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ELISA DETECTION OF *SPIROPLASMA CITRI* IN ADANA AND MERSIN REGIONS

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SUMMARY - A monitoring of *Spiroplasma citri*, the causal agent of stubborn disease, was carried out in Adana and Mersin regions using the ELISA kit from Morocco. About 25% of the tested trees, showing clear-cut stubborn symptoms, were ELISA-positive. Sweet oranges (Navels first) were the most infected.

Key words: citrus, *Spiroplasma citri*, ELISA, Turkey

RESUME - *Une enquête sur le Spiroplsma citri, agent causal de la maladie du stubborn a été réalisée dans les régions d' Adana et Mersin,en utilisant un Kit ELISA provenant du Maroc. Environ 25% des arbres testés montrant des symptômes évidents de Stubborn, ont été positifs au test ELISA, les orangers doux (Navels en premier lieu) se sont avérés les plus infectés.*

Mots clés*: agrumes, Spiroplasma citri*, *ELISA, Turquie*

INTRODUCTION

Stubborn, caused by *Spiroplasma citri,* has been reported as one of the most important diseases affecting Turkish citriculture. It was first noticed (stunting of the trees, deformation of the fruits etc.) on Washington Navel oranges in the 1980's. In the Eastern Mediterranean region of Turkey, it was detected by ELISA on different citrus species (Navel, Valencia, local orange varieties, Fremont and other mandarin varieties, Star Ruby grapefruit and Minneola tangelo) (Bové, 1995). The pathogen detection through culturing as reported by Saglio *et al.* (1971) was successfully achieved at any time of the year. However, the best results were obtained using samples collected from the summer flushes in autumn.

S. *citri* was also detected by ELISA, testing 250 samples of the following hosts: *Catharanthus roseus, C. vhiodes, Crepis echiodes*, *Echium* spp. and *Sesamum indicum, D. sanguinalis, Salsola kalì* and *S. halepense.*

Sesame was considered the best inoculum source for *S. cìtri*, and *Circulifer haematoceps* was reported as the most important vector of the pathogen.

In this study, the objective was to detect *S. citri* in citrus orchards in Adana and Icel regions, using a commercial ELISA kit as reported by Saillard *et al.* (1980).

MATERIALS AND METHODS

The young summer flush growth was collected from four different directions of the trees showing stubborn-like symptoms (stunting trees, small leaves, acorn-shaped fruits, etc.): Navel, Shamouti and Valencia oranges, Minneola tangelo, Nova and Satsuma mandarins, Star ruby grapefruit (Tab. 1). Totally 62 samples were tested by DAS-ELISA following the protocol described in the kit which was supplied by *Domaines Agricoles*-UCP, (Rabat - Morocco).

RESULTS AND CONCLUSIONS

Sixteen out of 62 samples were found ELISA-positive with an incidence of 26% (Tab. 1). Navel orange showed the highest number of infected trees (9/31) followed by Valencia orange (3/14), whereas grapefruit was the least infected (1/8). Other citrus varieties (Minneola tangelo, Satsuma and Nova mandarins) were less sampled and infection rate is not representative (Tab. 2).

S. citri was easily detected by serology, but only in symptomatic trees. Some trees showing stubborn-like symptoms were not ELISA-positive and culturing had to be carried out in order to evaluate the presence or the absence of the pathogen.

Even if visual observations of symptoms in the field can be very diagnostic, the use of ELISA is of utmost importance when symptoms are not so severe and budwood can be easily used for multiplication. Moreover, herbaceous spp., which are the primary hosts of the pathogen, should be assayed by ELISA for the presence of *S. citri* in order to avoid possible infections in the nurseries and in the orchards.

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Table 1. ELISA results of citrus species/varieties in different locations of Adana and Mersin regions

Location	***Species/Varieties***	***Symptoms***	***Samples N.***	***Infected plants N.***
ADANA Region				
Şıhmurat Köyü	Washington navel orange	***	2	0
Şıhmurat Köyü	Minneola tangelo	**	1	0
Şıhmurat Köyü	Fremont mandarin	**	1	0
Şıhmurat Köyü	Nova mandarin	**	1	1
Şıhmurat Köyü	Grapefruit	*	1	0
Abdioğlu Köyü	Navel orange	***	3	1
Abdioğlu Köyü	Grapefruit	**	3	0
B. Kapili Köyü	Valencia orange	***	3	0
B. Kapili Köyü	W.N. orange	***	3	2
Misis	W.N. orange	***	5	1
Yerdelen	Grapefruit	**	4	1
Yerdelen	Valencia orange	***	6	2
Yerdelen	W.N. orange	***	7	3
Yerdelen	Fremont mandarin	**	2	0
Yerdelen	Minneola tangelo	***	1	1
MERSIN Region				
Yenice-	W.N. orange	**	2	2
Abdioğlu	Satsuma mandarin	*?	2	1
Alata	W.N.orange	**	3	0
Alata	Valencia orange	**	5	1
Alata	Jaffa orange	*	1	0
Tuzla	W.N.orange	*	4	0
Balcali	W.N. orange	*?	2	0
Total			**62**	**16**

Stubborn-like symptoms: *mild **medium *** severe

Table 2. Total of *S. citri*-infected species/varieties in Adana and Mersin regions

Varieties/species	***Samples N.***	***Infected plants N.***	***%***
Washington Navel orange	31	9	29
Valencia orange	14	3	21
Grapefruit	8	1	13
Minneola tangelo	2	1	5
Satsuma mandarin	2	1	5
Freemont mandarin	3	0	0
Nova mandarin	1	1	100
Jaffa orange	1	0	0
Total	**62**	**16**	**26**