greatly between the three years of study, and the number of beetles captured during 1996 and 1997 was greater by 22.2% and 23.2%, respectively, compared to that in 1995.

Beetles started to appear in the trap, typically, in all three years of study, in early March 1995, 1996 and 1997 (Fig. 1). Catches increased gradually until a peak was reached in September in the years 1995 and 1996 and in August, 1997. The numbers then fell off in October of each year until no beetles were found in November and December. It should be noted that the largest number of beetles was captured in the period between July and September. The maximum number of beetles captured/week was 652 in the fourth week of August, 1997.

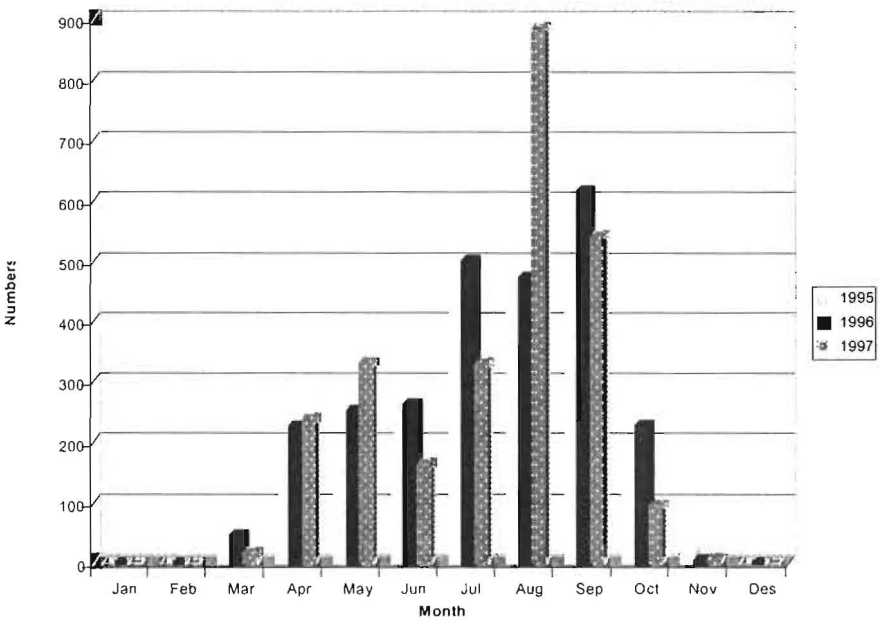

Fig. 1. Seasonal activity of *Maladera castanea* (Arrow) (Scarabaeidae, Melolonthinae), adult beetles, in light trap, Gassim, Saudi Arabia, 1995-1997.

Plants attacked

Adult feeding on field crops was not observed. However, the collected samples and examination of material from areas showing damage indicated a sporadic incidence of adult beetles and white grubs in alfalfa, wheat crop residues, rhodes grass, lawn and soybean plants.

Maladera castanea adults fed upon foliage of the following plant species: Seedlings of stone and pome fruits, *Prunus triflora* (plums), *P. persica* (peaches), *P. amygdalus* (Almonds) and *Pyrus communis* (Pears). Complete defoliation of seedlings was evident in many instances, such as those of pears. Adults burrow into the soil beneath the seedlings during the day and emerge to feed at night. Some ornamentals, citrus and blueberry trees were also slightly attacked.

Larval incidence

The larval populations recovered from the soil samples collected in areas under alfalfa, rhodes grass, wheat crop residues and weeds (fallow) are given in Table 1. Results were expressed as grub density/m^2. Larval densities were relatively higher in

alfalfa and weed areas in 1997 (26.1 and 19.3 white grubs/m^2, respectively), and lower in areas under wheat residues (11.1 white grubs/m^2). However, grub populations in rhodes grass were significantly higher in 1998 (34.5 grubs/m^2) and lower in the three other locations, compared with the corresponding densities in the previous season. Adults were also collected in alfalfa and rhodes grass soil samples, but their numbers were negligible. It was noticed that grubs are sometimes aggregated and damage to lawns and crops tends to be localized and inconsistent. The calculated aggregate average grub density for the four habitats sampled were 17.9 and 15.0 grubs/m^2, i.e. 179000 and 150000 grubs/ha, for 1997 and 1998, respectively (Table 1).

Table 1. Incidence of *Maladera castanea* in soil under alfalfa, weeds, rhodes grass and wheat crop residues, Meleida, Gassim 1997, 1998

Sample* source	**Mean No. Larvae recovered/ m^2	
	1997	1998
weeds	19.3 ab	12.3 b
alfalfa	26.1 a	10.0 b
rhodes grass	15.2 ab	34.5 a
wheat residues	11.1 b	3.7 b
Aggregate Avg/m^2	17.9	15.0

*N=9 , 2 Data were transformed into $\sqrt{x+1}$ for analysis.

**Means in the same column followed by the same letter were not significantly different at the 5% level, using Duncan's Multiple Range Test.

Discussion

Adult *M. castanea* population size showed an increasing trend with the years. They usually peaked during the dry months of August and September, probably building up from previous spring months, and disappeared during winter months between November and February. No evidence exists for immigration of adults from other localities, however, the larval densities detected in the area under different vegetation cover, provide proof for *M. castanea* breeding in the area. These larval densities do correlate well with the large numbers of beetles captured in the light trap, when considering an estimated grub density between 150 and 179 thousands/ha, in 1998 and 1997, respectively, in the sampled irrigated area measuring about 25 hectares. These year round irrigated alfalfa and rhodes grass fields and the light sandy soil provide favorable conditions for the larvae in this dry and hot region. Gaylor and Frankie [3] and Potter [4] suggested that adult flights of turfgrass infesting scarabaeids are triggered by rainfall, and that insufficient or excessive moisture can deter oviposition or reduce survival of eggs and young grubs. Irrigation patterns may affect the distribution of white grubs in urban environments, and, areas irrigated during beetle flights incurred significantly higher densities of grubs than did non-irrigated areas [5].

The decrease in grub density in 1998 in weed and wheat crop residue areas, relative to that of 1997, may have been caused by desiccation of the soil in the hot period and to the susceptibility of the grubs to low moisture content in the soil. Brown and Gange [6, pp. 1-58] stated that soil moisture may be the single most important parameter affecting population dynamics of root-feeding insects. Medium levels of soil moisture have been reported to be optimal for growth of several species of pasture-infesting scarabaeids [7&8]. Harari *et al* [9], working with another closely related species, *M. matrida*, suggested that the decrease in grub populations in fallow fields after peanut harvest was due to desiccation of the soil and high susceptibility of grubs to low moisture content in the soil. They assumed that *M. matrida* beetles invading sprouting peanut fields in May were immigrants from nearby fields with high grub numbers during winter, namely citrus groves and wheat. In this study, the decline of grub populations in the alfalfa area can be attributed to the unfavorable changes in soil characteristics, e.g. compaction and limited aeration resulting from water logging and lack of soil disturbance in a perennial crop. Reduction of grub densities in the three other habitats explains their increase in the rhodes grass field.

The total developmental time for *M.matrida* from egg to adult was estimated by Harari *et al* [10] as 75.7±0.6 days at 27°C and 60-80% RH. They observed the first adult beetles in soil samples on 10 May and the first instar larvae 28 days later. In this study although no soil sampling was done in summer months, it is likely that the first adults appearing in March and April reproduced in summer irrigated crops and citrus orchards to yield the June and July populations. These in turn reproduced to give the large adult progeny observed during August and September. This may suggest that *M. castanea* has no more than two generations per year in Gassim region. Breeding sites in this area during spring and summer months may be confined to irrigated areas such as alfalfa and vegetable fields, and lawns in sports arenas. These could be the possible source of the high adult densities trapped during the period following summer months.

Literature on *M. castanea* in our geographical region is lacking or very limited. Additional research is in progress to identify breeding sites and possible sources of adult populations with full understanding of the bionomics and potentialities of *M. castanea* as an agricultural pest.

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دراسة أولية على خنفساء الحديقة الآسيوية *Maladera castanea* (Arrow) (Coleoptera: Scarabaeidae) بالقصيم

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(قدم للنشر في ١٤١٨/١١/٥هـ؛ و قبل للنشر في ١٤١٩/١٠/٢٨هـ)

ملخص البحث. تمت متابعة النشاط الموسمي لخنفساء الحديقة الآسيوية *M. castanea* على مدى ثلاث سنوات باستخدام المصيدة الضوئية بالقصيم، المملكة العربية السعودية. تم اصطياد عدد ٢١٤١، ٢٦١٦ و٢٦٣٧ حشرة بالغة في الأعوام ١٩٩٥، ١٩٩٦ و١٩٩٧، على التوالي. بدأ ظهور الخنافس في المصيدة الضوئية في شهر مارس من كل عام، و ازدادت الأعداد تدريجيا وبلغت الذروة في شهر سبتمبر من العامين ١٩٩٥ و١٩٩٦، وأغسطس في العام ١٩٩٧. بدأت الأعداد في الانحسار ابتداء من شهر أكتوبر من كل عام إلى أن تختفي نهائيا. يشير النمط الموسمي لـ *M. castanea* إلى ازدياد أعداد هذه الخنفساء مع الوقت حيث ارتفعت كثافتها بنسبة ٢٢,٢ و٢٣,٢٪ في عامي ١٩٩٦ و١٩٩٧، على التوالي، مقارنة بالعام الأول للدراسة ١٩٩٥. تغذت الخنافس البالغة على العديد من النباتات، ولوحظ في بعض الحالات إزالة تامة للأوراق في بعض فسائل الفواكه ذات النواة الحجرية و التفاحية. كما وجدت الديدان البيضاء (white grubs) في إصابات متفرقة في المسطحات الخضراء، محصول البرسيم، بقايا محصول القمح وحشيشة الرودس. تم تقدير كثافة هذه اليرقات في التربة في محصول البرسيم، حشيشة الرودس، بقايا محصول القمح، والحشائش.