

## Prediapause and diapause development in *Adoxophyes orana* (Lepidoptera, Tortricidae)

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*Adoxophyes orana* enters diapause as a third instar larva by the end of September or early October. Larvae that have not developed far enough by October will not reach the diapausing stage and consequently die. The duration of prediapause development mainly depends on temperature. This relation was studied with larvae reared on an artificial diet (Ankersmit, 1968) at 13 h light per day and temperatures as given in Fig. 1. This figure shows the growth rate determined by weighing samples of 20 larvae at intervals of two days. The curves level off when all larvae have reached the diapause stage. At 15°C (average temperature of September is usually about 14.5°C) prediapause development takes 28 days, while an egg takes 17 to 18 days to develop (De Jong et al., 1965). Average October temperatures drop to 10.5°C. Therefore only a few of the eggs laid in September will produce larvae that can hibernate. At higher temperatures diapausing larvae become heavier. Their weight increases from 2.8 mg at 15°C to 3.8 mg at 20°C and 6 mg at 25°C. At 30°C no diapause occurs but growth rate is retarded in larvae of 13 to 18 days old.

The termination of diapause was studied with larvae kept singly in glass vials on artificial diet in an outdoor insectary. The trial started on 31 August 1972 when newly hatched larvae were placed on the diet. By the beginning of October they seemed in diapause. At the dates given in Fig. 2, samples were transferred to continuous light and 20°C. This light regime was chosen because it has less effect on diapause termination than long or short day treatments. Long days tend to terminate diapause and short days to prolong it. When the medium dried out, water was added. All remaining larvae were transferred to fresh medium on 2 May. The results (Fig. 2) show that the time needed to complete larval development at 20°C decreased rapidly during the autumn and slowly during winter and spring from 60 days to 22 days.

This decrease holds for the length of time needed for the first pupa to develop and for that for 50% to pupate. The difference between these periods diminished too. Thus we are not dealing with a population effect but with a gradual decline in intensity of diapause as expressed by the numbers of days needed for its termination. Even on 2 May diapause had not completely disappeared. Development of larvae, then taken from the insectary, to pupa lasted longer than the 15 days needed for non-diapausing larvae to grow from a third instar larva to a pupa at 20°C (M. B. Ponsen, personal communication).

Larvae kept continuously in the outdoor insectary started pupating on 1 June and 50% were pupated on 11 June. These observations are close to field data of 1973 when first pupae were found in the last week of May and flight had its peak just before

Fig. 1. Prediapause development in *A. orana* at various temperatures.

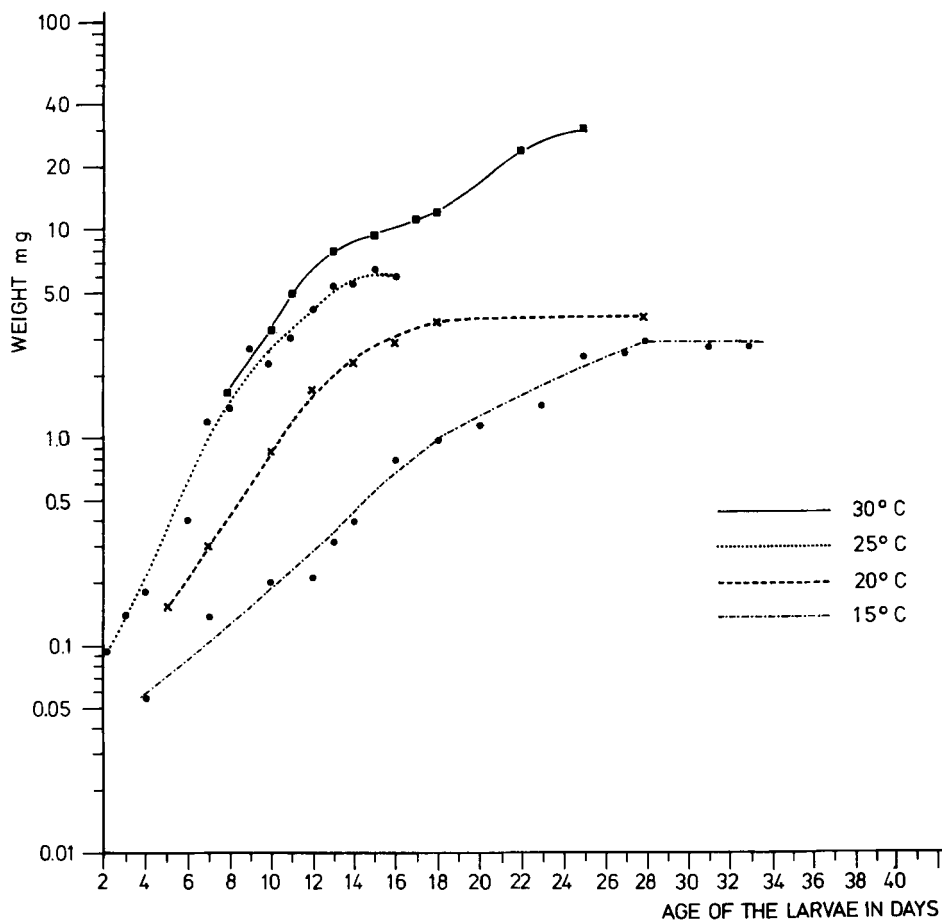


Fig. 1. Prediapauze ontwikkeling van *A. orana* bij verschillende temperaturen.

the middle of June (Plantenziektenkundige Dienst, 1973).

These results indicate that preblossom sprays of fruit trees against *A. orana* may not be successful because part of the population is still in diapause.

## Samenvatting

*Ontwikkeling voor en tijdens de diapauze van Adoxophyes orana (Lepidoptera, Tortricidae)*

De ontwikkelingsduur van de rupsen van de vruchtbladroller tot het intreden van de diapauze bij verschillende temperaturen werd bepaald door weging (Fig. 1). Rupsen uit in september gelegde eieren zullen vrijwel nooit het diapauze stadium bereiken. Bij hogere temperatuur gekweekte dieren waren zwaarder dan bij lagere temperatuur gekweekte.

Fig. 2. Number of days needed for pupation of larvae transferred from outdoor conditions to continuous light and 20°C. The numbers in the graph indicate the number of insects used.

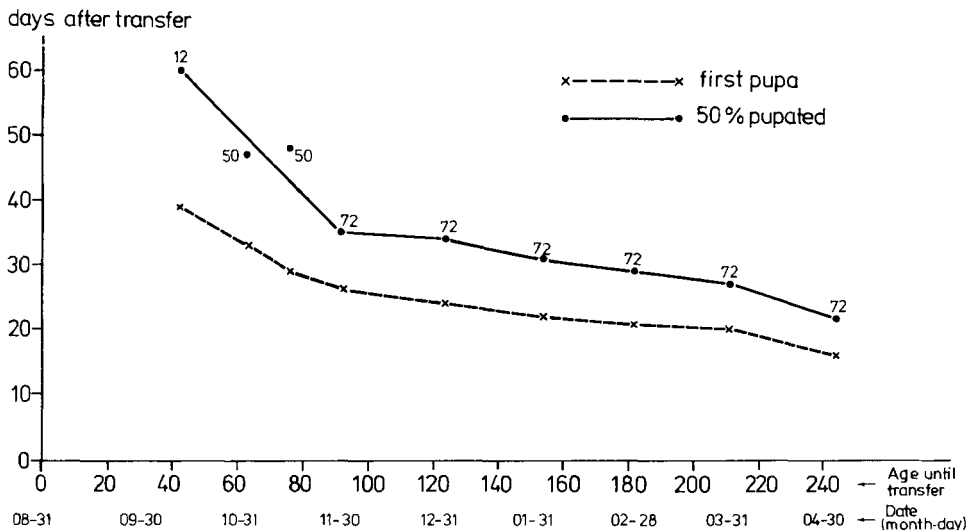


Fig.-2. Aantal dagen nodig voor verpopping bij larven die van buiten werden overgebracht naar continu licht en 20°C. De getallen in de grafiek geven het aantal gebruikte insecten aan.

De beëindiging van de diapauze werd bestudeerd door monsters in diapauze zijnde rupsen op verschillende tijdstippen vanuit een buiteninsectarium over te brengen naar 20°C en continu licht. De hierna nog tot verpopping benodigde tijdsduur (Fig. 2) blijkt aanvankelijk snel, later geleidelijk korter te worden. Dit wijst erop dat de intensiteit van de diapauze geleidelijk vermindert. Begin mei blijkt nog een zwakke diapauze aanwezig te zijn. Dit kan consequenties hebben voor het effect van bespuitingen tegen deze plaag vóór de bloei.

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