

Types of *Brevipalpus californicus* (Banks) (Tenuipalpidae) in Egypt

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ABSTRACT

A survey on *Brevipalpus californicus* (Banks) infesting fruit orchards was conducted in all Egyptian provinces to discover the different types of *B. californicus* in Egypt. Samples were collected from plant foliages, fruits, buds and branches. The study disclosed on presence of two types of the flat mite, *B. californicus*, as first record in Egypt, and the differences between both of them were discussed.

Key Words: Tenuipalpidae, Flat Mite, *Brevipalpus californicus*; Egypt.

INTRODUCTION

The family Tenuipalpidae has over 622 species in 30 genera describe! worldwide (Meyer, 1979; Meyer and Gerson, 1980; Ghai and Shenhmar, 1984; Baker and Tuttle, 1987; Ochoa and Salas, 1989; Sepasgosarian, 1990; Evans *et al.*, 1993; Ochoa *et al.*, 1994; Smiley and Gerson, 1995). Baker and Tuttle (1987) identified 165 species of the false spider mites from Mexico, including 117 species in the genus *Brevipalpus* with 65 new to science. Baker *et al.* (1975), Smith Meyer (1979), and Baker and Tuttle (1987) divided the genus *Brevipalpus* into seven species-groups based on the number of dorsolateral hysterosomal setae, number of setae on the palpus, and number of solenidia on tarsus II. Three of these groups include *Brevipalpus californicus* (Banks), *B. obovatus* Donnadieu, and *B. phoenicis* (Geijskes). There is concern that a hidden species complex may exist within one or more of these three species due to their morphological variations, extensive host lists, geographical distributions, and the number of plant specific viruses they vector. Manson (1967) indicated that variation within species based on the reticulation patterns on the propodosoma and relative length of the dorsal setae appeared to be associated with the host plant.

Baker and Tuttle (1987) reported considerable morphological variation within different populations of *B. californicus*. Morphological variation also has been reported between populations of *B. californicus* collected in Costa Rica by Ochoa *et al.* (1994) and *B. phoenicis* by Ochoa (1985).

Numerous authors have noted intraspecific variation in *Brevipalpus* spp. especially *B. californicus*, *B. obovatus*, and *B. phoenicis* (De Leon, 1961, 1965, 1967; Manson, 1967; Knorr, 1968; Gonzalez, 1975; Baker *et al.*, 1975; Baker and Tuttle, 1987) resulting in numerous synonymous

species. Manson (1967) observed a lack of consistency in the reticulation pattern of the female prodorsum and variation in the size and shape of the dorsal setae for all three species. He suggested these variations were associated with differences in host plants. Gonzalez (1975) stated that the same variation could be found within populations of mites collected from a single host plant species. There has been concern that *B. phoenicis*, *B. californicus*, and *B. obovatus* represent a complex group including a number of species (Knorr, 1968; Baker and Tuttle, 1987). There is need for a detailed study of these species, involving both molecular analysis and a comprehensive morphological review. The present study begins to address the latter objective through the use of low-temperature scanning electron microscopy (LTSEM). Currently, the only species shown to vector citrus leprosis is *B. phoenicis* (Rodrigues *et al.*, 2000). We have chosen to focus this study primarily on the morphology of *B. phoenicis*, and making comparisons to *B. obovatus* and *B. californicus*.

B. californicus was described three times in Egypt by Attiah (1956) as species *B. australis* Tucker (Zaher, 1984 and Halawa & Fawzy, 2012). Since then, no survey study has been conducted to revise the classification of *B. californicus* in Egypt, to disclose the presence of the three known types. Ochoa *et al.* (2013) stated that *B. californicus* actually represents several species, and the information available in the literature for the true identify of such species in question is now a mystery. Therefore, our study recorded and re-described species *B. californicus* in Egypt.

MATERIALS AND METHODS

The survey was conducted on fruit orchards in all Egyptian provinces. At each locality, monthly samples were carried out, from August 2012 to September 2013. Samples were collected from plant

foliages, fruits, buds and branches and individually bagged in tightly-closed plastic bags and transported on the same day to the laboratory. Mites were removed using a fine hair brush under dissection microscope, then preserved in 70% ethanol. Selected mites were cleared in Nesbitt solution for 10–12h. Subsequently, mites were mounted on micro-slides in Hoyer's medium, and later dried at 40 °C for one week (Zhang 2003). The terminology used in the key followed Mesa *et al.* (2009) and Ochoa *et al.* (2013). The measurements were given in micrometers (µm). The examined materials were deposited as slide-mounted specimens in the mite collection of the Agriculture Research Center, Plant Protection Research Institute, Fruit Acarology Department, Dokki, Egypt (ARC-PPRI).

RESULTS AND DISCUSSION

Systematics:

Family Tenuipalpidae Berlese, 1913

Subfamily Brevipalpinae Mitrofanov, 1973

Genus *Brevipalpus* Donnadieu, 1875

***Brevipalpus californicus* (Banks, 1904)**

Synonyms:

Tenuipalpus californicus Banks, 1904: 55.

Tenuipalpus australis Tucker, 1926: 3.

Tenuipalpus vitis Womersley, 1940: 241.

Brevipalpus confusus Baker, 1949: 380.

Brevipalpus browningi Baker, 1949: 382.

Brevipalpus woglumi McGregor, 1949: 19

Type 1 of *Brevipalpus californicus* (Banks, 1904) (Fig.1 A & B)

Material examined: 5 females and 3 males ex *Citrus spp.* (Rutaceae), 2 females ex *Psidium guajava* L. (Myrtaceae), *Vitis vinifera* L. (Vitaceae)

EGYPT: Qalubia province, Tukh district, Moshtohor village, 30°21'18"N, 31°13'30"E, 19 May 2012 coll. A.M.Halawa; 3 females and 3 males ex *Plumeria acutifolia* Poir (Apocynaceae), *Citrus aurantium* L (Rutaceae):**EGYPT:** Giza province, Nikla village, 30°02'6"N, 31°12'18"E, 17 April 2013 coll. A. M. Halaw.

Type 2 of *Brevipalpus californicus* (Banks, 1904) (Fig. 2 A & B)

Material examined: 3 females ex *Citrus spp.* (Rutaceae); 4 females ex *Pyrus communis* L. (Rosaceae) **EGYPT:** Behera province, Behera, 30°36'54"N, 30°41'6"E, 11 September 2012, coll. A.M. Halawa; 2 females ex *Citrus spp.* (Rutaceae) **EGYPT:** Dakahlia province, Tonamel village, 30°50' 6"N, 31°15'18"E, 3 September, 2012, coll. A.M. Halawa.

Remark: The original description of *Brevipalpus californicus* was given by Banks (1904) from

Redlands, California, and placed under the genus *Brevipalpus* by McGregor (1949). In Egypt, this species was described as *Brevipalpus australis* Tucker by Attiah (1956), and re-described by Zaher (1984) as *B. californicus* (Banks), and finally recorded by the first author (2012). Our study agrees with the mentioned descriptions, with exception the differences between the recorded types.

The major characters to differentiate between the two types of *B. californicus* recorded were detailed as follows:

Prodorsum: Propodosoma cuticle in *B. californicus* type 1 is smooth to wrinkled (rugose) centrally with large closed cells laterally, forming reticulation (Fig.1 A); while in type 2 the prodorsum cuticle entirely reticulate with weaker and faint reticulation centrally, but cells usually closed (Fig. 2 A), some cells fuse to form larger irregular cells .

Opisthosoma : Dorsal opisthosoma in type 1 the cuticle between c1-c1 and e1-e1 smooth wrinkled; cuticle posterior e1-e1 with a few short, diagonal lines to weak V- shaped folds (fig.1 A); while in type 2 the cuticle between c1-c1 and d1-d1 with weak reticulation wrinkled; cuticle between d1-d1 and e1-e1 wrinkled to irregularly folded; cuticle posterior e1-e1 irregularly folded with few short transverse folds (V- shaped) (fig. 2 A).

Ventral plate: with medium to small elliptical to circular cells in type 1 (Fig.1 B), whereas the ventral plate in type 2 with medium to large rounded to reticulate cells (Fig.2 B).

Despite the economic importance of genus *Brevipalpus*, the species remain poorly understood world-wide, Manson (1967), Baker and Tuttle (1987) Ochoa *et al.* (1994 & 2013). This is mainly due to lack of available clear information. This prompted specialists of the family Tenuipalpidae to create a new taxonomic keys in an attempt for checking the accuracy of the taxonomic characters and find further inherited characteristics, which can be reliable in rearranging this group, wherever necessary, and in verification of identification. Consequently, members of the species *B. californicus* world- wide were divided into three types, based on large and clear taxonomic characters anticipation, are to be divided into separate species Ochoa *et al.* (2013). The differentiation between the three types of *B. californicus* depends on the pattern of cuticle in prodorsum and opisthosoma dorsally and ventral plate ventrally. This study recorded the presence of type 1 in all samples collected and type 2 in some provinces. As for type 3, it was not detected in all samples examined.

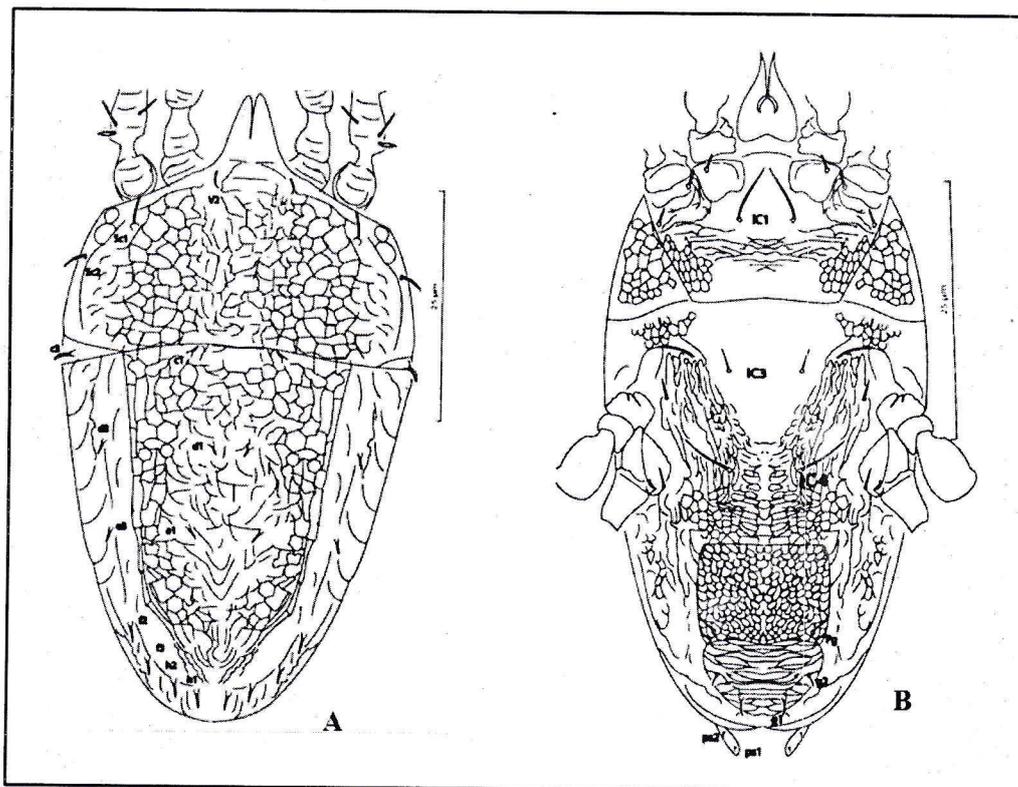


Fig. (1). *Brevipalpus californicus* type 1, A. Dorsal view, B. ventral view.

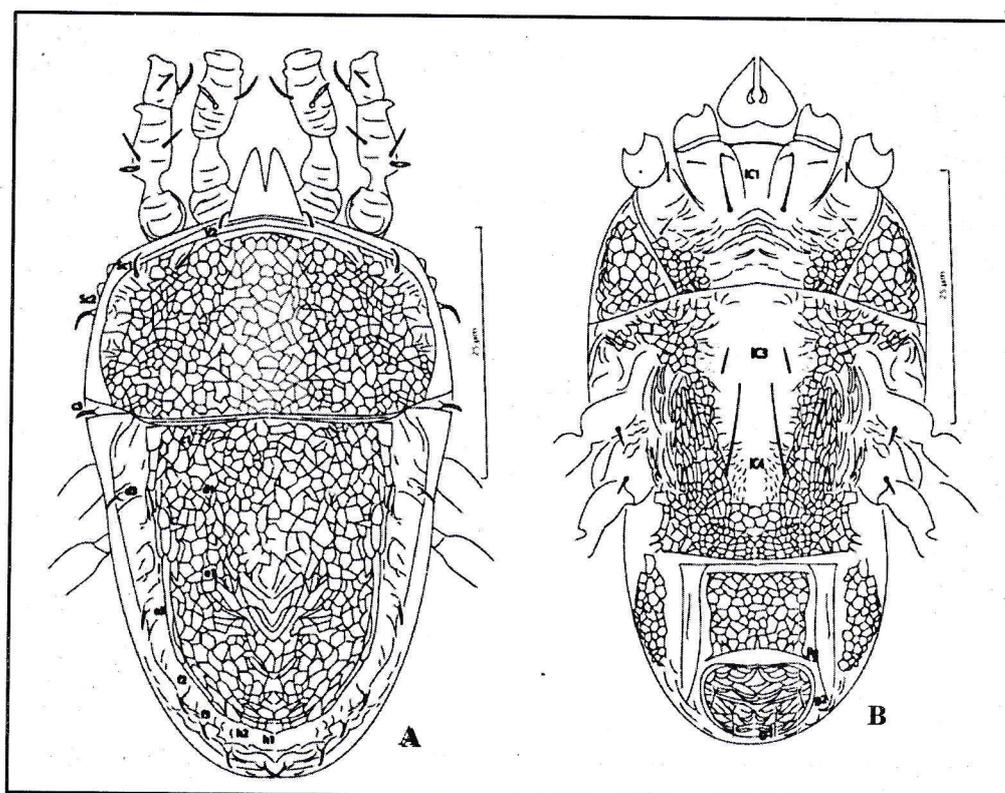


Fig. (2). *Brevipalpus californicus* type 2, A. Dorsal view, A. ventral view.

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