Contribution to the knowledge of *Frankliniella schultzei* (Thysanoptera: Thripidae)

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Abstract: In The Netherlands a new thrips species has settled in glasshouses: *Frankliniella schultzei* (Trybom). Although quite a common species in the tropics, so far settlings in glasshouses were not recorded in literature. A study has been started on its identification, host-specificity, world distribution and economic importance. The systematics do not seem to be clear. Possibly more species are involved. *F. schultzei* is mainly feared because of its ability to transmit Tomato Spotted Wilt Virus (TSWV). Direct thrips damage is seldom of interest. Especially the international flower trade has to realize the risks associated with *F. schultzei.*

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Introduction

In the tropics *Frankliniella schultzei* (Trybom, 1910), the cotton bud thrips, is known as a common pest (Mound et al., 1976) and mostly feared for its ability to transmit the Tomato Spotted Wilt Virus (Hill, 1983). It can live in flowers of plants belonging to different families. Introduction of this species into the temperate climate zone has been reported from rooms used for vegetative propagation of hyacinthbulbs in The Netherlands (Van Rossem et al., 1968; Mantel, 1968). Other settlings in temperate regions have not been reported.

From an inspection of Dutch flower auctions for Thysanoptera in 1987 it appeared that *F. schultzei* can be considered as a quite common species of thrips in the international flower trade. Other species regularly found were *Frankliniella occidentalis* (Pergande) and *Thrips tabaci* Lindeman (Vierbergen & Ulenberg, 1988). Both species occur world-wide in glasshouses. Hence settling in glasshouses of the pantropical species *F. schultzei* could also be expected.

Early 1988 the dark form of *F. schultzei* was found in a glasshouse in flowers of *Saintpaulia ionantha* Wendl in The Netherlands (Elden). This dark form is originally described as *Frankliniella paucispinosa* from Brazil (Moulton, 1933). A few months after elimination of the population at Elden the dark form of the thrips was found again in great numbers in flowers of Cactaceae in some nurseries. An inspection of imported, still packed cactus plants from Brazil was in one of the nurseries successful: the dark form of *F. schultzei* was found in low numbers on the plants. These specimens were identical to the thrips collected in the nurseries. Occurrence of *F. schultzei* in the glasshouse environment has never been reported before. Because of the virus transmission ability of *F. schultzei* and its settling in Dutch glasshouses a study on its identification, host-specificity, world distribution and economic importance was started.

Synonymy

The great variability of the species and the large area of distribution (fig. 1) has resulted in the description of different forms of *F. schultzei.* They can be divided in two more or less distinguishable forms: a pale one and a dark one. The natural distribution of the pale form is mainly north, that of the dark form south of the equator.

It is not possible to judge on morphological

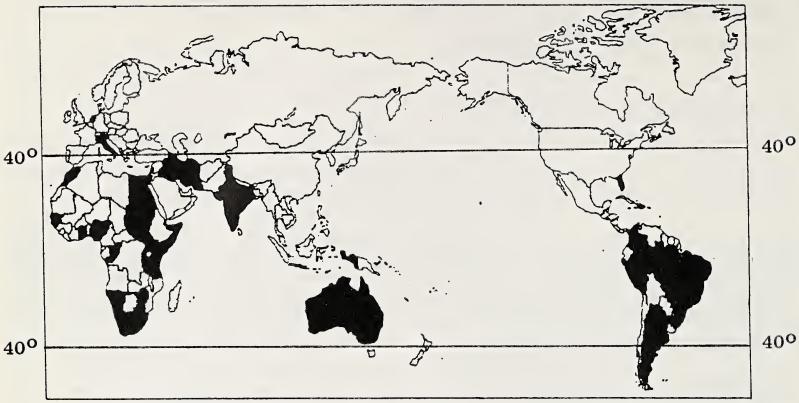

Fig. 1. Distribution of *Frankliniella schultzei* (Trybom).

characteristics only whether all synonyms of *F. schultzei* mentioned by Jacot-Guillarmod (1974) are correct. More than one species might be involved. Before this is sorted out *F. schultzei* has to be considered as a variable species.

Diagnosis

The genus *Frankliniella* is a rather well defined genus. Satisfactory descriptions of the genus are given by Priesner (1964) and Sakimura & O'Neill (1979). *F. schultzei* can be distinguished from the other, approximately 150 *Frankliniella*-species by the combination of the following morphological characteristics (males and females):

- length of one pair postocular setae more than twice the length of the other postoculars (fig. 2)
- ocellar setae situated between the posterior ocelli (fig. 2)
- on the pronotum between the anteromarginals usually two setae (sometimes three or four) present
- metanotal pores absent (fig. 3).

Additional characters:

- female: at the posterior margin of tergite VIII the comb is only developed laterally
- male: the glandular areas on sternites III-VII broad, about half the width of the sternite.

Only the form of *F. schultzei*, which has been described as *F. paucispinosa*, with the almost completely dark brown body, has settled in the Dutch glasshouses. By import inspection of cut flowers other colour forms, such as intermediates and light yellow forms have also been found. Morphological differences between the colour forms could not be determined except for one female specimen imported on *Limonium* sp. from Kenya in 1987. This thrips, with only the antennal tips brown, has ocellar setae with a length of 22 µm, whereas the normal length of these setae is 34-48 µm. The specimen fits well in the description of *Frankliniella dampfi* Priesner, 1923, which is now regarded as a junior synonym of *F. schultzei* (Mound, 1968).

Distribution

F. schultzei has a pantropical distribution (Jacot-Guillarmod, 1974). In the subtropics the species is probably less common, while in the temperate regions the insect is restricted to heated places such as glass- and storehouses.

Fig. 2. Head of *Frankliniella schultzei* (Trybom), ♀, Lisse, The Netherlands, 1965, *Hyacinthus*. Scale bar: 25 µm.

So far, reports on the presence of this thrips in temperate zones have been rare (England, The Netherlands). In general its range lies between latitude 40° north and 40° south (fig. 1).

Countries where *F. schultzei* has been found so far (the figures refer to the literature cited below):

Europe – The Netherlands (introduced), England (found incidentally)[1, 2] Italy[1].

Asia – Israel[1], Iraq[3], Iran[4], India[1], Sri Lanka[1], Bangladesh[5], Indonesia: Java[6], New Guinea[1].

Africa – Canary Islands[1], Morocco[1], Egypt[1], Sudan[1], Cape Verde Islands[7], Senegal[1], Gambia[1], Ghana[1], Togo[8], Nigeria[9], Somalia[1], Kenya[1], Uganda[1], Congo[1], Zimbabwe[1], Namibia[1], South Africa[1].

Australia and Pacific Islands – Australia (introduced?)[1, 3], Mariana Islands[1], Johnston Island[1], Hawaii[1].

North America – U.S.A.: Florida[10].

Central America and the West Indies – St. Thomas[11], Puerto Rico[11], Dominican Republic[11], Jamaica[1].

South America – Colombia[1], Peru[12], Brazil[1], Argentina[1].

1. Jacot-Guillarmod (1974); 2. Mound et al. (1976); 3. Kirk (1987); 4. Bournier & Couilloud (1969); 5. Zur Strassen (1984); 6. Miyazaki et al. (1984); 7. Zur Strassen (1981); 8. Zur Strassen (1982); 9. Okwakpam (1967); 10. Anonymus (1974); 11. Sakimura (1986); 12. Ortiz (1973).

Host-specificity

F. schultzei is a polyphagous species, mainly living in the flowering parts of plants. Representatives of at least twelve dicotyledonous plant families are known as host plants. Large families like Leguminosae, Solanaceae and Compositae are included. Also representatives of monocotyledonous families are visited and serve as host plants, e.g. Liliaceae, Iridaceae and Graminae.

In contrast with the above mentioned angiospermous families, needle leaved trees, other gymnosperms and lower plants are not appropriate for the reproduction of *F. schultzei*.

F. schultzei is likely as polyphagous as a number of other *Frankliniella* species as e.g. *Frankliniella intonsa* (Trybom) and *F. occidentalis*. More host-plant records, however, will be needed to justify this statement.

Economic Importance

Direct damage

Like many other species of thrips *F. schultzei* can cause suction damage and probably also damage by laying eggs in the leaves and flow-

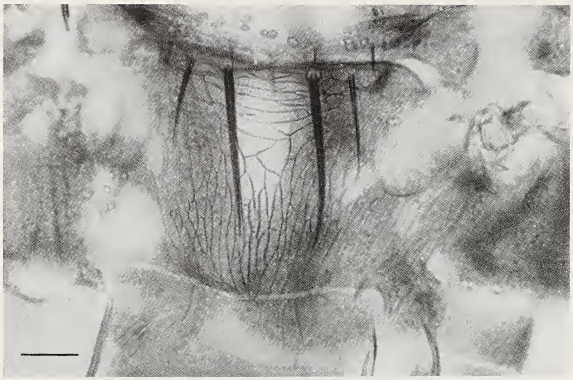

Fig. 3. Metanotum of *Frankliniella schultzei* (Trybom), ♀, flowerauction Aalsmeer, The Netherlands, *Limonium*, origin: Israël, 1987. Scale bar: 20 µm.

ers. The latter, however, has never been confirmed. The flowers can be damaged by the suction activity in such a way that they become unsalable. However, reports on this type of damage by *F. schultzei* are rare. In The Netherlands suction damage was established in flowers of *Mammillaria* sp. (Cactaceae) in a glasshouse in October 1988. In the flowers two species of thrips could be found: *F. schultzei* and *F. occidentalis*. Probably the unusually high number of thrips per flower was responsible for the damage; normally both thrips species feed only from the nectar produced by the flowers of *Mammillaria* sp.

According to the literature *F. schultzei* can cause yield loss due to diminishing fruit setting as a result of suction damage. Flower shedding and poor fruit setting by red gram (*Cajanus cajan* (L.) Millsp.) in India were described by Vaishampayan & Singh (1969). Because another thrips species was involved (*Taeniothrips nigricornis* (Schmutz)), the damage particularly caused by *F. schultzei* is unclear.

Still, the ability of *F. schultzei* to injure cotton flowers in southern Iran has been confirmed (Bournier & Couilloud, 1969). In this region the thrips seems to be responsible for withered spots or wounds in the pericarp of the bolls. However, a negative effect on the ripening of the bolls and the quality of the seed has not been observed. Control did not seem to be necessary.

In The Netherlands *F. schultzei* was noxious in the usual way of vegetative propagation of hyacinth bulbs (Van Rossem et al., 1968; Mantel, 1968; Mantel & Van de Vrie, 1988). Probably by the application of effective chemical control in the propagation room, the thrips no longer occurs on hyacinths for propagation in The Netherlands.

The appearance on hyacinth bulbs was due to the easily attainable plant-liquids from the injuries of the bulb. Also *T. tabaci*, which is common in glasshouses in The Netherlands, took advantage of this situation and settled in the propagation rooms. The damage symptoms caused by both species cannot be distinguished from each other (Franssen & Mantel, 1965; Mantel, 1968).

Indirect damage

Because of its ability to transmit Tomato Spotted Wilt Virus (TSWV) *F. schultzei* is internationally a most feared insect (Hopkins, 1956; Klesser, 1966; Sakimura, 1969; Shaw, 1979). The vector capacity of this thrips has been proved in several crops (e.g. peanut, tobacco and tomato). Sakimura (1969) discovered that not all forms of *F. schultzei* could be considered as vector. The pale form of Hawaii, for example, originally described as *Frankliniella sulphurea* Schmutz, seems to be unable to transmit TSWV. Most likely only the dark

form can transmit TSWV. This is supported by the fact that transmission is only recorded from regions south of the equator (Southern Africa, Australia and South America). This dark form is also able to settle in glasshouses and thereby enhances the risks of the dispersion of TSWV.

TSWV has a wide host range and is one of the few viruses which can pass from dicotyledons to monocotyledons. It was first recorded in Australia in 1915 (Smith, 1957). Before the second world war the virus was found worldwide. Later on the virus became rare in The Netherlands. Probably because of the appearance of *F. occidentalis*, another vector of TSWV, spotted wilt becomes more important. Especially growers of *Chrysanthemum morifolium* de Ramatuelle have problems with the virus.

The whitefly *Bemisia tabaci* Gennadius, known as a vector of nineteen viruses, recently became of interest in international flower trade (Cock, 1986). The ability of the whitefly to transmit viruses is feared more than its property to cause direct damage. Most likely resistance against insecticides enabled *F. occidentalis* and *B. tabaci* to settle in glasshouses in temperate areas (Robb et al., 1988; Price et al., 1987). *F. schultzei* can be compared with *B. tabaci* in many ways. The thrips is only slightly noxious to plants, but its function as a vector of TSWV makes the thrips of economic interest. However, in contrast with *B. tabaci* an insecticide resistant strain of *F. schultzei* is not known to exist till now.

Future outlook

In The Netherlands it appeared to be impossible to eliminate *F. schultzei* with insecticides from the glasshouses where it infests Cactaceae. It is expected that not the resistance against insecticides, but the hiding behaviour in the flowers is the main factor responsible for surviving chemical treatment. Nevertheless increase of resistance can never be ruled out in this variable species. So, the international flower trade must realize the risks associated with *F. schultzei* with its great variability, its large host range and its ability to settle in glasshouses and to transmit TSWV.

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