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A CASE OF MONSTRA DUPLICIA IN TETRANYCHUS URTICAE KOCH (ACARI: TETRANYCHIDAE)

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SUMMARY: A case of monstra duplicia is recorded in a laboratory population of Tetranychus urticae Koch. The population had not been previously exposed to teratogenic agents. The developmental abnormality was found in the protonymph stage. The setae, stylets and leg articles are approximately 10-20% shorter than in normal protonymphs. Ventral and dorsal chaetotaxy and all anal structures have also been modified, as the consequence of the duplicated last 6 segments, i.e. the hysterosoma. Legs IV have been duplicated, and III partly so, by missing the one of them and deforming the other, inner one.

RESUME: Un cas de monstra duplicia est decrit d'une population de laboratoire de Tetranychus urticae Koch non exposee aux agents teratogenes. Un probleme de developpement est observe au stade protonymphe : les poils, stylets et articulations des pattes sont plus courts de 10-20% par rapport a la protonymphe normale. On note des modifications de la chetotaxie dorsalement et ventralement, et des structures anales consecutives a la duplication des 6 derniers segments (hysterosoma). La quatrieme paire de pattes est doublee, partiellement la troisieme paire avec la reduction d'une et deformation de l'autre.

INTRODUCTION

Morphological anomalies or changes in the structure of important morphological features can be found in mites collected from nature or reared under laboratory conditions. Morphological anomalies may originate spontaneously or under the influence of different physical or chemical factors (STEPEN, 1979; BUCZEK, 1994). CAMPANA-ROUGET (1959a, b) classified them as general anomalies (changes in shape and asymmetry of the body, duplication of the body, nanism, gigantism and gynandromorphism) and local anomalies (changes in the shape of the gnathosoma, of legs, of chitinous structures, changes in the ornamentation of the body etc.).

Morphological anomalies in mites, according to data in the literature, are mostly found in ticks (Ixodida) (BUCZEK, 1994, 1995a, b), but also in mite orders Prostigmata (ANDRE, 1949), Mesostigmata (SKORUPSKI, 1995) and Astigmata (HALMAI, 1989, SOLARZ, 1995).

During experiments on a laboratory population of T. urticae, one duplicated protonymph (monstra duplicia) was found in the control group.

To our knowledge, such a teratological phenomenon has not been noticed previously in spider mites.

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This study describes the expressed teratological changes and compares them with a normal individual of the same developmental stage.

**MATERIAL AND METHODS**

The morphologically anomalous juvenile was taken from the control group of the laboratory population of *T. urticae* and mounted in Heinze medium. The ordinary microphotograph of the slide was taken after drying and ringing.

For the analysis of morphological characteristics, a phase contrast microscope was used. It was concluded that the deformed juvenile stage corresponded to the protonymph. In order to compare morphological characteristics, a normal protonymph was treated in the same way.

Measurements were done using a micrometer scale and are expressed in micrometers. Legs were measured from the front edge of trochanter to the base of empodium. The designations of dorsal and ventral setae follow Lindquist (1985). Designation of duplicated legs as outer or inner was determinate in relation to the symmetry axis suitable to the designation of setae.

**RESULTS AND DISCUSSION**

The duplicated *T. urticae* protonymph represented 1/120,000 of the manipulated individuals within the experimental laboratory population. Superficially, its vitality was normal, but it attracted attention by its extraordinary appearance.

Analysis of the chaetotaxy shows that the individual had reached the protonymph stage. Dorsal and ventral aspects of morphological features in duplicated and normal protonymph can be compared from Figures A1-A4 and B1-B4.

This *monstra duplicia*, in our opinion, is the result of the duplication of last six segments.

As the consequence of this process:
- legs IV are duplicated;
- legs III are partly duplicated by the atrophy of one and the deformation of the other. It is difficult to determine which of the articles are lost or fused. There are neither setae nor and ambulacral-empodial structure on this leg;
- the chaetotaxy of the hysterosoma is changed, which is visible from the fragmentary duplicated number of setae on segment C, the reduction of the both inner c1 setae and one c3 seta; the rest of three setae which are not inserted in a regular series, are two closely situated seta c2 and an unpaired seta c3;
- the setal numbers of all the remaining segments are duplicated;
- all ventral hysterosomal setae are duplicated; intercoxal and coxisternal setae corresponding to the third pair of legs are lost; one of these legs is lost and the other is deformed; both 3a and 3b setae are lost;
- all anal structures are duplicated.

The leg chaetotaxy in the *monstra duplicia* corresponds entirely to the chaetotaxy of normal protonymph; with the exception of the deformed leg III. Differences in length of setae, styles and leg articles are also evident. The morphological features mentioned and the ratio between them in duplicated and normal protonymph are presented in the Table 1. The modified features are shorter by 10-20% in duplicated mite. The only exceptions are setae h1, 1b, 1c and ag.

The position of the legs suggests that the mite was using first two pairs of legs normally, outer legs III and IV, instead the normal III pair, and the inner IV, instead of normal pair IV. The mite must have been handicapped because of the joined coxae and the heavier, duplicated opisthosomal region. The unpaired leg was not use by the mite. Curving of the leg indicates that it belongs to the right half of the body.

The general development of appendages, skin striation, strength of the exoskeleton and relatively equal development of duplicated structures (except the unpaired, non-functional leg) indicate that the duplicated mite might have completed its juvenile development if it had not been sacrificed.

Duplications of the body have been recorded until now in Ixodidae, where it can be expressed as a doubled anus and doubled ventral shields (Campagna-Rouget, 1959a), a doubled anus, a supplementary pair of fused anal shields, as well as doubled spiracular plates and a supplementary pair of legs (Brumpt, 1934).
A2 - *Tetranychus urticae* Koch. — Ventral view of *monstra duplicia* protonymph.
A4 - *Tetranychus urticae* Koch. — Ventral view of *monstra duplicia* with equivalent notations for protonymphal ventral body setae (after Lindquist, 1985).


From the systematized data of different authors (Buczek, 1995a), the frequency of morphological anomalies in ticks ranges from 0.0001 in Ixodes ricinus (L.) to 0.01 in I. hexagonus Leach. In soft ticks, like Argas (A.) reflexus (Fabr.) and A. (P.) persicus (Oken), the values are 0.06 and 0.009, respectively. The frequency of duplication in our case in *T. urticae* was 0.000008, which lead us to the conclusion that in spider mites morphological anomalies are rather exceptional phenomenon in comparison with ticks.

Teratological changes originate from spontaneous and induced mutations in somatic or reproductive cells, or other developmental disturbances during different phases in ontogenesis, i.e. gametogenesis, fertilization, embryogenesis and postembryonic development. Because the laboratory population of *T. urticae* used in our experiments was not exposed to any teratogenic agent and in view of its low frequency, we believe phenomenon had a natural, spontaneous origin.

**REFERENCES**


