BIOLOGICAL LETT. 2006, 43(2): 389–392
Available online at http://www.biollett.amu.edu.pl

Tetranychoid mites (Prostigmata: Tetranychoidea) inhabiting green plantings in Kyiv

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(*Received on 1 January 2006, Accepted on 15 September 2006*)

Abstract: Tetranychoid mites inhabiting green plantings were investigated in Kyiv metropolis for the first time and 9 species of the families Tetranychidae and Bryobiidae were recorded. The degree of infestation of studied plants by mites was assessed. It depends on some factors that can affect both parasites and hosts.

Key words: mites, host plants, metropolis, environmental factors

INTRODUCTION

Tetranychoid mites (Tetranychoidea Donnadieu, 1985) are a worldwide-distributed superfamily of phytophagous arthropods, found in nearly all vegetation zones and landscape types. Their hosts are represented by more than 1000 plant species from many countries (RECK 1959, VAINSHTEIN 1960, HELLE & SABELIS 1985). This superfamily includes numerous spider mites (Tetranychidae), which are able to spin a loose silk webbing and use it for the protection of laid eggs. In fact, such a webbing can cover not only the underside of leaves but also whole branches.

The high level of air pollution as well as sharp fluctuations of temperature and radiation are specific features of the modern city. The cumulative effect of these factors results in decreasing the vital activity of green plants. On the other hand, urban conditions can also stimulate the reproduction of some important phytophages. In this respect, tetranychoid mites are one of the most dangerous groups, especially in the big cities (KRIVOSHEINA 1992).

Most of the damage caused by phytophagous mites to plants is due to the huge loss of some basic nutrients, which are necessary for their normal growth and development. Symptoms noticed on leaves include chlorosis and white or yellow spots that result in reducing their photosynthetic activity or even premature leaf fall. In this context, my work was aimed to study the diversity of tetranychoid mites associated with green plantings in Kyiv city. The article presents preliminary results, which require further studies.

MATERIAL AND METHODS

Tetranychoid mites were studied in the main districts of Kyiv in 2004–2005. Green plantings in various parks, squares, botanical gardens as well as streets and avenues were investigated. The mites were collected together with leaves or by shaking them off branches onto a black oilcloth. The material was placed in polyethylene bags as well as in plastic tubes with 70% ethanol, and after that transported to the laboratory. The leaves were examined under a binocular microscope. The studied plants belonged to the families Aceraceae, Asteraceae, Betulaceae, Corylaceae, Juglandaceae, Fagaceae, Hippocastanaceae, Malvaceae, Mimosaceae, Rosaceae, Oleaceae, Salicaceae, Tiliaceae, Ulmaceae, Urticaceae and Vitaceae. The mites were embedded in preparations by using liquid Fora-Berleze, and then investigated under a phase-contrast microscope. The plant samples on the diagram represent 5 or more plant specimens. If the number of samples per species was lower, they were included in the category 'All others'.

RESULTS AND DISCUSSION

In the study, 9 species of tetranychoid mites of 6 genera and 2 families were found:

1) *Tetranychus atlanticus* McGregor, 1941 — *Urtica dioica* L., *Lavatera thuringiaca* L., *Malva neglecta* Wallr.
2) *Amphitetranychus viennensis* Zacher, 1920 — *Carpinus betulus* L., *Crataegus monogyna* Jacq., *Crataegus laevigata* Poir., *Prunus divaricata* Lebel., *Prunus domestica* L., *Malus domestica* Borkh., *Sorbus aucuparia* L., *Sorbus melanocarpa* Heyn., *Amelanchier ovalis* Medik., *Cerasus vulgaris* Mill.
3) *Schizotetranychus tiliarium* Hertmann, 1804 — *Tilia cordata* Mill., *Tilia americana* L., *Tilia europaea* L., *Tilia platyphyllos* Scop.
4) *Schizotetranychus pruni* Oudemans, 1931 — *Acer platanoides L., Acer negundo* L., *Acer saccharinum* L., *Acer tataricum* L., *Acer pseudoplatanus* L., *Aesculus hippocastanum* L., *Sorbus aucuparia* L., *Sorbus melanocarpa* Heyn., *Malus domestica* Borkh.
5) *Schizotetranychus carpini* Oudemans, 1905 — *Carpinus betulus* L.
6) *Schizotetranychus schizopus* Zacher, 1913 — *Salix caprea* L.
7) *Panonychus ulmi* Koch, 1836 — *Ulmus glabra* Huds., *Sorbus aucuparia* L., *Sorbus melanocarpa* Heyn.
8) *Tetranycopsis horridus* Canestrini et Fanzago, 1875 — *Corylus avellana* L., *Corylus colurna* L.
9) *Bryobia redikorzevi* Reck, 1947 — *Malus* Borkh., *Prunus divaricata* Lebel., *Prunus domestica* L., *Armeniaca vulgaris* Mill., *Pyrus communis* L., *Pyrus betulifolia* L., *Cerasus vulgaris* Mill., *Artemisia vulgaris* L., *Cotoneaster niger* Fries., *Ulmus glabra* Huds., *Ulmus carpinifolia* Rupr. ex Suckow, *Morus nigra* L.

In 2005 as many as 58% of the examined samples were infested by mites, compared to nearly 30% in 2004 (Fig. 1).

The diversity of tetranychoid mites in the metropolis seems to be much lower than in natural habitats. On the other hand, the urbanized conditions can be very favourable for the reproduction of some species (KRUGLIKOV 1985).

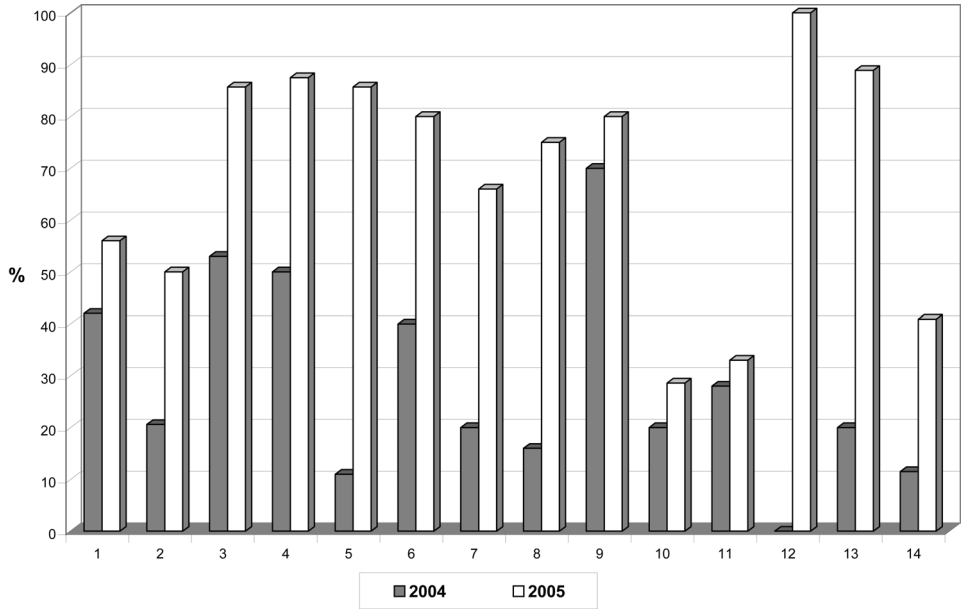

Fig. 1. Frequency index of tetranychoid mites on green plantings in Kyiv: 1 – *Tilia* L., 2 – *Acer* L., 3 – *Malus* Mill., 4 – *Prunus* Mill., 5 – *Cerasus* Juss., 6 – *Sorbus* L., 7 – *Crataegus* L., 8 – *Ulmus* L., 9 – *Urtica dioica* L., 10 – *Lavatera thuringiaca* L., 11 – *Quercus* L., 12 – *Corylus* L., 13 – Conifers, 14 – All others

The quantitative changes of mite populations are self-regulating processes depending on various environmental factors. In this respect, weather conditions have an impact on development time as well as harmfulness of mites. For example, a high air humidity decreases both fertility and harmfulness of mites on account of the water excess that results in physiologic starvation (AKIMOV 1965). Temperature is of certain significance for mite development, too. Dry and hot weather during the growing season seems to promote the growth of the pest populations (KROPCZYŃSKA et al. 1988, PRASLICKA & HUSZAR 2004).

Aside from abiotic factors, the population dynamics of phytophagous mites is closely related to the biochemical composition of the host plants as well as intraspecific and interspecific interactions, competition, and predator–prey relationships in particular. Feeding conditions are of great importance for mite reproduction and it must be taken into account that both qualitative and quantitative characteristics of the forage are changed depending on season as well as age or physiological state of the host plants (VAINSHTEIN 1960).

The growth of tetranychid populations depends on the nutritive value of the host plant, as established by Japanese scientists (GOTOH & GOMI 2000). On the other hand, a certain reduction of the feeding activity of phytophagous mites resulted in their malnutrition and, hence, was reflected in their lower fertility. The stable state of mite populations also depends on specific anatomical characteristics of leaves, such as thickness of the cuticle and epidermis, and presence or absence of some superficial structures, like hairs (MITROFANOV et al. 1987).

Both phytophagous mites and their host plants are often subject to similar ecological factors (RECK 1959) and this should be taken into account when monitoring this or another important parasitic group of arthropods. In this respect, the growth of the mite population is reasonably reflected in the physiological state of the host plant and, hence, the pests must feel some changes in food quality.

The dynamics of the plant pests in the metropolis can be related to the level of pollution (TARASOVA et al. 2004). Their influence upon the vital activity of green plants is reflected in the decreasing of antibiotic reactions as well as physiological resistance of plants. If the negative effects of some pollutants or even of their complex on the mites are much less severe as compared with plants, the fast growth of the pest population may result from increasing environmental pollution. The spontaneous outbreaks of tetranychid mites may be also explained by the lack of acariphagous mites, which could effectively control various plant pests but are rare in cities, possibly because of their sensitivity to contamination.

Thus there are certain factors markedly affecting the pests of green plantings in the big cities: microclimatic conditions, feed quality, and activities of predatory species as well. All these seem so interconnected that further investigation of this problem requires a more complex approach, taking into account the accumulating anthropogenic stress.

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Associate editor: ANNA SKORACKA