

A STUDY ON THE BIOLOGY AND SEASONAL ACTIVITY OF THE PEACH ROOT BORER *CAPNODIS CARBONARIA* KLUG (COL. : BUPRESTIDAE) IN NORTH SINAI., EGYPT

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Abstract

The peach root borer, *Capnodis carbonaria* infests the roots of peach trees in North Sinai Governorate. The mean number of deposited eggs/ female under laboratory conditions was 47.05 ± 0.73 eggs. The mean of incubation period was 9.5 ± 0.96 days. The mean durations of larval, prepupal and pupal stages were 313 ± 1.73 , 14.2 ± 0.08 and 17.6 ± 0.09 days, respectively. Under laboratory conditions, *C. carbonaria* had one generation yearly. The seasonal activity of beetles showed two peaks; at the first half of April and second half of August, 1995 and at the first half of May and first half of September 1996.

INTRODUCTION

The peach root borer (PRB) *C. carbonaria* is one of the major pests on peach trees in North Sinai. Bodenheimer (1929) recorded this pest infesting plum trees in Rafah district. Klapperich (1968) in Jordon, mentioned that female of *C. carbonaria* oviposited her eggs in the lower trunk or root collar of stone fruit trees. Alfieri (1976) and Mohamed (1990) surveyed four species of Genus, *Capnodis* i.e. *C. carbonaria*, *C. cariosa* Pallas, *C. excisa alfierii* Thery and *C. excisa excisa* Mene-tries. According to available literature, there is no information on this borer in Egypt. The aim of the present work is to throw light on the biology and seasonal activity of *C. carbonaria* in Egypt .

MATERIALS AND METHODS

Biological studies : A stock culture of the peach root borer (PRB) was established from infested roots of peach trees collected from Rafah district. These roots were kept in rearing cages, 150 x 50 x 50 cm. under laboratory conditions. The newly emerged adults were collected and sexed. Each pair of beetles (male and female) was put in a cylindrical wire cage, 15 cm high x 10 cm diameter, with cutti-

ngs of peach shoots (each of 10 x 2 cm.) as oviposition sites. Some leaves of almond or peach were used as food. The deposited eggs were collected and kept in a petri dish under normal laboratory conditions until hatching. Every two newly hatched larvae were planted into fresh cuttings of peach, 30 x 4 cm. which were replaced by fresh ones every two weeks till pupation. The periods of the developmental stages as well as adult longevity were estimated. The adults were put in wire cage 40 x 40 x 40 cm. with fresh leaves and cuttings of peach shoots as food. The influence of laboratory conditions on longevity of adults was estimated.

Seasonal activity : Twenty infested peach trees with PRB were randomly chosen in a peach orchard located at Rafah district. A cylindrical wire net, 80 cm. diameter and 50 cm. high, was placed around the trunk of each tree. The nets were closed tightly from all sides. Biweekly inspections were carried out and the emerged beetles were counted and removed. The numbers were calculated each month to study the progress of infestation.

The effect of three weather factors (maximum temperature, minimum temperature and relative humidity) on population density of PRB was studied, the simple correlation was calculated according to Fisher (1950)

RESULTS AND DISCUSSION

Biological studies

Egg stage : The egg of *C.carbonaria* is white in colour and elongate in shape. It measures 1.12-1.25 mm. long (mean of 1.2 ± 0.002 mm) and 0.38-0.44 mm. wide (mean of 0.41 ± 0.008 mm). Field observations revealed that the eggs were deposited singly or in small groups (2-7 eggs) set free or adhered to the bark or on the ground near root collar. In the laboratory, the eggs were laid on different sites such as the crevices of bark, the muslin cloth and wire of the containers, adhered or free. Reichart (1967) found that *C.tenebrionis* laid eggs mainly in the soil but occasionally on the soil surface or on the root collar. Klapperich (1968) mentioned that the female of *C.carbonaria* oviposited in the lower trunk or root collar of stone fruit trees or in the soil.

The incubation period lasted 8 to 11 days with a mean of 9.5 ± 0.96 days, Table 1. The percentage of hatchability ranged between 69.6 and 80% with a mean of $72.5 \pm 4.13\%$.

Larval stage : The newly hatched larva is slightly flattened, creamy in colour with the head capsule of dark brown. It moves rather quickly. It is 1.8 -2.2 mm. in

length (Mean 2 ± 0.14) and $0.32 - 0.35$ mm in width (mean 0.34 ± 0.02). The length of mature larva ranged 72 to 82 mm. with a mean of 77.6 ± 0.18 mm., while the width ranged 10 to 14mm. with a mean of 12.15 ± 0.06 mm. The duration of larval stage ranged 287-317 days with a mean of 313 ± 1.47 days, Table 1.

Pre-pupal stage : The length of prepupa ranged 30-46 mm. with a mean of 40.84 ± 0.16 mm., while its width ranged 8-13.4 mm. with a mean of 10.78 ± 0.08 mm. The prepupa lasted 11-17 days with a mean of 14.2 ± 0.08 days, Table 1.

Pupal stage : Pupa of *C.carbonaria* is creamy in colour. Its length ranged from 23 to 35 mm. with a mean of 29.7 ± 0.17 mm., and its width ranged from 8-19 mm. with a mean of 12.7 ± 0.17 mm. The duration of pupal stage from 15-21 days with a mean of 17.6 ± 0.09 days, Table 1.

Table 1. Durations of different stages of *C.carbonaria* under laboratory conditions.

| Stage | Duration (in days) | Mean.±S.E. | Lab. conditions (average) | |
|-------------------|-----------------------|-------------------|---------------------------|-------|
| | | | Temp °C | R.H % |
| Egg | 8-11 | 9.5 ± 0.96 | 28.2 | 60.5 |
| Larva | 287-317 | 313 ± 1.47 | 27.2 | 55.3 |
| Prepupa | 11-17 | 14.2 ± 0.08 | 28.6 | 61.2 |
| Pupa | 15-21 | 17.6 ± 0.09 | 28.3 | 62.3 |
| Adult hardness | 4-8 | 5.6 ± 0.07 | 29.2 | 59.4 |
| Pre-oviposition | 1-3 | 2 ± 0.78 | 28.4 | 60.5 |
| Oviposition | 2-3 | 2.73 ± 0.49 | 28.6 | 59.7 |
| Post-oviposition | 5-12 | 8.95 ± 0.1 | 29.0 | 62.2 |
| Generation period | 315-384 | 330.65 ± 0.49 | 28.3 | 62.4 |

Adult stage

Description : The beetle is robust, oval-elongate, wide rather convex, colour black shining on back with whitish spots, body below tarnish with points or impressions pulverulent with white, head is big with some torn points, antennae short; legs robust, claws simple; elytra wider than pronotum at base. The extremity of last abdominal segment is faintly bilobed with a very small median notch in male, but rounded and subacuminate in female. The body length ranged from 19 to 34 mm. with a mean of 26.8 ± 0.24 mm., while its width ranged 7-14 mm. with a mean of 11.15 ± 0.11 . Mohamed (1990) mentioned that the dimensions of *C.carbonaria* adult were 28-32 mm in length and 11-13 mm in width.

Ovipositional periods

a. **Pre-oviposition period** : As shown in Table 1 mated female started egg deposition 1-3 days after emergence with a mean of 2 ± 0.78 days.

b. **Oviposition period** : As presented in Table 1, the oviposition period was 2.73 ± 0.44 days, (range 2-3 days).

c. **Post oviposition period** : The post oviposition period ranged from 5 to 12 days with a mean of 8.95 ± 0.1 days.

d. **Number of eggs deposited / female** : The number of eggs laid per female ranged from 21 to 77 eggs with a mean of 47.05 ± 0.73 eggs. Alavidze (1965) mentioned that the fecundity of *C.tenebrionis* varied according to the food plant; the maximum number of eggs (650) laid on apricot and the minimum was on almond or peach.

e. **Duration of generation** : The results in Table 1 indicate that *C.carbonaria* had one generation per year, which lasted 315-348 days with a mean of 330.65 ± 0.49 days. Reichart (1967), in Hungry, mentioned that one generation of *C.tenebrionis* might take two years, while Klapperich (1968) in Jordon stated that *C.carbonaria* pupated after 15 months.

Seasonal activity of *C.carbonaria* : Data concerning the population density of *C.carbonaria* beetles indicated that emergence of beetles continued during the whole year.

The fluctuations in beetles populations with changes of temperature and relative humidity during two successive years 1995 and 1996 are illustrated in Fig. 1 and Fig.2. They showed two distinct peaks in each year. In the first year, the peaks were recorded during the first half of April and second half of August, while in the second year the peaks were recorded during the first half of May and the first half of September.

Such a continuous emergence of beetles through the whole year is a serious parameter of infestation and imposes the need of urgent approaches towards towards a control strategy for this pest.

Effect of weather factors on beetle abundance : The effect of weather factors (Max. Temp., Min. Temp and R.H. %) on the activity of *C.carbonaria* beetles is demonstrated by simple correlation and regression, Table 2. In the first year, re-

sults indicated that occurrence period of the first peak lasted 20 weeks and showed significant and negative correlation between population density of beetles and each of Max. and Min. Temp. On the other hand, no correlation was noticed between the number of beetles and R.H. Occurrence period of the second peak lasted 24 weeks and the effect of three weather factors on population density showed insignificant correlation. In the second year, occurrence periods of first and second peaks occupied 12 and 22 weeks, respectively. In the first peak the effect of weather factors on population density showed insignificant correlation for Max. and Min. Temp and high significance for R.H. In the second peak, however, the correlation was significant with temperature and insignificant with R.H.

Table 2. The periods of beetles occurrence, simple correlation and regression of three weather factors (Max. Temp., Min. Temp. and R.H. %) affecting abundance of PRB, *C.carbonaria* under field conditions.

| Year | No.of peak | Occurrence of beetles | | Duration in weeks | Weather factors | | |
|------|------------|-----------------------|---------------------|-------------------|-------------------|-------------------|------------------|
| | | From | To | | Max. Temp (r) (b) | Max. Temp (r) (b) | R.H. (r) (b) |
| 1995 | 1 | First half of Feb. | Second half of June | 20 | -0.776 -1.870 | -0.771 -2.257 | 0.232 0.510 |
| | 2 | First half of July | Second half of Dec. | 24 | 0.094 0.472 | 0.292 1.260 | 0.254 1.495 |
| 1996 | 1 | Second half of Apr. | First half of July | 12 | 0.180 0.234 | 0.317 0.569 | 0.940 1.750 |
| | 2 | Second half of July | Second half of Dec. | 22 | 0.691 1.845 | 0.680 2.402 | -0.232 -1.315 |

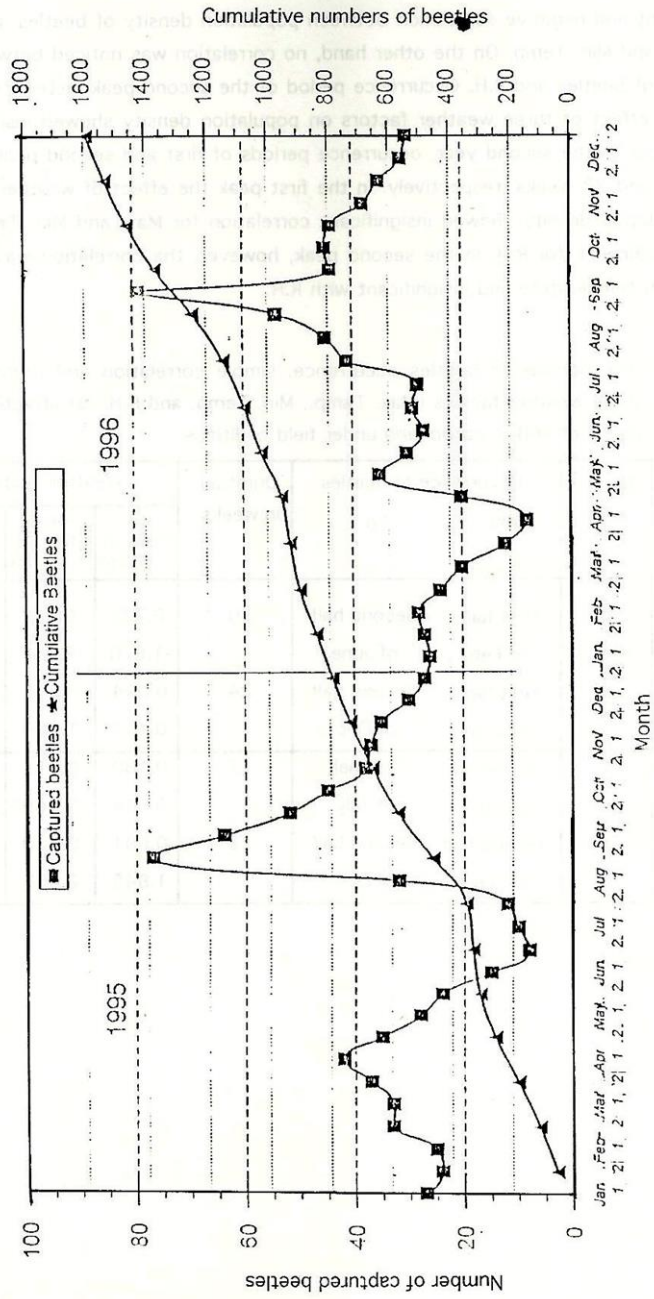


Fig.1. Actual and cumulative numbers of PRB, *Capnodis carbonaria* Klug. captured during 1995 and 1996 at Rafah region, North Sinai.

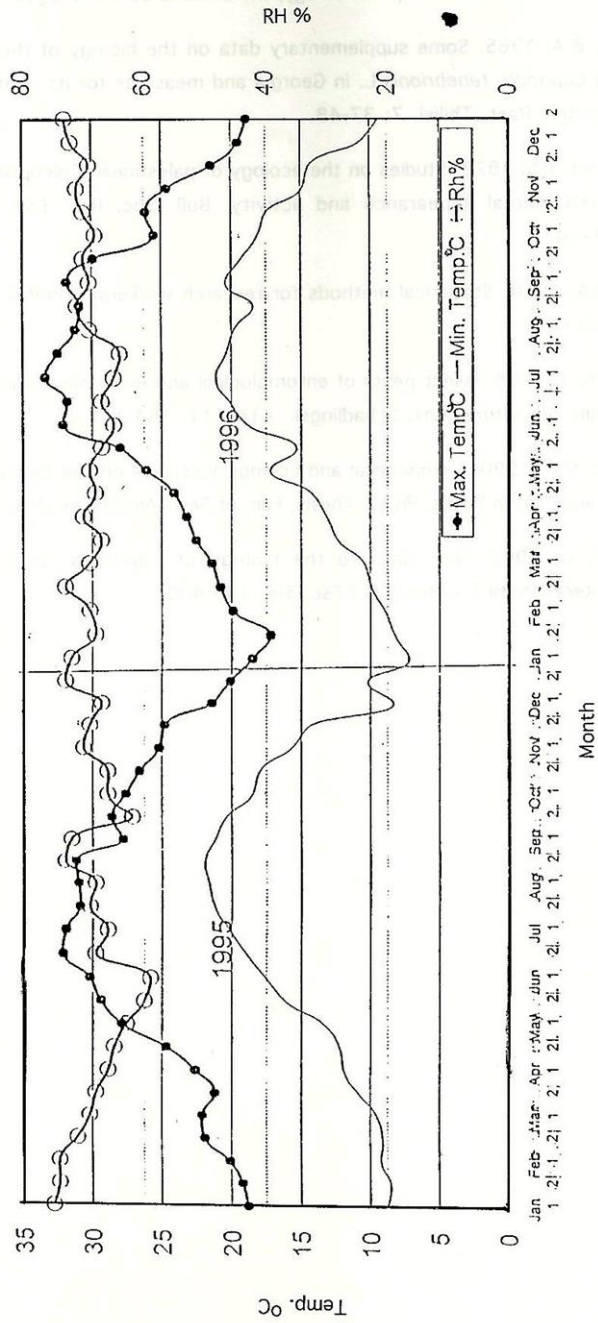


Fig.2. Half monthly means of Max. and Min. temperatures and relative humidity during 1995 and 1996 at Rafah region, North Sinai.

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دراسة بيولوجية والنشاط الموسمي لحفار جذور الخوخ (كابنودس كاربوناريا) في مصر

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تهاجم زراعات الخوخ في محافظة شمال سيناء بحفار *C.carbonaria* حيث يصيب جذور الأشجار ويسبب موتها سريعا، وقد بينت نتائج الدراسة التي أجريت لأول مرة في مصر الآتي :
تضع الإناث البيض في شقوق القلف أو على منطقة تجمع الجذور أو بالقرب منها فوق سطح الأرض ويصل متوسط عدد البيض الذي تضعه الأنثى تحت الظروف المعملية ٤٧,٠٥ بيضة ومتوسط نسبه الفقس ٧٢,٥٪ وبلغ متوسط فتره الحضانه ٩,٥ يوم، كما بلغت متوسطات فتره طور اليرقه وطور ما قبل العذراء ٣١٣، ١٤,٢، ١٧,٦ يوما علي التوالي. وبلغ متوسط مدة الجيل ٣٢٠,٦٥ يوم أي ان لها جيل واحد في العام كما بينت الدراسة ان هذه الحشره موجوده طول العام.
وقد تم تسجيل قمتي نشاط لهذه الحشره في سنوات الدراسه ففي العام الاول ١٩٩٥ كانت قمه النشاط الاول في النصف الأول من أبريل والثانيه في النصف الثاني من اغسطس وفي العام الثاني ١٩٩٦ كانت قمتي النشاط في النصف الاول من مايو وفي النصف الاول من سبتمبر.