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Tuberculatus (Tuberculoides) inferus sp. n., a new aphid from *Quercus pubescens* Willd. in Italy (Homoptera Aphididae)

During a faunistic and taxonomic revision of the aphid fauna linked with oaks in Italy, a new species of *Tuberculoides* v.d.G. was detected from a few aphid samples collected on *Quercus pubescens* Willd. in Sicily. The new taxon belongs to the *T. eggleri* group, owing to the long spinal hairs in the embryos. *Tuberculoides* v.d.G., after Hille Ris Lambers (1974) and Eastop & Hille Ris Lambers (1976), is here regarded as a subgenus of *Tuberculatus* Mordvilko. Nevertheless other authors (Richards, 1969; Stroyan, 1977; Heie, 1982) treat it as a full genus.

Tuberculatus (Tuberculoides) inferus sp. n.

Alate vivipara. Body length 1.35-2.24 mm. Colour, when alive, yellowish green, covered with inconspicuous waxy dust; third pair (sometime also tips of second pair) of abdominal spinal tubercles and distal parts of III-VI antennal segments blackish. Macerated specimens without evident pigmented areas on the body; head and thorax rather yellowish. Antennae pale, with apices of segments III-V and sensillar area of VI distinctly brown pigmented; processus terminalis of VI infuscated, mostly apically. Legs pale yellowish, with tibiae (mainly their basal 2/3 length) slightly darker than femora; tarsi fuscous. Abdomen pale, with well pigmented third pair of spinal tubercles; usually also the second pair of spinal tubercles slightly pigmented and rarely (in some elder specimens) the first pair may appear dusky, too. Cornicles pale at their base and progressively darker towards the blackish distal part; cauda and anal plate pale yellowish.

Head with median frontal process, as well as the lateral frontal prominences, well developed. Frontal hairs capitate, 20-30 μ long and nearly equal in length to the basal articular diameter of III antennal segment; anterior discal hairs similar to the frontal ones, and placed on small cone-shaped elevations; posterior discal hairs just shorter (8-15 μ in length) than the anterior ones, blunt

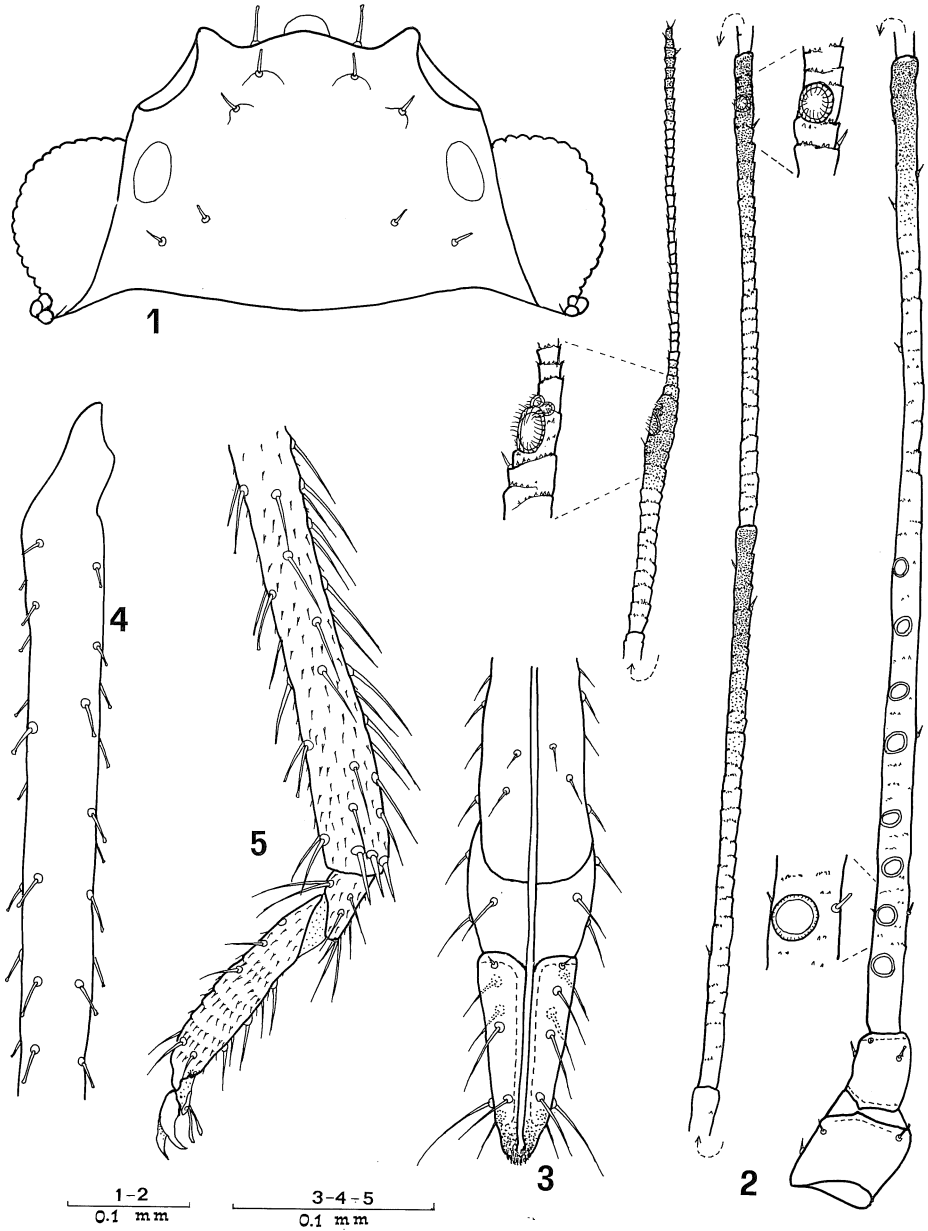
at apex or only slightly capitate. Antennal flagellum (segments III-VI) 1.00-1.18 longer than body length and with thin segments; III segment with 3-9 secondary, round rhinaria, scattered in one line into the 0.4-0.6 basal part; VI segment with well developed processus terminalis, 1.41-1.71 (measured from the distal margin of the main primary rhinarium) times its basal part. Antennal hairs short and more or less capitate on the first two segments (inner hair on II segment 12-19 μ long); they are much shorter and inconspicuous on flagellar segments; those on III are blunt or rarely weakly knobbed, 6-13 μ in length and 0.30-0.50 of the basal articular diameter of the same segment.

Rostrum rather short, just reaching the middle of mesosternum; apical segment cone-shaped, 0.92-1.02 of the second hind tarsomer and with 7-8 supplementary hairs, in addition to the very basal pair and the three primary distal pairs.

Legs normal, with slightly enlarged fore coxae. Femoral hairs rather knobbed on the outer side, at most 12-23 μ long and $^1/_2$ - $^1/_3$ of the diameter of trochantro-femoral suture. Hind tibiae 0.50-0.66 of the body length. Tibial hairs distinctly knobbed (particularly those on the outer margin) on the basal part, and progressively blunt and acute (mostly along the inner margin) towards the apex of the segment. Longest outer tibial hairs on hind legs 0.90-1.40 times the median tibial width; longest inner hairs on the same tibiae 1.20-1.60 times that diameter. Rastral organ (i.e. spur-like apical tibial hairs) poorly developed and consisting of 4 stout setae for each tibia, which are more strongly modified on the front legs. First tarsomer with 2 dorsal and 6 ventral hairs. Empodial hairs (arolia) flabellate. Cuticular spinules present on distal half of tibiae and on tarsi.

Wings with hyaline and smooth membrane and weakly infuscated veins, each one ending in a very small triangular dusky spot; small brown spots are also present in the forewings, at the base of Rs, Cu_1 and Cu_2 veins; pterostigma with a small brown oblique basal spot and a narrow brown border along the inner margin.

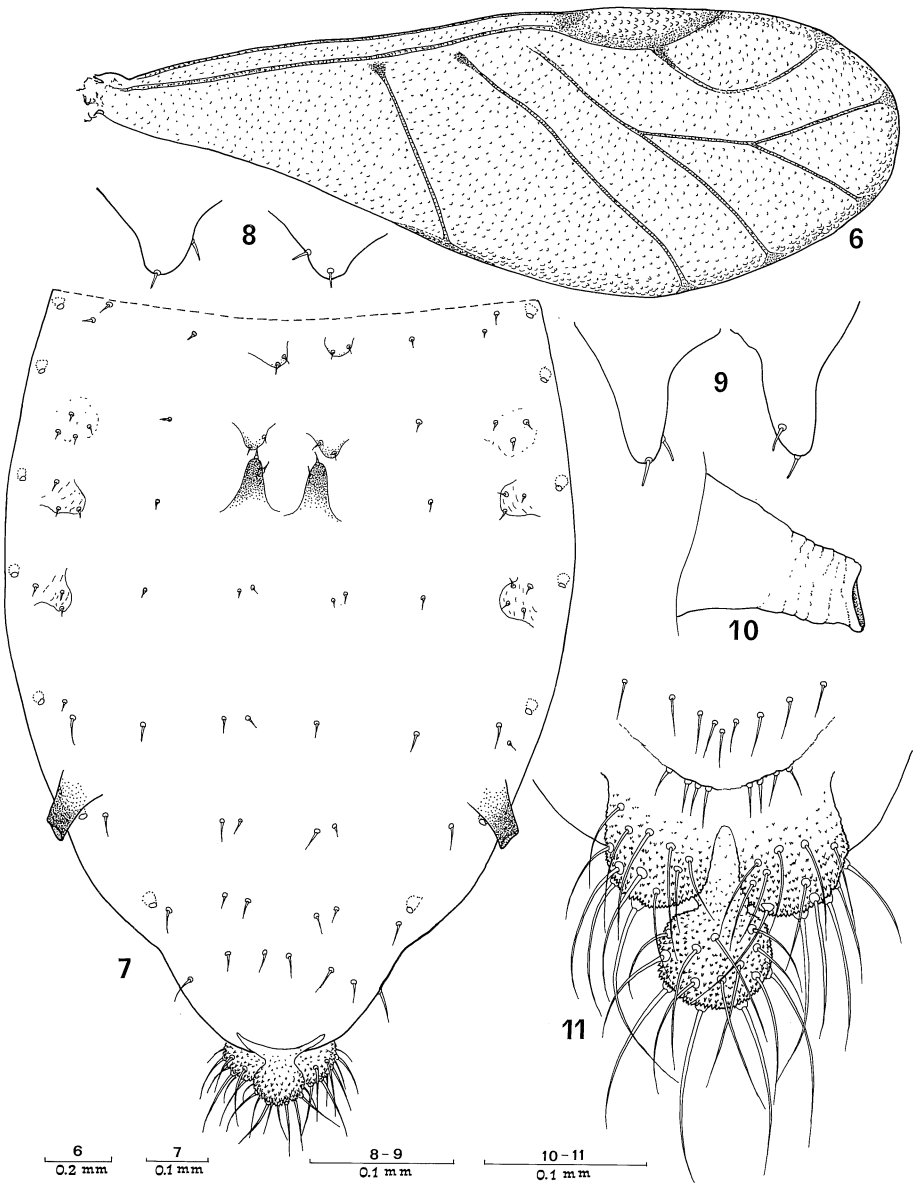
Abdomen with three pairs of spinal tubercles on tergites 1st-3rd; their size and pigmentation progressively increase from the first to the third one, the latter being dark brown, particularly at the tip. Such finger-like tubercles on third tergite are 0.070-0.100 mm long and mutually free at their base; they distally have two small setae each, about 10-18 μ long. Marginal pale, mammiform processes, bearing small hairs at their tip, are quite well developed on 3rd and 4th abdominal segments; those on third segment up to 55 μ long. Spinal abdominal hairs, usually doubled for each row, blunt or slightly knobbed, except on 8th tergite, where they are usually rather acute at apex; their maximum length is: 14-16 μ on 1st (at apex of tubercles), 8-16 μ on 4th, 9-19 μ on 5th, 11-23 μ on 7th and 20-46 μ on 8th segment.



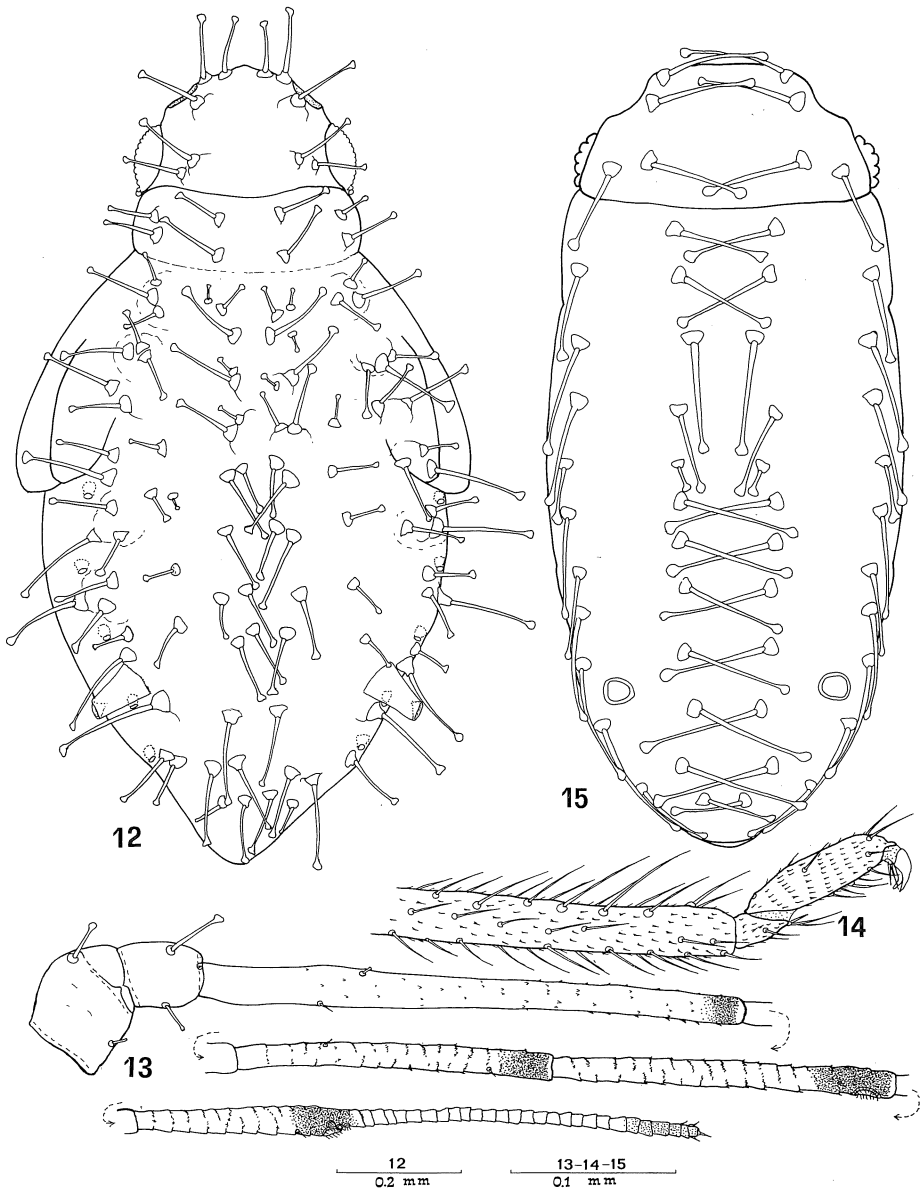
Figs. 1-5 - *Tuberculatus (Tuberculoides) inferus* sp. n., alate vivipara: 1. Head; 2. Antenna, with details of some segments; 3. Distal part of rostrum; 4. Basal part of hind tibia; 5. Distal part of hind tibia and tarsus.

Siphunculi obliquely truncate at apex and with nearly smooth cuticle, as usual in the genus, pigmented on distal 0.45-0.80 of their length (which is measured as perpendicular distance between their base and apical tip); siphuncular length 1.00-1.38 times their basal diameter, or 0.70-0.95 the length of the second hind tarsomer. Cauda with apical knob shorter (0.70-0.90) than its width and with 10-14 setae. Anal plate deeply indented, with 8-15 (usually 12-14) setae for each lobe. Gonochaetae in two small groups of 4-6 setae each.

Alatoid nymph (4th instar). Body length 1.25-1.96 mm. Colour in life pale green, with pale appendages and brown tips of antennal segments III-VI and sensillar part of the latter. In macerated specimens, body mostly pale without sclerification, except for the distal part of antennal segments, as above indicated, and the faintly brownish anterior wing pads and distal part of tarsi. Dorsal body setae pale, all thick and well knobbed at apex. Frontal and anterior discal setae from 80 to 135 μ long (including the basal articular papilla). Abdominal spinal rows, on 1st-7th tergites, usually composed of two pairs of hairs for each segment, but sometimes reduced to a single seta on one side of some variable tergites. Their length is as follows (basal papilla inclusive): 76-103 μ on 1st, 102-140 μ on 3rd, 106-145 μ on 5th, 110-165 μ on 7th tergite. An additional smaller (45-85 μ long) pleural hair is usually present on some of the tergites 1st-5th. Seventh tergite with spinal hairs not as far apart as those on other previous segments. Eighth tergite with usually 4 (rarely 5) dorsal hairs, 85-135 μ long, as well as or weakly knobbed, compared with those on other tergites. Antennal flagellum 0.70-0.88 of the body length; IV and V segments subequal in length (their ratio varying from 0.90 to 1.03). Processus terminalis 1.42-1.78 times the base of VI antennal segment. Antennal hairs rather long and distally capitate at inner side on the first two segments; those on II segment 42-56 μ long or nearly twice the basal diameter of III antennal segment. Antennal segments III-VI with short and rather inconspicuous hairs; those on third segment are more or less capitate or at least blunt at apex, with a maximum length of 8-12 μ (corresponding to 0.27-0.43 of the basal width of the same segment). Rostrum not reaching the middle coxae; its apical segment 0.75-1.00 times the length of second hind tarsomer and a little longer (1.05-1.20) than siphunculi, with 6-8 supplementary hairs. Tibiae with outer distal hairs longer than inner ones (the reverse of the condition in the alate morph), of which the longest on hind tibiae are 1.30-2.25 times the median tibial width. Siphunculi truncate-conical, smooth and pale, shorter (0.75-0.94) than II hind tarsomer; their basal width about 2/3 of their length.



Figs. 6-11 - *Tuberculatus (Tuberculoides) inferus* sp. n., alate vivipara: 6. Anterior wing; 7. Abdomen; 8. and 9. Second and third pair, respectively, of abdominal spinal tubercles (pigmentation omitted); 10. Siphunculus; 11. Cauda, anal and genital plate (ventral view).



Figs. 12-15 - *Tuberculatus (Tuberculoides) inferus* sp. n.: 12. Fourth instar nymph (antennae and legs omitted); 13. Antenna of the same; 14. Distal part of hind tibia and tarsus of the same; 15. Embryo.

Embryo. All dorsal body setae, both spinal and marginal ones, long (except those on 1st tergite and particularly the spinal pair), thick, smooth and apically knobbed. Spinal setae in a single pair for each segment, with the following length: 10-38 μ on 1st; 55-75 μ on 3rd; 53-78 μ on 5th; 58-86 μ on 7th tergite; the latter ones are not significantly laterally shifted from the series of other spinal setae. Marginal setae on 1st abdominal segment (about 20-45 μ long) reaching behind the base of those on 2nd urite, whereas marginal ones on 2nd, 3rd and 4th urites (up to 78-82 μ long) nearly reach the base of the second following hair. Siphuncular pore 20-42 μ in diameter (external ring).

TYPES. *Holotype*: alate vivipara (measurements n. 1 in tab. I) from *Quercus pubescens* Willd., s.l., collected at Grammichele (Catania province), Sicily, Italy, 30.IV.1990; in the collection of the Institute of Entomology, University of Catania-I (S. Barbagallo). *Paratypes*: 4 alate viviparae and 3 alatoid nymphs, same data as the holotype; 8 alate vivipare and 5 alatoid nymphs collected on the same host plant at Pagliara (Messina province), Sicily-I, 19.IV.1989; 3 alate viviparae and 2 alatoid nymphs, same host plant and locality as the holotype, but date 9.X.1990.

The paratypes are in the Author's collection and in the collections of the Natural History Museum (formerly The British Museum (Natural History)), London - England, of Dr F.W. Quednau (Laurentian Forestry Centre, Sainte-Foy, Quebec-Canada) and of Prof. G. Remaudière (Institut Pasteur, Paris-France).

TAXONOMY. Within the species belonging to the subgenus *Tuberculoides* v.d.G., *sensu* Hille Ris Lambers (1974), *T. (T.) inferus* sp. n., by its long dorsal body hairs (both spinal and marginal) in the immature stages, including embryos, shares most affinity with *T. eggleri* (Börn.), *T. maximus* H.R.L. and *T. remaudierei* Nieto Nafria. Nevertheless, the new taxon differs from both the first two species at least by the longer processus terminalis in alate viviparous and immature morphs. The processus terminalis/base VI antennomer ratio varies from about 0.9 to 1.3 (but usually it is less than 1.2) both in *eggleri* and *maximus*, against 1.4-1.7 in *inferus*. Also *T. remaudierei* has a usually shorter processus terminalis (ratio p.t./b.VI = 1.0-1.5) than *T. inferus*, but in any case it has a much longer last rostral segment (ratio l.r.s./II hind tarsomer = 1.06-1.36 in *remaudierei* against 0.9-1.0 in *inferus*) (see also Nieto Nafria & Mier Durante, 1978). In addition, alatae of *T. eggleri* and of *T. remaudierei* differ in having four pairs of spinal tubercles, which are all pale (depigmented); alatae of *T. maximus*, on the other hand, differ by the usual presence of only two pairs of such spinal tubercles, also pale or at most fuscous, placed on the 2nd and

Tab. 1 - Tuberculatus (Tuberculoides) inferus *sp. n.* - *Alate viviparous female* - *Measurements in mm of some specimens.*

N.	Body length	Ant. flag.	Antennal segments				Rhin. on III	Last rostral segment	II hind tars.	Siph.	Cauda (knob part)
			III	IV	V	VI					
1	1.86	2.10	0.79	0.41	0.40	0.19+0.31	7/9	0.11	0.11	0.08	0.06
2	1.81	1.94	0.65	0.42	0.38	0.19+0.30	7/7	0.11	0.11	0.10	0.05
3	1.55	1.82	0.63	0.39	0.34	0.18+0.28	6/7	0.10	0.11	0.08	0.05
4	1.93	2.10	0.72	0.45	0.41	0.21+0.31	7/8	0.11	0.11	0.10	0.06
5	1.86	2.07	0.77	0.44	0.38	0.20+0.28	8/?	0.11	0.12	0.09	0.05
6	1.84	2.06	0.68	0.48	0.40	0.20+0.30	6/6	0.11	0.12	0.10	0.05
7	1.99	2.05	0.73	0.45	0.39	0.20+0.28	6/6	0.11	0.11	0.10	0.05
8	2.05	2.12	0.78	0.45	0.37	0.20+0.32	7/8	0.11	0.12	0.11	0.06
9	1.48	1.50	0.49	0.31	0.30	0.16+0.24	3/3	0.10	0.10	0.08	0.04
10	1.57	1.63	0.54	0.33	0.31	0.17+0.28	3/4	0.10	0.10	0.09	0.04

Ns. 1-3, from *Quercus pubescens*, Grammichele (Catania), Sicily-I, 30.IV.1990;
Ns. 4-8, same host plant, Pagliara (Messina), Sicily-I, 19.IV.1989;
Ns. 9-10, same host plant and locality as ns. 1-3, but date 9.X.1990;
N. 1, holotype; ns. 2-10 are paratypes.

3rd abdominal tergites (nevertheless not excluding the presence of a small pair also on 1st tergite).

Among the other three common European species of the same subgenus, *T. annulatus* (Hartig), alate viviparous, shares with *T. inferus* sp. n. the general aspect of the abdominal tubercles, but again it differs by the shorter processus

Tab. 2 - Tuberculatus (Tuberculoides) inferus *sp. n.* - *Alatoid nymph (4th instar)* - *Measurements in mm of some specimens.*

N.	Body length	Ant. flag.	Antennal segments				Last rostral segment	II hind tars.	Siph.
			III	IV	V	VI			
1	1.94	1.46	0.44	0.30	0.31	0.17+0.24	0.11	0.12	0.09
2	1.96	1.37	0.43	0.26	0.27	0.15+0.26	0.12	0.12	0.10
3	1.84	1.50	0.45	0.29	0.31	0.16+0.29	0.12	0.13	0.10
4	1.55	1.36	0.42	0.27	0.27	0.16+0.24	0.11	0.12	0.09
5	1.25	1.08	0.32	0.19	0.21	0.13+0.23	0.10	0.10	0.09
6	1.50	1.20	0.34	0.22	0.23	0.15+0.26	0.11	0.11	0.09

Ns. 1-2, from *Quercus pubescens*, Grammichele (Catania), Sicily-I, 30.IV.1990;
Ns. 3-4, same host plant, Pagliara (Messina), Sicily-I, 19.IV.1989;
Ns. 5-6, same host plant and locality as ns. 1-2, but date 9.X.1990;
All specimens are considered as paratypes.

terminalis (ratio p.t.VI/b. VI = 0.7-1.1) and the shorter dorsal setae of immatures. *T. borealis* Krzywiec and *T. neglectus* Krzywiec have immature forms with very short spinal setae and small other differences in the adult viviparous morph (see Stroyan, 1977), compared with *T. inferus*.

Distribution and ecology. The new species is so far known only from two different localities in Sicily, Italy, where it lives on *Quercus pubescens* Willd., *sensu latiore*. The aphid, as usual for other European species in the genus, lives scattered on the underside of the leaves of its host plant, without ant attendance. But it occupies, as far as it appears from the three different collections, only the most basal leaves of small young plants and shrubs, up to 30-60 cm from the soil. Therefore, it is likely that, due to such habits, the aphid has been overlooked and, consequently, its distribution may be wider than is at present known, within the geonemic range of its host plant. The life cycle of the aphid is not yet known, but like *T. eggleri* – with which *T. inferus* lives sometimes associated on the same leaves – it may overwinter both as viviparae and/or as egg, depending on the climatic conditions of its biotope.

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SUMMARY

The new species *Tuberculatus (Tuberculoides) inferus* sp. n. is described from Sicily, Italy, where it lives on *Quercus pubescens* Willd. Short notes are given on the morphology of the alate viviparous female, the alatoid nymph and embryo; the taxonomic position of the new taxon is also discussed and information is given on its distribution and ecology.

RIASSUNTO

Tuberculatus (Tuberculoides) inferus *sp. n., nuovo afide vivente su Roverella in Italia.*

Viene descritta la nuova specie *Tuberculatus (Tuberculoides) inferus* sp. n., afide Callafidino rinvenuto in Sicilia su *Quercus pubescens* Willd. Sono riportate notizie mor-

fologiche relative alla femmina vivipara alata, la ninfa di quarta età e l'embrione; viene effettuata una comparazione morfologica con le altre specie affini a diffusione euro-mediterranea e, infine, sono riportate brevi notizie sulla diffusione e il comportamento ecologico del nuovo afide.

Key words: Aphididae (Rhynchota Homoptera), *Tuberculatus (Tuberculoides) inferus, Quercus pubescens.*

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