The plant health challenge of detecting cryptic small arthropods: lessons from mites invasive to Europe

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Introduction

More than 80 alien mite species have been introduced in Europe during the past 50 years, most of them reaching the status of pest. These figures are stately and the situation is not expected to improve as international trade intensifies. These introduced mites often have a tropical origin but established easily in Mediterranean area. Spider mites are minute and therefore easily remain undetected until they cause damage. In open field conditions their presence is often disclosed too late, when outbreaks occur. Detection of spider mites in consignments by inspection is difficult, as it is often the case for small/cryptic arthropods. Neither improving interception schemes, nor reducing the volume of trade appear realistic means to prevent the introduction of new mite species, which in most of the cases are highly polyphagous and therefore with many pathways for entry. The development of prevention strategies appear as the first approach to be implemented. The use of databases to identify new emerging risks in combination with thorough phytosanitary certification and quarantine protocols for those commodities particularly susceptible to harbor mite pests are explored and discussed as approaches to improve European plant health.

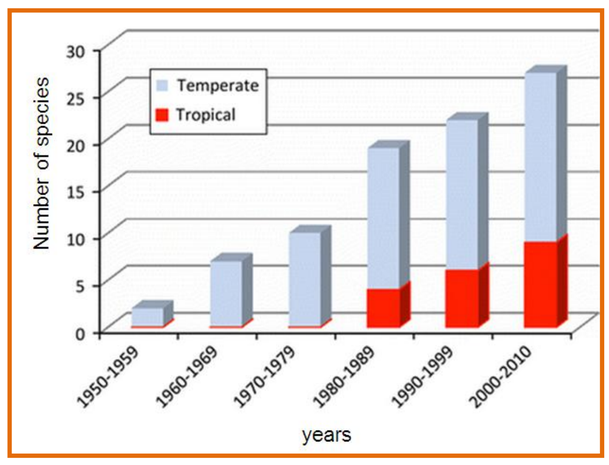

Fig. 1. Number and origin of Tetranychidae alien species observed in Europe since 1950. Data compiled from Navajas *et a*l. (2010)

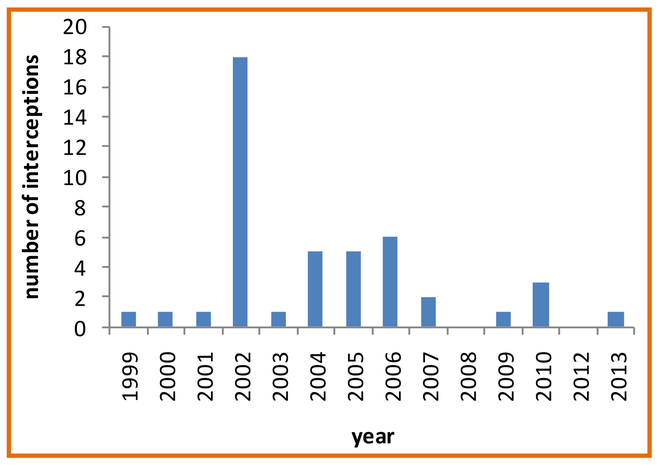

Fig. 2. Interceptions of Tetranychidae from Europhyt between 1999 and 2013

Observations

Data on interceptions at the borders represent a crucial tool for the EU phytosanitary services in order to share information on pests intercepted on imported consignments. The EU platform currently in use is EUROPHYT: a database for notifications of interceptions of plants or plant products that do not comply with EU legislation. Its efficient use by all Member States represents an important achievement for the EU phytosanitary services. However, some shortcomings on its application for the identification of emerging pests, as in the case of spider mites, need to be highlighted:

- Non obligation to report on intercepted non-regulated pest species
- Frequent lack of detail at species level (e.g. among the interceptions on spider mites, 30 are on *Tetranychus* sp., 2 on Tetranychidae, and only 11 provided the species name). This may indicate some limitations in identification capacity
- Evidence of new pest species having crossed EU borders without interception. Some recent examples are the Tomato Red Mite, *Tetranychus evansi*, Texas Citrus Mite, *Eutetranychus banksi*, the Oriental Mite, *E. orientalis,* and the Persea Mite, *Oligonychus perseae,* first detected in Spain in 1995, 2001, 2001 and 2004, respectively.
- Minute size appears as a major risk factor for lack of interception. While the situation for mites is similar to that of other small sized arthropods like Diaspididae and Scolytidae, certain small sized insects, as the leafmining family Agromyzidae, are more frequently intercepted, most likely because regulated (e.g. *Liriomyza* sp. in Council Directive 2000/29/EC) and easily identifiable by visible mines in leaves.

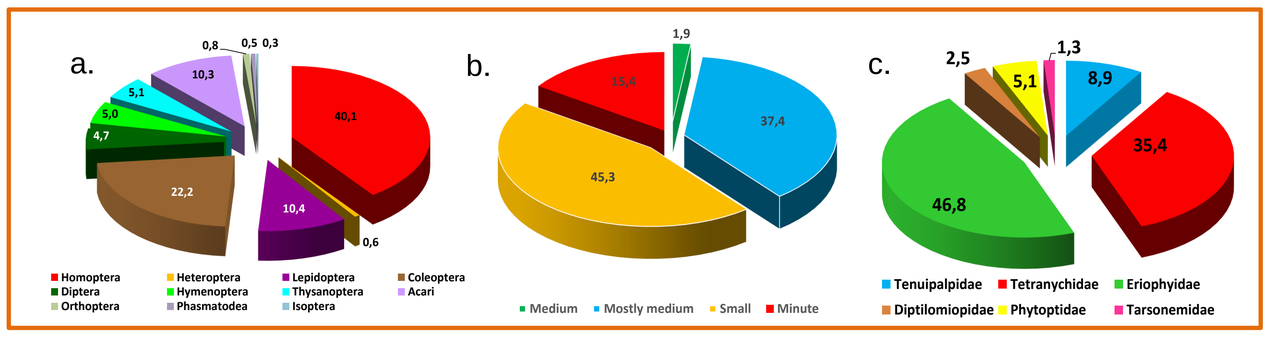

Fig. 3. Percentage of invasive alien arthropod herbivore species detected in Europe and presented by (a) order, (b) size and (c) mite families. Data were extracted from DAISIE[1] database up to 2013.

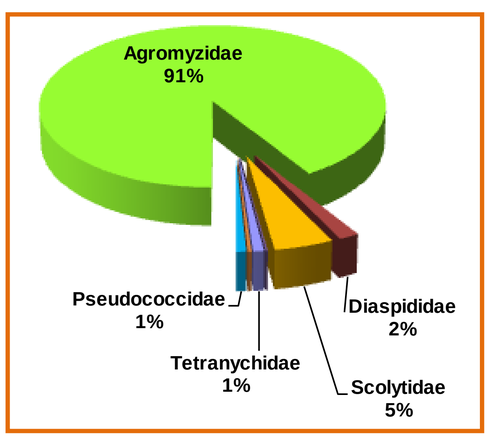

Fig. 4. Relative percentage of interceptions (n = 5102) for some families of small size insects registered in Europhyt between 1993 and 2014.

Fig. 5. Tomato plant infested by *Tetranychus evansi*. (picture A. Migeon, INRA)

Fig. 6. Avocado plant infested by the persea mite *Oligonychus perseae*

Conclusions and Recommendations

Among interceptions, the proportion of mites is low and this is certainly due to the difficulty of detection in a consignment. This can be interpreted as a consequence of their small size and the advanced taxonomic expertise needed for species identification. Yet, mites deserve much attention as plant pests *per se* and as virus vectors (e.g. some Eriophyidae and Tenuipalpidae), strengthening needs for their interception. The recent entry in Spain of a new avocado mite pest, while no interception on *Persea americana* is recorded in Europhyt, illustrates the need for tackling emerging risks to EU.

Among the operational strategies recommended to improve protective measures, we suggest: (i) the constitution of lists of emerging pests to alert interception services, (ii) the use of dedicated data bases, as for the Tetranychidae of the world[2] , crossing information on distribution and host plants (commodities), (iii) the combination of quarantine and plant protection tools from different geographical regions of the world, e.g. the Invasive Mite Identification platform, by CPHST[3], (iv) the application of the commodity approach newly developed by EPPO for tomato. Its utility to detect emerging tomato mite pests is illustrated hereafter.

Recent introduction of tomato pests have led EPPO to try a complementary approach and to launch commodity based analysis. EPPO has initiated a study to identify potential threats to tomato from other regions of the world. The study aims at a more general search for important tomato pests worldwide. During the study several potential Acari have been identified which had not been identified previously. More experience will be gained with such an approach with using it on other commodities.

[1] http://www.europe-aliens.org/
[2] http://www.montpellier.inra.fr/CBGP/spmweb/
[3] http://itp.lucidcentral.org/id/mites/invasive_mite/Invasive_Mite_Identification/key/Whole_site/Home_whole_key.html

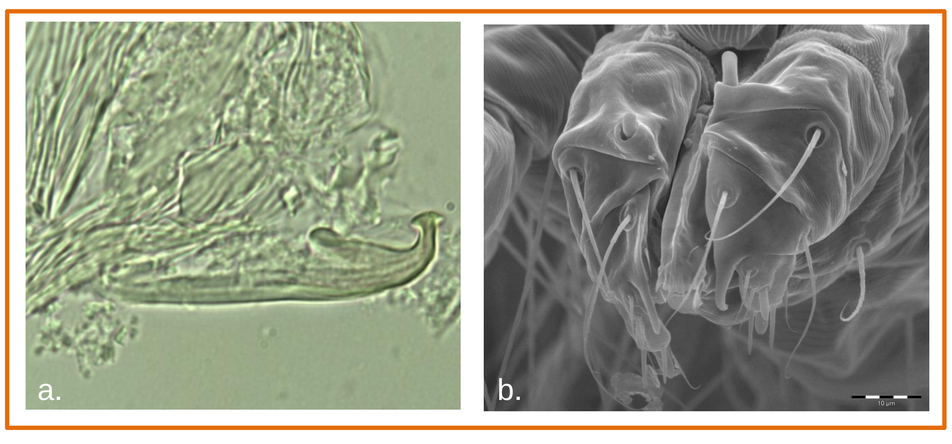

Fig. 7. Morphological characters typically used to identify *Tetranychus* species: (a) aedeagus (the male genitalia) and (b) mounthparts: palptarsus and tibia claw. (pictures L. Tiedt, North-West University, South Africa)

References and Acknowledgments

Navajas M, Migeon A, Estrada-Peña A, Mailleux A-C, Servigne P and Petanović R, 2010. Mites and ticks (Acari). Chapter 7.4. In: Arthropod invasions in Europe. BioRisk 4, 149–192.

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