LOCATION OF *EUSEIUS FINLANDICUS* (ACARI: PHYTOSEIIDAE) ON LEAVES OF *FAGUS SYLVATICA*

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Phytoseiid mite *Euseius finlandicus* was sampled from leaves of beech *Fagus sylvatica* planted in urban green areas. The accurate locations of *E. finlandicus* on the leaf undersurfaces were recorded. 125 specimens in total of *E. finlandicus* were collected from leaves of *F. sylvatica*. The population density of this mite species averaged 1.04 mites per leaf on investigated *F. sylvatica* trees. Most specimens of *E. finlandicus* were captured along the raised veins with hairlike trichomes. *E. finlandicus* was not observed on hairless leaf blades of investigated beech leaves. Some specimens (10.4% of all sampled motile stages) were found within tuft domatia. The raised veins with long hairlike trichomes the most preferred leaf surface microhabitat by the both motile immature and adult stages of *E. finlandicus* on leaves of *F. sylvatica*. This vein microhabitat can be used for shelter and the rest by *E. finlandicus* on beech leaves. Leaf surface structures together with type of defensive strategy before macropredators influenced the occurrence of *E. finlandicus* within leaf microhabitats on beech leaves.

Euseius finlandicus; *Fagus sylvatica*; leaf microhabitat; defensive strategy; Phytoseiidae; Acari

INTRODUCTION

Predatory mites of the family Phytoseiidae are known as important natural enemies of small arthropods including various phytophagous tetranychid and eriophyid mite species. Many phytoseiid species are used as effective predators in integrated pest management programs to control agriculturally important pests in many crops (Huffaker et al., 1970; McMurtry et al., 1970). In natural habitats, some phytoseiids are important in preventing outbreaks of various phytophagous mites (Edland, Evans, 1998). These predaceous mite species often inhabit the leaves of deciduous tree and shrub species.

The local ecology of phytoseiids is influenced strongly by leaf morphology (Beard, Walter, 2001). Various structures on leaf undersurfaces (raised veins, density of hairs, domatia) affect searching, mating, oviposition, and other behaviors of these predatory mites (Kreiter, 2002). The numbers of phytoseiids are affected by the density and locations of hair, bristles, and pockets on the leaf surfaces (Karban et al., 1995). Leaves with domatia have more mites than leaves without them (Walter, O'Dowd, 1992).

The mite *Euseius finlandicus* (Oudemans, 1929) is a common phytoseiid species on broad leaf trees in Bohemia (Kabíček, 2000). The subject of this study was to investigate the presence and location of the phytoseiid mite *E. finlandicus* on leaves of *Fagus sylvatica*.

MATERIAL AND METHODS

Leaf samples (one sample = ten haphazardly selected leaves per tree of approximately identical size) were taken from trees of *Fagus sylvatica* planted in urban green in Prague in 2002 and 2003. Leaves were sampled from branches 2–3 m above the ground. A total of 120 leaves was collected. The beech trees were identified using the key of Dostál (1954). The packed samples in plastic bags were placed and cooled in the portable storage box and brought to the laboratory where they were either examined immediately or stored in the refrigerator at 5 °C for <24 h before examination.

Cooled leaves were inspected individually for phytoseiids in the laboratory using a stereomicroscope. The underside of each leaf was divided into three microhabitats – veins, domatia and the leaf blade. The mites occurring nearby domatia (veins) within the two-fold mite body length distance were included into the domatia (vein) microhabitat. The accurate positions and numbers of motile stages of phytoseiids per each leaf microhabitat were recorded. Observations were made on the entire leaf surface. Mite densities were expressed as the number of motile stages per leaf. The phytoseiid mites were separated from leaves by using insect pins, and than transferred directly into lactic acid. After clearing in lactic acid, mites were mounted in Swann medium on microscope slides. The mites were identified using the keys of Beglyarov (1981a, b).

RESULTS AND DISCUSSION

A total of 125 specimens of *E. finlandicus* was found on leaf undersurfaces of *F. sylvatica*. This mite species occurred on almost 51% of all sampled leaves. The population density of *E. finlandicus* averaged 1.04 mites per beech leaf.

Both immature and adult stages of this phytoseiid species were most abundant along the raised veins with hairlike trichomes (Table 1). Most of non-moving and non-

Table 1. The distribution of *E. finlandicus* on leaves of *F. sylvatica*

Leaf microhabitat	Females (%)	Males (%)	Larvae, nymfae (%)	Total (%)
Veins	95.3	85.0	87.1	89.6
Domatia	4.7	15.0	12.9	10.4
Leaf blade	0.0	0.0	0.0	0.0

moulting specimens of *E. finlandicus* inhabited the raised mid-ribs and some specimens were found nearby the large raised subsidiary veins of beech leaves, too. By contrast, Chant (1959) reported that *E. finlandicus* was uniformly distributed over the lower surface and showed no preference for any part of the apple leaf. *E. finlandicus* is the generalist mite predator that mostly feeds on pollen (McMurtry, Croft, 1997; Jung, Croft, 2001) and vertical leaf hairs on the undersurfaces of leaves are used for oviposition by this mite species (Chant, 1959). It is known that various sheltered leaf habitats rather than food availability may limit the numbers of phytoseiid mites on plants (Tuovinen, Rokx, 1991; Karban et al., 1995). The presence, density and distribution of hairs on the underside of beech leaves may explain the frequent occurrence of *E. finlandicus* nearby the raised veins with numerous long trichomes on investigated leaves. The distribution of non-moving and non-moulting specimens of *E. finlandicus* on examined beech leaves indicates that the raised veins with hairlike trichomes are the most preferred leaf microhabitat used by this phytoseiid mite for shelter and rest, too.

E. finlandicus did not occur on hairless leaf blades of inspected beech leaves. Some specimens (10.4% of all sampled stages) of this phytoseiid species were found in tuft domatia (Table 1). These specialized structures enclose minute spaces on the leaf undersurface usually located in major vein axils (O'Dowd, Willson, 1997). Typically predaceous and fungivorous mite species use these structures for shelter and breeding (O'Dowd, Willson, 1989; Pemberton, Turner, 1989).

The most specimens of *E. finlandicus* moved rapidly over the hairless beech leaf blade when disturbed within the vein or domatia microhabitats. Tuovinen (1994) reported that *E. finlandicus* moved quickly and was very active on apple leaves. According to Chant (1959) *E. finlandicus* roamed freely over apple leaf surfaces and moved rapidly over apple leaf when disturbed or even undisturbed. *E. finlandicus* evolved a method of rapid escape before macropredators that depends on speed (Chant, 1959). This defensive strategy together with leaf surface structures may explain the preference of the leaf vein microhabitat by this phytoseiid species on examined beech leaves. Leaf vein microhabitat used by most specimens of *E. finlandicus* for shelter and rest and glabrous leaf blade microhabitat on leaves of *F. sylvatica* allow them better to utilize their defensive strategy depending on rapid escape before macropredators.

CONCLUSION

The results obtained by this study show that leaf microhabitats with trichomes were preferred by *E. finlandicus* on beech leaves. Frequency of occurrence of non-moving and non-moulting specimens of *E. finlandicus* along the raised veins with numerous trichomes indicates that this leaf microhabitat can be used for shelter and rest by this phytoseiid species on beech leaves. The raised veins with long hairlike trichomes were the most preferred leaf surface microhabitat by the both motile immature and adult stages of *E. finlandicus* on leaves of *F. sylvatica*. Leaf surface structures together with the type of defensive strategy influenced the occurrence of *E. finlandicus* within leaf microhabitats on beech leaves.

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Rozmístění *Euseius finlandicus* (Acari: Phytoseiidae) na listech *Fagus sylvatica*.

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V průběhu dvou let byl sledován výskyt a rozmístění roztočů čeledi Phytoseiidae na listech buků *Fagus sylvatica* rostoucích v městském lese. Listy přibližně stejné velikosti byly odebírány náhodně z větví do výšky dvou až tří metrů. Spodní strana listu byla z hlediska výskytu roztočů rozdělena na tři mikrohabitaty: žilky, domatia a listová čepel.

Na rubu sledovaných listů bylo nalezeno celkem 125 jedinců roztoče *Euseius finlandicus*, v průměru 1,04 roztoče na list. Více než 89 % jedinců bylo odchyceno v těsné blízkosti výrazně vystouplých žilek porostlých dlouhými rovnými trichomy. Ostatní jedinci (necelých 11%) byli nalezeni v domatiích tvořených překrývajícími se trichomy v paždí žilek. Na zbývajících lysých částech listových čepelí nebyl zjištěn žádný roztoč *E. finlandicus*. Převažující nálezy dospělců a pohyblivých vývojových stadií roztoče *E. finlandicus* v blízkosti žilek svědčí o výrazné preferenci tohoto mikrohabitatu tímto roztočem. Četný výskyt nepohybujících se a nesvlékajících se jedinců *E. finlandicus* v blízkosti žilek indikuje využívání tohoto mikrohabitatu jako místa pro úkryt a odpočinek. Listové struktury a typ obranné strategie před makropredátory ovlivňovaly výskyt roztoče *E. finlandicus* v mikrohabitatech listů buku *Fagus sylvatica*.

Euseius finlandicus; Fagus sylvatica; listový mikrohabitat; obranná strategie; Phytoseiidae; Acari

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