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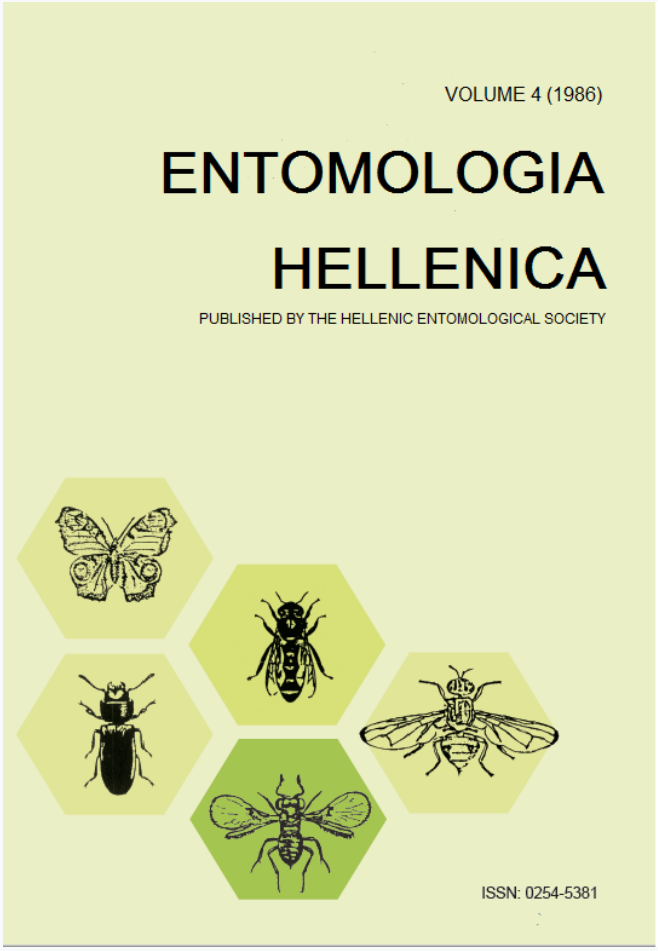

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Contribution to the Study of Potato Aphids in Greece[1]

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ABSTRACT

Four aphid species were identified in the Metsovo potato center, Greece. *Rhopalosiphoninus latysiphon*, infesting subterranean parts of potato, is reported for the first time in Greece, while *Aphis frangulae*, infesting the potato foliage, is reported for the first time on potato plants in Greece. High resistance to methamidophos was observed with the latter aphid species. Potato virus Y (PVY) was transmitted by all four species of aphids.

Introduction

The role of aphids in the potato crops, especially those grown for seed, is of great importance mainly because they can transmit viruses (Broadbent 1953).

In Greece, certified potato seed is produced in eleven delimited areas, scattered in isolated places with different climatic conditions either on mountains or in one island. In one of the seed potato centers, Metsovo in Ioannina county, the potato crop was found to be heavily-infested with aphids at the end of August 1985. Although fields had been regularly sprayed at 15-day intervals with the insecticide methamidophos, dense aphid populations thrived. Besides the aphids infesting the aerial plant parts, another aphid species was noticed living clustered on the subterranean parts of the potato plants.

This contribution reports on the aphid species found in the potato center in Metsovo, the identification of a new aphid species in Greece found on potato and the results of some transmission trials of PVY° by using the isolated aphid species.

Materials and Methods

The aphid samples collected were identified in our laboratory using the manual "Aphid's on the world's crop, an identification guide" (Blackman and Eastop 1984). Aphid samples were also sent to Rothamsted Experimental Station U. K. for confirmation of our identification.

All aphid species used in the transmission tests were reared on caged virus-free potato plants cv. Sahel. The virus used was a locally isolated strain of potato virus Y (PVY°) from potato cv. Sahel. Only potato apterae were used. They were starved for about 2-4 hr before an acquisition access for 2 min. Subsequently, the viruliferous aphids were placed on the test plants, i.e. tobacco plants cv. White Burley, for 1 day, after which the plants were thoroughly sprayed with a selective aphicide (pirimicarb) and kept on a glass house bench for 2-3 weeks to allow symptoms to develop.

Results and Discussion

The aphid species detected on the roots and underground stems of potato plants cv. Sahel was identified as the bulb-and-potato aphid, *Rhopalosiphoninus latysiphon* (Davidson). This is the first time that *R. latysiphon* is been reported in Greece (Santorini 1977, Santas 1980, Remaudiere 1982).

R. latysiphon is one of four aphid species known to infest potato sprouts. Bawden and Kassanis (1947) found that *R. latysiphon* does not transmit PVY. On the contrary, Bell (1984) and Blackman and Eastop (1984) reported that *R. latysiphon* transmits not only

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PVY, but other viruses as well. Consequently, the losses caused by *R. latysiphon* in potato are both direct and indirect. The direct losses are due to the feeding activity of the insect on the sprouting tubers in both stores and fields. A dense population of aphids may weaken and kill developing sprouts. When a large number of aphids builds up in stores, the tuber surface becomes moist and sticky because of the deposit of abundant honeydew. Finally, the tubers get covered with sooty mould. The indirect losses are due to the transmission of viruses to developing sprouts. The potato viruses known to be transmitted by *R. latysiphon* are potato leafroll (PLRV), a luteovirus persistently transmitted and potato viruses Y and A (PVY and PVA), two potyviruses non-parsistently transmitted (Bell 1984, Blackman and Eastop 1984). Other viruses known to be transmitted by *R. latysiphon* are the cucumovirus cucumber mosaic virus (CMV) and the clostervirus beet yellows virus (BYV) (Blackman and Eastop 1984).

In the present study, the new aphid was not found on the foliage of potato plants at sampling time, mainly because of the high temperature (above 20°) and the high intensity of light. Gibson (1971) reported that *R. latysiphon* is unable to tolerate high air temperature and radiant heat of sunlight. It prefers the humid and dark subterranean environment of sprouting tubers. More work needs to be done nationwide on the host range and the overwintering places of this aphid species. It has always been reported that this species has a rather limited host range (Heathcote and Cockbain 1966, Blackman and Eastop 1984). Potato stores are considered as favoured overwintering places of aphids, although potato dumps and various weeds could also serve as aphid reservoirs.

Other aphid species which were detected on the foliar parts of potato plants cvs Claustar and Sahel in the Metsovo center were *Aphis frangulae* Kaltenbach, *Macrosiphum euphorbiae* (Thomas), the potato aphid and *Myzus persicae* (Sulzer), the green peach aphid. This is the first report of *A. frangulae* on potato in Greece. All these species are potential vectors of potato viruses. The most abundant species found was *A. frangulae*. This species showed acquired resistance to methamidophos, apparently because of the repeated sprays at fortnight intervals. A similar incident concerning the resistance acquired by the chrysanthemum-living form of *Aphis gossypii* to organophosphorous and carbamate insecticides is worth mentioning (Blackmam and Eastop 1984). The aphids were efficiently controlled by spraying with the pyrethroid insecticide deltamethrin.

The results of transmission trials of PVY° by the identified aphids are summarized in Table 1. Symptoms on the indicator tobacco plants cv. White Burley, i.e. vein clearing, were recorded 10 days after the inoculation feeding. All the aphid species tested transmitted PVY° in different rates. *M. persicae* and *M. euphorbiae* transmitted PVY° in high percentages, as it was expected. *A. frangulae* was also an efficient vector and this is in agreement with the results given by other researchers (Völk 1959, Karl and Proeseler 1976). Finally, *R. latysiphon* was able to transmit the virus, when 10 individuals were used per indicator plant. There are discrepancies in several reports on whether *R. latysiphon* can transmit PVY (Bawden and Kassanis 1947, Bell 1984). According to our results *R. latysiphon* is able to transmit PVY° and might be a dangerous vector, when it invades potato stores and starts transmitting viruses to sprouting tubers before they are even planted.

In Greece, the total number of aphids re-

TABLE 1. Efficiency of *Aphis frangulae*, *Macrosiphum euphorbiae*, *Myzus persicae* and *Rhopalosiphoninus latysiphon* in transmitting potato virus Y (PVY°).

Aphid species	Number of aphids used per plant	Virus transmission
A. frangulae	2	7/20*
M. euphorbiae	2	9/20
M. persicae	2	18/20
R. latysiphon	10	2/40
» »	5	0/40

* Numerator is no. of plants that became infected, denominator is no. of plants infested.

ported so far is limited (Santorini 1977, Santas 1980). Until 1982, the aphid species recovered in Greece were 133, while in the adjacent countries of the Balkan Peninsula or the Mediterranean Basin, with more or less similar climatic conditions, the respective number was two to five times more (Remaudiere 1982). Furthermore, doubt has been expressed as to the accuracy of identification of some of the species (Remaudiere 1982). For the majority of aphid species, no epidemiological studies have been carried out. Finally, very little is known about aphids as virus vectors in Greece (Panayotou 1980a, Panayotou 1980b, Kyriakopoulou and Bem 1984).

Acknowledgment

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KEY WORDS: *Rhopalosiphoninus latysiphon, Aphis frangulae,* Aphid resistance to insecticide, Methamidophos

Συνεισφορά στη Μελέτη Αφίδων Πατάτας στην Ελλάδα

ΠΑΝΤΕΛΗ ΠΑΝΑΓΙΩΤΟΥ και ΝΙΚΟΥ ΚΑΤΗ

Δ/νση Φυτικής και Τεχνολογικής Έρευνας, Υπουργείο Γεωργίας και Φυσικομαθηματική Σχολή, Τμήμα Βιολογίας, Πανεπιστήμιο Κρήτης

ΠΕΡΙΛΗΨΗ

Η παρούσα μελέτη ασχολείται με τα παρακάτω θέματα:

1. Παρουσίαση περιστατικού ανθεκτικότητας πληθυσμού αφίδων στο εντομοκτόνο μεδαμιδοφώς, σε πατατοφυτείες του Κέντρου Σποροπαραγωγής Πατάτας Χρυσοβίτσας Γιάννινα, τον Αύγουστο του 1985. Οι φυτείες είχαν δεχθεί 3-4 ψεκασμούς σε 15-ήμερα διαστήματα. Ο πληθυσμός των αφίδων απαρτιζόταν από τα είδη *Aphis frangulae* Kaltenbach, *Macrosiphum euphorbiae* (Thomas) και *Myzus persicae* (Sulzer). Το είδος *A. frangulae* συναντιόταν συχνότερα και σε μεγαλύτερους αριθμούς από τα άλλα είδη.

2. Εύρεση του είδους *A. frangulae* για πρώτη φορά σε φυτά πατάτας στην Ελλάδα.

3. Εύρεση του είδους *Rhopalosiphoninus latysiphon* (Davidson) στις ρίζες και υπόγειους βλαστούς φυτών πατάτας ποικιλίας Sahel. Το είδος αυτό που δεν προσβάλλει καθόλου το υπέργειο τμήμα της πατάτας αναφέρεται για πρώτη φορά στην Ελλάδα. Προκαλεί σοβαρές άμεσες και έμμεσες ζημιές σε πατατοκαλλιέργειες. Οι άμεσες ζημιές οφείλονται στη μυζητι-

κή δραστηριότητα των αφίδων. Οι έμμεσες ζημιές οφείλονται στη μετάδοση διαφόρων ιών (π.χ. PLRV-καρούλιασμα των φύλλων της πατάτας, PVY και PVA-ιοί πατάτας Υ και Α κλπ.). Ο τρόπος διαχείμασης της αφίδας αυτής και ο κύκλος των ξενιστών δεν είναι ακόμα γνωστός στην Ελλάδα.

4. Διενέργεια δοκιμών μεταδοτικότητας ενός στελέχους του ιού Υ της πατάτας (PVY°), που απομονώθηκε επιτόπια, με τα προαναφερόμενα είδη αφίδων. Τα είδη *A. frangulae, M. euphorbiae* και *M. persicae* μετέδιδαν τον ιό PVY° σε ψηλά ποσοστά. Το είδος *R. latysiphon* επίσης μετέδιδε τον ιό όταν αντί 2 χρησιμοποιούνταν 10 άτομα ανά φυτό-δείκτη.