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Abundance and wild host plants of predator mirids (Heteroptera: Miridae) in horticultural crops in the Southeast of Spain.

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Abstract: Prospecting for predator mirids with interest in biological pest control on horticultural crops was carried out during 2002 and 2003 in the province of Murcia (southeast Spain) to determine species composition and abundance and host plants. To date little information of this kind was available for the southeast of Spain. Tomato, pepper, squash and eggplant were among the crops more frequently sampled. The most abundant mirids were *Macrolophus* sp., *Nesidiocoris tenuis, Dicyphus cerastii*. *Dereaocoris punctulatus* was frequently found but at a low number. *Dicyphus tamanii* was occasionally found. About 100 wild plants belonging to 30 families were sampled in the surrounding of the crops. *Macrolophus* sp. was very abundant on *Dittrichia viscosa*, *Marrubium vulgare, Ononis natrix* and *Carduus* sp.; it was found very occasionally on *Tamarix canariensis. Dicyphus* was found at a low number on *Withania frutescens Ononis natrix* and *Erodium petraeum.*

Key words: *Macrolophus, Nesidiocoris, Deraeocoris, Dicyphus*, whitefly, biological pest control.

Introduction

Mirids (Hemiptera: Miridae) are one of the most abundant predators in some horticultural crops in the Mediterranean area. A few species are commercially available and commonly released to control whiteflies. However, there are others from the local fauna that colonize the crops spontaneously, which activity as pest control agents depends to a great extent on the health of the surrounding environment and crop management practices (Fauvel, 1999). The advantages of including these natural enemies into integrated pest management (IPM) programmes are, among others, their perfect adaptation to the local environmental conditions and the natural pest control they provide for free.

In the south of Spain control of whitefly (*Trialeurodes vaporariorum* Westwood,) and *Bemisia tabaci* (Gennadius) (Homoptera: Aleyrodidae)) on tomato is mainly done by chemical treatments. The high incidence of virus diseases transmitted by these two whiteflies (TYLCV, TYLCSV, TICV and ToCV), and the high intensification of agriculture are some of the reasons of the lack of diffusion of biological control on tomato. Nowadays, difficulties to control whiteflies by chemical methods, the consumer demand for biological products, yield residue reduction, etc., make it necessary to look for new alternatives. Strategies of conservation and promotion of crop colonization by mirid predators have been reported to provide a good control of whiteflies on tomato in Catalonia (northeast Spain) (Arno *et* al., 2000). However, the implementation of conservation strategies requires to deepen in some aspects of the biology of the insects such as, population dynamics, host plants and their role as a source of natural enemies depending on crop cycles. In pepper *Eretmocerus mundus* Mercet (Hymenoptera: Aphelinidae) have been reported to satisfactorily control *B. tabaci* (Urbaneja, *et al*., 2002). However, whitefly

predators might enhance whitefly control and increase the stability of the system. In other crops such as eggplant whitefly control using natural enemies has been little assayed. Squash is normally associated with tomato in traditional crops in the north of the province of Murcia. Although, it is not very important economically, it was considered of interest because of the great amount of mirid predators it harboured.

The objective of this work was to determine the abundance and host plants of predator mirids present in some of the horticultural crops, mainly tomato, pepper, squash and eggplant, and surrounding vegetation in the province of Murcia. To date little information of this kind was available for the southeast of Spain. The aim was to know which are the species of mirid predators that occurs naturally in these crops and which plants may serve as their refuge.

Material and methods

Sampling

Sampling was carried out in 2002 and 2003 in horticultural intensive production areas, concentrated mainly along the coast of the province, and in traditional crops with little use of pesticides, whose production goes almost completely to the local market. More than 30 localities were visited several times a year.

Tomato (*Lycopersicon esculentum* Miller), pepper (*Capsicum annuum* L.), squash (*Cucurbita pepo* L.) and eggplant (*Solanum melanogena* L.) were among the crops more frequently found and sampled. Other crops such as broad bean (*Vicia sativa* L.) , beans (*Phaseolus vulgaris* L.), celery (*Apium graveolens* L.), potatoes (*Solanum tuberosum* L.) etc., were sampled occasionally. About one hundred and ten plans from around 30 families were sampled between crops and natural vegetation. Sampling was done using sweeping nets, tapping or inspecting the plants. Samples were taken to the laboratory where the insects were extracted and preserved in alcohol (70%) or pinned.

For each plant captures were expressed in two ways (1) the number of samples on which a determined mirid species was collected in relation to the number of times this plant was sampled (frequency) and (2) the total number of individuals collected from that plant (abundance).

Identification

Determination of *Dicyhus* Fieber and *Nesidiocoris* Kirkaldy species was based on morphology, measurements of the insects and male genitalia according to the works of Wagner (1964 and 1970). In the case of the species of genus *Macrolophus* Fieber, due to the high variablility found in the characters used to differenciate *Macrolophus melanotoma* (Costa, 1853) (= *Macrolophus caliginosus* Wagner, 1950) from *Macrolophus pygmaeus* (Rambur, 1839), we preferred to consider them as the complex *Macrolophus* spp. (Carapezza, 1995; Josifov, 1992).

Results and discussion

Mirid predators with interest for biological pest control in horticultural crops were found on only 14 of more than one hundred plants sampled (Tables 1 and 2). Among crops, mirid predators were found on tomato, squash, eggplant, potato and pepper. The most abundant species on tomato were *Nesidiocoris tenuis* and *Macrolophus* spp. (Table 1). *Nesidiocoris tenuis* Reuter was more abundant in the centre and the coast while *Macrolophus* spp. was more abundant in the

Table 1. List of plants on which mirid predators of interest for biological pest control in horticultural crops were found. *D.punct.= Deraeocoris punctulatus*, *Macroph.= Macrolophus melanotoma*/*M. pygmaeus*, *D. taman.= Dicyphus tamanii*. Frc= frequency, Abd= abundance, total captures.

		D.punct.		***Macroph.***		***D.cerastii***		***D.taman.***		***N.tenuis***	
Plant	**Family**	Freq	Abd	Freq	Abd	Freq	Abd	Freq	Abd	Freq	Abd
Artemisia spp.	Asteraceae	1/13	1	-	-	-	-	-	-	-	-
Carduus sp.	Asteraceae	-	-	10/16	100	-	-	-	-	-	-
Dittrichia viscosa	Asteraceae	-	-	65/82	845	-	-	-	-	2/82	3
Cucurbita pepo	Cucurbitaceae	-	-	8/23	125	19/23	876	2/23	49	11/23	393
Ecballium elaterium	Cucurbitaceae	-	-	-	-	-	-	-	-	1/5	1
Ononis natrix	Fabaceae	1/17	7	9/17	101	1/17	10	-	-	-	-
Erodium petreum	Geraniaceae	-	-	-	-	1/8	4	-	-	-	-
Lycopersicon estulentum	Solanaceae	-	-	22/31	1305	21/31	149	-	-	27/31	1887
Solanum Melongena	Solanaceae	2/8	10	5/8	17	-	-	-	-	4/8	41
Solanum tuberosum	Solanaceae	-	-	1/3	2	-	-	-	-	-	-
Withania frutescens	Solanaceae	-	-	-	-	1/3	4	-	-	-	-
Tamarix canariensis	Tamaricaceae	1/8	1	-	-	-	-	-	-	-	-
Marrubium vulgare	Lamiaceae	1/25	1	9/25	188	-	-	-	-	-	-
Foeniculum vulgare	Apiaceae	1/2	1	-	-	-	-	-	-	-	-
Capsicum annum	Solanaceae	1/*	10								

* From 3 to 4 greenhouses sampled weekly for more than 6 years.

northern parts of the province. *Dicyphus cerastii* Wagner was frequently found on tomato but at a lower number than the other two species. On the contrary, *D. cerastii* was more frequent and abundant than *Macrolophus* and *N. tenuis* on squash. *Dicyphus tamaninii* Wagner was collected only in a couple of occasions. *Nesidiocoris tenuis*, *Macrolophus* spp. and *Deraeocoris punctulatus* Fallen were collected on eggplant and only *D. punctulatus* was very occasionally found on pepper (Table 1).

There was a great number of species from the natural vegetation surrounding the crops on which no mirids of interest were collected (Table 2). *Macrolophus* was found in a higher number than the rest of the species (Table 1). The main wild host plants for *Macrolophus* were, in a decreasing order, *Dittrichia viscosa* (L.) W. Greuter, *Marrubium vulgare* L., *Ononis natrix* L and *Cardus* sp.. *Nesidiocoris tenuis* was ocassionally found and at a low number on *Ecbalium*

Table 2. List of sampled plants on which no mirids of interest for biological pest control in horticultural crops were found.

Plant	Family	Plant	Family
Apium graveolens	Apiaceae	*Anthyllis cytisoides*	Fabaceae
Eryngium campestre	Apiaceae	*Bituminaria bituminosa*	Fabaceae
Foeniculum vulgare	Apiaceae	*Dorycnium pentaphyllum*	Fabaceae
Nerium oleander	Apocynaceae	*Genista scorpius*	Fabaceae
Anacyclus clavatus	Asteraceae	*Genista valentina*	Fabaceae
Andryala ragusina	Asteraceae	*Medicago sativa*	Fabaceae
Artemisia barrelieri	Asteraceae	*Ononis natrix*	Fabaceae
Artemisia herba-alba	Asteraceae	*Ononis tridentata*	Fabaceae
Atractylis cancelata	Asteraceae	*Phaseolus vulgaris*	Fabaceae
Calendula arvensis	Asteraceae	*Retama sphaerocarpa*	Fabaceae
Carduus sp.	Asteraceae	*Vicia faba*	Fabaceae
Centaurea sp.	Asteraceae	*Vicia sativa*	Fabaceae
Chrysanthemum coronarium	Asteraceae	*Arundo donax*	Gramineae
Cichorium intybus	Asteraceae	*Hordeum murinum*	Gramineae
Dittrichia viscosa	Asteraceae	*Hyparrhenia hirta*	Gramineae
Helichrysum stoechas	Asteraceae	*Lygeum spartum*	Gramineae
Launaea arborescens	Asteraceae	*Sorgum halepense*	Gramineae
Onopordom corymbosum	Asteraceae	*Stipa tenacissima*	Gramineae
Reichardia tingitana	Asteraceae	*Artemisia barrilieri*	Lamiaceae
Sonchus oleraceus	Asteraceae	*Artemisia herba-alba*	Lamiaceae
Sonchus tenerrimus	Asteraceae	*Lavandula dentata*	Lamiaceae
Echium creticum	Boraginaceae	*Menta sp.*	Lamiaceae
Capparis spinosa	Capparaceae	*Phlomis lychnitis*	Lamiaceae
Arthrocnemum macrostachyum	Chenopodiaceae	*Rosmarinus officinalis*	Lamiaceae
Atriplex halimus	Chenopodiaceae	*Thymus spp.*	Lamiaceae
Beta vulgaris	Chenopodiaceae	*Asphodelus albus*	Liliaceae
Chenopodium album	Chenopodiaceae	*Asphodelus fistulosus*	Liliaceae
Salsola genistoides	Chenopodiaceae	*Gladiolus illyricus*	Liliaceace
Salsola verticillata	Chenopodiaceae	*Malva sp.*	Malvaceae
Suaeda vera	Chenopodiaceae	*Olea europaea*	Oleaceae
Cistus albidus	Cistaceae	*Oxalis pes-caprae*	Oxalidaceae
Cistus clusii	Cistaceae	*Pinus halepensis*	Pinaceae
Fumana ericoides	Cistaceae	*Plantago lagopus*	Plantaginaceae
Helianthemum almeriense	Cistaceae	*Limonium sp.*	Plumbacinaceae
Convolvulus althaeoides	Convolvulaceae	*Coris monspeliensis*	Primulaceae
Convolvulus arvensis	Convolvulaceae	*Rhamnus lycioides*	Rhamnaceae
Diplotaxis sp.	Cruciferae	*Prunus dulcis*	Rosaceae
Eruca vesicaria	Cruciferae	*Rubus ulmifolius*	Rosaceae
Moricandia arvensis	Cruciferae	*Osyris quadripartita*	Santalaceae
Moricandia arvensis	Cruciferae	*Capsicum annuum*	Solanaceae
Rapistrum rugosum	Cruciferae	*Nicotiana glauca*	Solanaceae
Sisymbrium irio	Cruciferae	*Solanum nigrum*	Solanaceae
Cucumis sativus	Cucurbitaceae	*Tamarix boveana*	Tamaricaceae
Cucurbita pepo	Cucurbitaceae	*Daphne gnidium*	Thymelaeaceae
Ecballium elaterium	Cucurbitaceae	*Thymelaea hirsuta*	Thymelaeaceae
Juniperus oxycedrus	Cupressaceae	*Urtica urens*	Urticaceae
Euphorbia serrata	Euphorbiaceae	*Zigophylum fabago*	Zygophyllaceae
Acacia cyanophylla	Fabaceae		

elaterium (L.) A.Rich and *D. viscosa*. *Dicyphus cerastii* was found at low number in *O. natrix* and *Withania frutescens* (L.) Pauquy. *Deraeocoris punctulatus* was the species with the greatest range of host plants. It was found on *Artemisia* spp., *Ononis natrix*, *Tamarix canariensis* Willd., *Foeniculum vulgare* Miller and *M. vulgare* (Table 2).

As a conclusion for the prospection carried out over these two years we can say that several species of mirids are potentially good candidates for whitefly control on horticultural crops in the south of Spain, either by release or conservation estrategies. There are also several important wild host plants for mirids. However, for these to be used as insectary plants it is necessary to know more about insect population dynamics and dispersal movements in relation to crop cycles.

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References

Arno, J., Ariño, J., Español, R., Marti, M. & Alomar, O. 2000. Conservation of *Macrolophus caliginosus* Wagner (Het. Miridae) in commercial greenhouses during tomato crop-free period. IOBC wprs Bulletin. 23: 241-246.

Carapezza, A. 1995. The specific identities of *Macrolophus melanotoma* (A. Costa, 1853) and *Stenodema curticolle* (A. Costa, 1853) (Insecta Heteroptera, Miridae). Naturalista sicil., S.IV, Vol. XIX (3-4): 295-298.

Fauvel, G. 1999. Diversity of Heteroptera in agroecosystems: role of sustainability and bioindication. Agriculture, Ecosystems and Environment. 74: 275-303.

Josifov, M. 1992. Zur taxonomie der paläarktischen *Macrolophus*-Arten (Insecta, Heteroptera: Miridae). Reichenbachia, 29: 1-3.

Urbaneja, A., Calvo, J., Beltran, D., Lara, L., Van der Blom, J. & Stansly. *Eretmocerus mundus*: control biológico de *Bemisia tabaci*. 13º Symposium Internacional: Control biológico de plagas y enfermedades: agentes microbianos y entomófagos. Phytoma ESPAÑA. 144: 139-142.

Wagner, E. & Weber, H. 1964. Héteroptères Miridae. Faune de la France. Fédèration Française des Sociètèss de Sciences Naturelles. Office Centrale de Faunistique. Paris.

Wagner, E. 1970. Die Miridae Hahn, 1831, des Mittelmeerraumes und der Makaronesischen Inseln (Hemiptera: Heteroptera). Entomologische Abhandlungen. 37: 1-484.