DURATION OF DEVELOPMENT OF *F. OCCIDENTALIS* PERGANDE (THYSANOPTERA: THRIPIDAE) AND POPULATION GROWTH ON DIFFERENT VEGETABLE HOST PLANTS

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Absract

The Western flower thrips *Frankliniella occidentalis* Pergande is the most common thrips on vegetable crops on the island of Crete. Though it is polyphagous, preference to some of the cultures has been observed. The aim of the study was to compare the development time from egg to adult and population growth of the thrips on several vegetable host plants: cucumber, tomato, sweet pepper, eggplant and French beans. The trials for duration of development were carried out at laboratory at 29°C on detached leaves isolated in Petri dishes, and for the population growth – at experimental glasshouse. The results showed that *F. occidentalis* developed most rapidly when feeding on eggplant leaves – 11 days, followed by cucumber – 11,6 days, and for tomato, bean and pepper – 12 days. The actively feeding stages – larvae 1st and 2nd instars developed faster on the leaves of eggplant which indicates that eggplant was the most suitable host for *F. occidentalis*. The growth of the population density of *F. occidentalis* was more significant on eggplant, cucumber, tomato and French beans. On the leaves of pepper the population density retain very low levels until the desiccation of the plants. The maximum of the population density of *F. occidentalis* was observed on the eight week after infestation with thrips. The population density of the thrips on eggplant reached more than 16-fold increase compared to the initial density, on tomato and cucumber –about 14-fold increase, on French beans – 12-fold, on melon – 8-fold.

Key words: Western flower thrips, eggplant, cucumber, pepper, French beans, tomato

INTRODUCTION

The Western flower thrips *Frankliniella occidentalis* (Pergande) (Thysanoptera: Thripidae) is one of the most important pests of vegetable crops because of the damage it causes by its feeding and oviposition and as a vector of Tomato spotted wilt virus (Childers, 1997; Ulman et al., 1997). The total development time of the Western flower thrips was studied at different temperatures (Lublinkhof, 1977, van Rijna et al., 1995, Ishida et al., 2003). It was shown experimentally that between 15

and 28°C, developmental rate of *F. occidentalis* is linearly related to temperature, (van Rijna et al., 1995), but it is well known fact that host plant also may influence it. In this respect the aim of the study was to determine the influence of host plant on the duration of development and on the population dynamics.

MATERIAL AND METHODS

To determine the duration of the different developmental stages, individual adult females were allowed to oviposit for 8 h in sections of leaves of different vegetable crops (cucumber, tomato, French beans, sweet pepper, eggplant and melon) in Petri dish. After the females were removed, the Petri dishes were kept in climatic room at 29 ±1 °C, 70±10% r.h., 16L:8D photoperiod. The leaf sections were and covered by a smaller Petri dish (fig. 1) with a section cut and replaced with metal netting for aeration and to prevent thrips to escape. The leaf petiole was placed in wet cotton and wrapped in Para film. The leaf sections were observed under stereomicroscope for hatching of larvae every 12 hours. The hatching larvae were moved to a different Petri dish to be monitored individually. For each vegetable culture and for each developmental stage 10 replications were made.

The population dynamics was studied in an experimental greenhouse at TEI of Crete, in separate compartments insulated by fine metal netting, which does not allow thrips to pass through (fig. 2). In each compartment 12 potted plants of one of the vegetable cultures listed above were placed. An initial number of 100 adult females of *F. occidentalis* were released in each compartment at the same date. The population dynamics was monitored at weekly intervals by tapping the leaves of each plant on a sheet of white paper and counting the number of nymphs and adults. After recording the number, the thrips were released back on the plants. The population density was recorded two weeks after the initial release of the thrips in the separate compartments until the death of the plants. The population density on the flowers was monitored in the same way but by tapping the flowers.

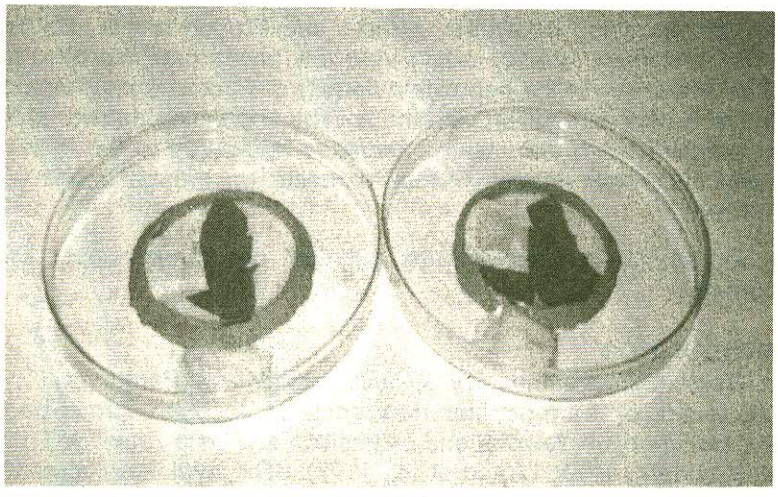

Fig. 1. The experimental design for studying the duration of developmental stages

Fig. 2. Sweet pepper plants in one of the experimental compartments

RESULTS AND DISCUSSION

Duration of different stages of *F. occidentalis* on different host plants

F. occidentalis developed most rapidly when feeding on eggplant leaves – 11 days (tabl. 1), followed by cucumber – 11,6 days, and for tomato, bean and pepper – 12 days. The egg stage varied from 2,5 for French beans and melon, and eggplant respectively. The larvae 1-st instar developed from 0,8 on cucumber to 1,9 days on French beans. The larval 2-nd instar was the longest stage on all the host plants, varying from 3,6 on eggplant to 5,6 for French beans. The prepupal stage was the shortest one again for all the host plants – from 0,7 on melon to 2,5 on tomato. The pupal stage varied from 1 day on tomato to 2,3 days on melon. The average developmental period for *F. occidentalis* (from egg to adult) at 29°C was shortest on the leaves of eggplant as a host. The actively feeding stages – larvae 1-st and 2-nd instars developed faster on the leaves of eggplant which indicates that eggplant was the most suitable host for *F. occidentalis*.

The results about the duration of the development of *F. occidentalis* on French beans leaves, published by Boev (1997) showed a little shorter development time from egg to adult – 11,3 but at temperature 30°C.

Growth of population density of *F. occidentalis*

The results given on fig. 3 present the growth of the population density of *F. occidentalis* in isolated experimental greenhouse. The population dynamics on the flowers and the leaves looked in a different way on the different cultures. The increase of the population on the leaves began earliest on eggplant (fig. 3). The

population growth was more significant on eggplant, cucumber, tomato and French beans. On the leaves of pepper the population density retain very low levels until the desiccation of the plants.

Table 1

Duration of the developmental stages of *F. occidentalis* on different host plants at 29°C

Stage	Vegetable culture /days±					
	cucumber	tomato	French beans	melon	eggplant	Sweet pepper
Egg stage	3.2	3.0	2.5	2.6	3.2	2.75
Larva 1st instar	0.8	1	0.9	1.7	1.2	1.75
Larva 2nd instar	4	4.5	5.6	4.9	3.6	3.80
Prepupa	1.4	2.5	1	0.7	1	1.7
Pupa	2.2	1	2	2.3	2	2,0
Egg to adult	11.6 (±1,3)	12,0 (±1,5)	12,0 (±1,6)	12,2 (±1,2)	11 (±1,0)	12,0 (±1,2)

The maximum of the population density of *F. occidentalis* on all the cultures except cucumber and sweet pepper, which continued to increase insignificantly, was on 30 June - the eight week after infestation with thrips. After that date eggplant, tomato and French beans showed a significant decrease until the death of the plants. On 30 June the population density of the thrips on eggplant reached more than 16-fold increase compared to the initial density, on tomato and cucumber –about 14-fold increase, on French beans – 12-fold, on melon – 8-fold. The population dynamics of the thrips on the leaves of sweet pepper showed very low increase until 23 June. After that for a week it doubled and continued to keep that level until the end of the experiment. On 30 June the population density of *F. occidentalis* only doubled.

On the flowers the population dynamics of *F. occidentalis* showed lower values and smaller changes with the exception of melon on which the highest peak of population was recorded (fig. 4). The maximum of the population density both for adults and larvae was reached on 23 June – the seventh week after infestation on all the cultures except on French beans. For melon, cucumber and sweet pepper the population decreased up to 30 June and after that began to increase. After 23 June the population density of the thrips on tomato decreased until the death of the plants. On eggplant the population dynamics of the larvae and the adults was

similar to that of tomato– only one peak on 23 June and reduction after that. As a whole population dynamics of the larvae was similar to that of the adults on the separate cultures.

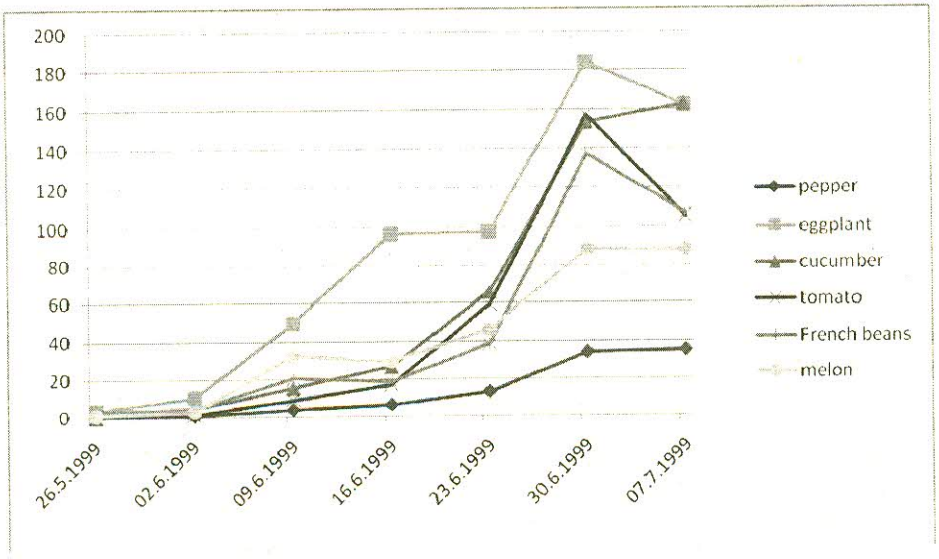

Figure 3. Growth of population density of *F. occidentalis* on the leaves of different vegetable crops

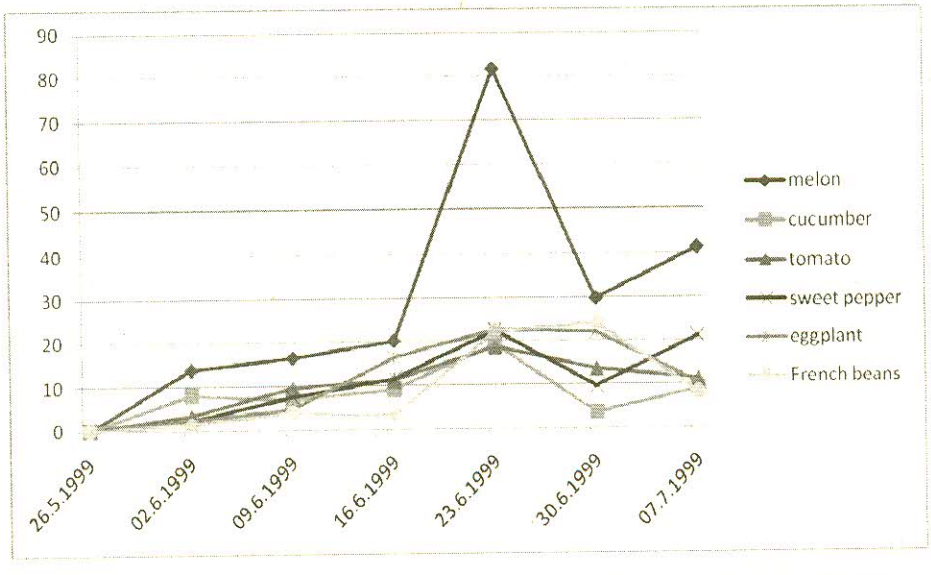

Fig. 4. Growth of population density of *F. occidentalis* on the flowers of different vegetable cultures

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