# FACTORS AFFECTING FEEDING ACTIVITY AND DATES LOSS BY CADRA CALIDELLA LARVAE (LEPIDOPTERA : PYRALIDAE)

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## ABSTRACT

The effects of larval density of Cadra calidella Guen., date variety and ambient temperatures were studied as ecological factors influencing date consumption rate and consequently the amount of date loss caused by this species. The amount of date consumption showed negative relationship with larval density.

Density of larvae also affected the number of emerged adults, sex ratio and survival rate of immature stages.

Date vatiety markedly influenced larval food consumption.

Food consumption and dates loss were affected by both of ambient temperatures and type of diet. At constant temperatures (25&30C), the greates date loss was shown by Saidi dates and the lowest from Soltani. Increasing of temperatures from 25 to 30 C was accompanied by remarkable decrement of feeding activity of larvae and consequently reduction of date loss.

## INTRODUCTION

The oases dates moth Cadra calidella (Guen.) have been considered as a serious pest of dried dates, carob and almonds (Gough, 1917; Shafik, 1938; Martin, 1958).Most of the work done by Hammad et al. (1965), Prevett (1968), Omar et al. (1973), Cox (1974 & 1975) concentrated on the biology of this pest as influenced by temperature, food plants and relative humidity.

Date-palm trees are cultivated in Egypt all over the Delta, Nile valley, and oases up to Aswan. Bahria oases are fertilize district for the production of dry dates where more than half million date-palm trees are cultivated. The yield of which being an important source of revenues to oases citizens. Most of the damage noticed in dry dates and other types is caused by Cadra calidiella. Information on damage assessment and that factors affecting yield loss in different types of dates particularly dry dates are very limited. Therefore, the present work was then under taken to gain more detailed information on this prevalent dates pest.

## MATERIALS and METHODS

Culture of Cadra calidella (Guen.) (Lepidoptera: Phycitidae) was bred on stored dry-dates obtained from Bahria oases, Giza governorate. Insect larvae were collected from natural infested dates and were placed on dry dates in glass jars. The culture was kept at 28-30°C and 70-75 % relative humidity. In this study

the effects of larval population density, controlled temperatures and dates types are investigated as ecological factors influencing food consumption by the insect larval stage, survival rate and emergence of adults.

To study the influence of population density of larva, twenty glass jars (cap. 1/2 Kg.), each containing 250 g of fresh semi-dry dates of Saidi variety, were prepared. Four levels of infestation: 5, 10, 20 and 40 newly hatched larvae were introduced to diet jars, so each level was represented by four replicates. Jars of dates were covered with muslin held tightly by rubber bands and kept at 30° ± 1°C and 65 - 70 % rel. humidity. Jar diets were inspected 2- days intervals till pupation. When pupae were removed, the remained food was reweighed and dates loss was assessed. The same experiment was repeated using Kakea dates variety (dry-type).

To study the influence of dates varieties and controlled temperatures, three dates varieties were tested, Saidi (Semi-dry), Kakea and Soltani (dry-dates) being the most dominant varieties in Bahria oases. For each dates variety, eight glass jars (cap. 1/2 Kg.), each contained 250 gm. of dates, were prepared and each jar was supplied with 10 newly hatched larvae. Jars were covered with muslin held tightly by rubber bands and divided into two groups, four jars each group; the first was kept at 25° ± 1°C while the second was kept at 30° ± 1°C. Food consumed, survival rates of immatures and adult emergence were recorded.

## RESULTS and DISCUSSION

**Influence of larval density :**

On the basis of the weight of food consumed by larva of C. calidella from fruits of two types of dates at different levels of larva, it is evident that larva generally consumed more Saidi dates than kakea (Table 1). The difference in rates of food consumption between Saidi and Kakea dates was significant (P 0.05). On the other hand, a negative correlation between larval density and amounts of food consumed was achieved. The highest food consumption existed at a density of 5 larvae/culture. As the larval density increased, the amount of food consumed substantially decreased. Thus about 50 % of the total food consumed was reduced when the number of larvae increased from 5 to 10 larvae/culture on Saidi or Kakea dates. Larvae preserved as the highest density (40 larvae/culture) consumed the smallest amounts of food.

These results reveal that the greatest damage and dates loss are not proportionally to the increase of larval population density and may occur at lower density of larvae than higher one. Food consumption decrement could be attributed to the interspecific competition between larvae which induces starvation and mortality. Our findings confirm those of Ali (1982), who reported that the amounts of foliage consumed by EAW, Hypera brunnipennis larvae considerbly decreased by the increasing of larval density. At the same time, fruits of Kakea seem to be less accepted and suitable as food than those of Saidi since the amounts of food consumed were always lower than that of Saidi at different levels of density.

Density of larvae also showed conspicious influence on the number of emerged moths, sex ratio and mortality percentages of immature stages as show in Table (II). On Saidi dates, the increase of population density of larvae from 5 to 10 resulted an obvious increase in the number of emerged moths; higher density significantly (P > 0.05) reduced the percentages of adult emergence. The lowest percentage of emerged adults was obtained at a density of 40 larvae/colony. Sex ratio did not greatly influenced by larval density and in most cases, the percentages

**Table (I) :** Relation between density of Cadra calidella larva and the amounts of food consumed of two date varieties.

| Density of larvae | Saidi | | Kakea | |
|---|---|---|---|---|
| | Mean weight of food consumed (mg.) | Food consumed by one larvae (mg.) | Mean weight of food consumed (mg.) | Food consumption by one larva (mg.) |
| 5 | 42.6 ± 1.7 (40.3 - 45.0)* | 8.51 | 30.2 ± 4.6 (24.0 - 34.7) | 6.00 |
| 10 | 46.0 ± 2.6 (42.8 - 49.5) | 4.60 | 29.8 ± 2.8 (25.1 - 32.3) | 2.98 |
| 20 | 44.4 ± 8.3 (38.5 - 58.7) | 2.22 | 38.3 ± 7.3 (29.4 - 45.9) | 1.91 |
| 40 | 65.2 ± 21.0 (50.0 - 101.1) | 1.63 | 32.9 ± 4.8 (28.1 - 40.1) | 0.82 |

* Numbers between two pathensis are the range of food consumption.

**Table (II) :** Effect of larval density of Cadra calidella reared on two date varieties on moth emergence, mortality of immature stages and sex ratio.

| Date variety | Number of larvae/ colony | Total No. of tested larvae | Total No. of emerged moths | % Moth emergence | | % Moths emerge-nce | % Mortality (larvae + pupae) |
|---|---|---|---|---|---|---|---|
| | | | | Females | Males | | |
| Saidi | 5 | 20 | 12 | 58.3 | 41.7 | 60.0 | 40.0 |
| | 10 | 40 | 31 | 61.3 | 38.7 | 77.5 | 22.5 |
| | 20 | 80 | 38 | 36.8 | 63.2 | 47.5 | 52.5 |
| | 40 | 160 | 33 | 57.6 | 42.4 | 20.6 | 79.4 |
| Kakea | 5 | 20 | 14 | 14.3 | 85.7 | 70.0 | 30.0 |
| | 10 | 40 | 19 | 36.8 | 63.2 | 47.5 | 52.5 |
| | 20 | 80 | 24 | 54.2 | 45.8 | 30.0 | 70.0 |
| | 40 | 160 | 50 | 58.0 | 12.0 | 31.3 | 68.7 |

of emerged females surpassed those of males, the only exception was the higher males emerged under 20 larvae/colony.

Concerning the effect of larval crowding on the survival rate of immature stages (larva and pupa), it was found that rate of mortality increased with the increase of larval density. However, survival rate of larvae reared under a density of 5 larvae/colony reached 60 %, it was markedly higher (77.5 %) at a density of 10 larvae/colony. The maximum mortality (79.4 %) occurred when larvae were reared under the greatest crowding condition (40 larvae/colony). From these data, it is clear that rearing of C. calidella larvae at a density level of 10 larvae/colony seems to be the most appropriate condition since the percentage of emerged adults and survival rate of immatures were the highest.

When larvae were reared at different population densities using Kakea dates fruits (dry-dates) as feeding diet, survival rate of immature stages, sex ratio and percentages of emerged adults showed different patterns than using Saidi dates (semi-dry dates) as larval diet. These results as presented in Table (II), may illustrate that the previous phenomena are largely larval diet and density dependent. Survival rate of immatures obviously decreased with the increase of larval density. In other words, 30 % of immatures population died when larvae were reared at crowding rate of 5 larvae/colony and that percentage gradually increased to approximately 70 at a density level of 40 larvae/colony. The increment of immatures mortality could be attributed to hunger induced between individuals due to interspecific competition which was highly pronounced at high densities. On the other hand, the highest percentage of emerged moths was achieved at 5 larvae/colony, while it significantly reduced to nearly the half when the population density increased to 40 larvae/colony. On Kakea dates, it was found that low density of larvae produced more males while the reverse effect existed at high larval density. The present results also ascertain that preserving of larvae at low density is the most suitable condition for rearing this pest.

**Influence of temperature and type of dates :**

Data presented in Table (III) and depicted in Fig. (1), reveal that feeding activity and food consumption of C. calidella larva are markedly influenced by both of environmental rearing temperature and kind of diet introduced.

At 25°C, Saidi dates were the greatest consumed food, while larva consumed approximately equal amounts from Kakea and Soltani dates throughout its entire life. However, both Kakea and Soltani dates are dry-types, date loss or damage existing for Kakea was nearly double that of Soltani indicating its higher suitability and acceptability as larval food. Saidi dates still kept the highest damaged and consumed food. Feeding behaviour of larvae was obviously altered at 30°C. Under such conditions, the highest food consumed and greatest damaged fruits was Kakea dates. Soltani date, on the other hand, was the least consumed and damaged diet.

When larva fed on Saidi dates (semi-dry type), a considerable decrease of the amount of food consumed was observed with raising of temperature. Larva consumed 246 mg. of Saidi dates at 25°C but this rate dropped to 129 mg. at 30°C. Similarly, the percentage of dates loss drastically decreased from 4.95 at 25°C to about 2.66 at 30°C.

larvae fed on Soltani dates showed feeding activity similar to those fed on Saidi dates in response to change of environmental temperature. The amounts of food consumed by larva from Soltani dates decreased by the increase of temperature from 25° to 30°C. Food intake amounted 123 mgs. at 25°C while this value

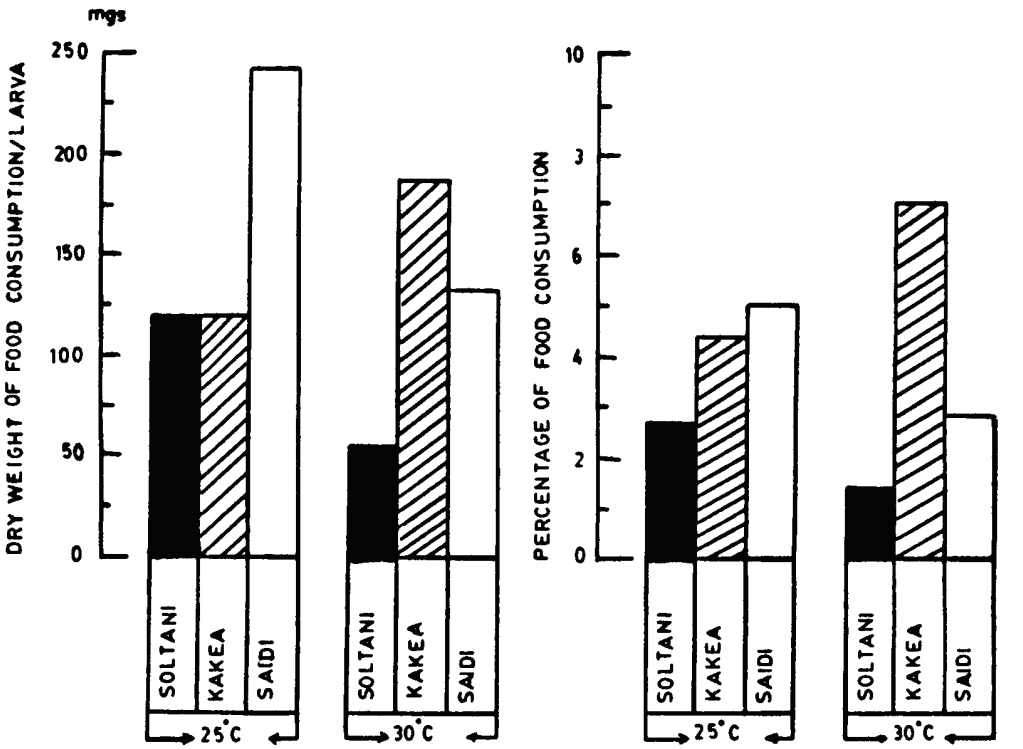


FIG:1 - AMOUNTS OF FOOD CONSUMED BY C. CALIDELLA LARVA FROM THREE DIFFERENT VARIETIES OF DATES AT TWO CONSTANT TEMPERATURES.

**Table (III) :** Amounts of food consumption of Cadra calidella larva fed on different types of dates and kept at different constant temperatures (data for 10 larvae).

| Temp. °C | Date variety | Means of weight of dates introduced (gm.) | Means of weight of dates consumed (gm.) | % Dates loss |
|---|---|---|---|---|
| 25°C | Saidi | 49.72 ± 1.18 | 2.46 ± 0.99 | 4.95 |
| | Kakea | 27.78 ± 0.63 | 1.23 ± 0.2 | 4.43 |
| | Soltani | 45.71 ± 2.1 | 1.23 ± 0.76 | 2.69 |
| 30°C | Saidi | 48.53 ± 2.6 | 1.29 ± 0.6 | 2.66 |
| | Kakea | 27.17 ± 1.55 | 1.91 ± 0.27 | 7.02 |
| | Soltani | 42.78 ± 2.28 | 0.61 ± 0.33 | 1.43 |

sharply declined to 61 mgs. at 30°C. Similarly, the percentages of dates loss were reduced from 2.69 to 1.43 at the previously mentioned temperatures, respectively. Consumption of Kakea dates was evidently different. Food consumed by larva obviously increased from 123 mgs. at 25°C to 191 mgs. at 30°C. The effect of changable temperature was evidently pronounced as the percentage of dates loss at 30°C (7.02 %) significantly ($P > 0.01$) increased to double of that recorded at 25°C (4.43%). These results indicate that Saidi and Soltani dates proved to be favourable diet for feeding of larvae but their suitability is greatly influenced by environmental or rearing temperature. On the contrary, Kakea date was more accepted at high temperature than at lower one. The great consumption and acceptance of Saidi (semi-dry type) dates could be attributed to its high contents of carbohydrates and moisture than Soltani and kakea which are dry-types as reported by Ahmad et al. (1979), Metwally et al. (1984) on C. maculatus & C. chinensis. and Metwally (1989) on B. incarnatus. However, the preference of Kakea dates (dry type) at 30°C as compared with Saidi (semi-dry type) still requires more biochemical and physical analyses of date fruits of these different types at the two tested temepratures to understand this phenomenon.

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# LES FACTEURS AFFECTANT L'ACTIVITE ALIMENTAIRE DE LA LARVE DE *CADRA CALIDELLA* (LEPIDOPTERA : PYRALIDAE) ET LES PERTES OCCASIONNEES SUR DATTES

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## RESUME

La densité larvaire de *Cadra calidella* Guen., la variété des dattes et la température ambiante ont été étudiées en tant que facteurs écologiques influençant le taux de consommation de dattes et, par conséquent, le niveau des pertes causées par cette espèce. Le taux de consommation a montré qu'il n'y avait pas de rapport avec la densité larvaire.

La densité des larves a également affecté le nombre d'émergences d'adultes, le rapport des sexes et le taux de survie dans les étapes précédant la maturité.

La variété des dattes a nettement influencé la consommation alimentaire des larves.

Cette consommation, ainsi que les pertes en dattes ont été affectées à la fois par la température ambiante et par le type d'alimentation. A température constante (25-30° C), les plus grandes pertes ont été enregistrées pour les dattes de la variété Saidi et les plus basses pour les dattes de la variété Soltani. Un accroissement de la température allant de 25° C à 30° C s'est accompagné d'une baisse remarquable de l'activité alimentaire de la larve et, par conséquent, d'une réduction des pertes.