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A MORPHOLOGICAL STUDY OF THE POPULATIONS OF UROLEUCON ON PICRIS AND ANDRYALA (HOMOPTERA, APHIDOIDEA).

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ABSTRACT

Aphids identified as Uroleucon (U.) picridis (Fabricius) had ultimate rostral segments longer than 1.5 times the length of their hind tarsal segment II and were collected from the compositae genera Picris and Andryala.

Fourteen characters were measured on 84 apterous viviparous females, and an analysis showed that Uroleucon (U.) picridis living on these two composites can be separated morphologically into two groups consistent with the differences in the host plant. However, until further biological information is obtained, these two groups can not be given separate taxonomic status.

INTRODUCTION

Uroleucon (U.) picridis (Fabricius) is a species which has been found in practically all Europe, Central Asia, Japan, Turkey, and Israel. It can be separated from the rest of the species of Uroleucon by its very long ultimate rostral segment which is between 1.51 and 1.85 times longer than the length of the second segment of the hind tarsus (Hille Ris Lambers, 1939). At first it was thought to be monophagous on Picris hieracioides (Hille Ris Lambers, 1939). However, it has also been recorded on Picris pyrenaica in France

(Remaudière, 1951), Picris echioides in Portugal and the Middle East (Ilharco, 1979; Eastop, 1985), Cichorium and Lactuca in Turkey (Tuatay and Remaudière, 1964) and Sonchus and Leontodon in Madeira (Ilharco, 1974).

The presence of one Uroleucon species on Andryala spp. in southeastern Europe was reported by Nieto (1974) and Mier (1978) in Spain, by Ilharco (1973) on the island of Porto Santo (Portugal), and by Starý et al. (1975) in Corsica (France). In all cases, it was identified as Uroleucon (U.) picridis.

However, when Nieto Nafría and Remaudière (personal communication) found sexual morphs, including winged males, on Andryala spp. in the province of Cuenca and when it was realized that Andryala has a tomentose stem while Picris has hispid hairs on its stem, we began to wonder if there were differences between the populations on Andryala and those on Picris. This study was started to find out if differed morphologically these two populations of Uroleucon.

MATERIAL AND METHODS

The aphids used in this study were 53 parthenogenetic apterae field collected as follows: 6 from Picris hieracioides, 10 from P. echioides, and 34 from Andryala spp. Additionally, two Uroleucon samples collected on Leontodon hispidus and one on Hispidella hispanica, in the Department's collection, were classified as U. picridis and were included in this study. Overall, 84 specimens were measured.

The samples were mainly collected in Spain (47 from 13 Spanish provinces) although 3 were from Algeria, 2 from France and one from Italy (Sardinia).

Each aphid was measured for fourteen variables, including those normally used in the separation of Uroleucon species.

The characters used were the length of the following: (1) body, (2) antenna, (3) hind tibia, (4) hind femur, (5) siphunculus, (6) cauda, (7) antennal segment III, (8) antennal segment IV, (9) antennal segment V, (10) basal part of antennal segment VI, (11) processus terminalis of antennal segment VI, (12) apical segment of rostrum, (13) hind tarsal segment II, and (14) antennal segment I.

The data were analyzed using various statistical methods to find variables to characterize both populations and afterwards to find a discriminant function between both of them.

RESULTS AND DISCUSSION

Figure 1 shows a plot of the scores of the first two canonical variables, which together account for 76.5% of the total variation of the individuals. They were obtained by the principal component method using the 84 specimens and the 14 variables. The specimens segregate into two groups, one formed by the Picris hieracioides, P. echioides and Leontodon hispidus (Picris group) samples and the other formed by the Andryala spp. and Hispidella hispanica (Andryala group) samples.

The first canonical variable evaluated as a linear combination of the 14 variables, is interpreted as the general size of the individuals and equally influenced for all the variables. The second canonical variable has a higher discriminatory value and is basically correlated to the length of the apical segment of the rostrum and, to a lesser extent, to the length of the processus terminalis of antennal segment VI.

The next step consisted in analysing the biometric variables and the possible differences between both groups using univariate statistical and regression test. Figures 2 and 3 represent frequency histograms for some of

the more significant variables such as the lengths of the apical segment of the rostrum and the antennal segment IV, and the normal curves associated with these distributions. Histograms of the lengths of the hind tarsal segment II (Fig. 4) has also been included because it is a character normally used in the separation of this species.

No particular variable (with exception of the length of the apical segment of the rostrum) is clearly discriminate in either group, and we had to resort to using pairs of variables (Fig. 5) or proportions between pairs (Fig. 6) in order to define the Picris and Andryala groups.

In the relationship between pairs of variables, the rostrum and the tarsus were studied in more detail (Fig. 7) as they are used in identifying U. picridis, although in this paper they show a lower discriminatory value than other pairs of variables. When comparing our values with the limits given by Hille Ris Lambers (1939), it is shown that all of the specimens of the Picris group are included within these limits. However, these limits exclude 88% of the specimens of the Andryala group, which fall within the limits given to U. picridis and to U. cichorii (Koch, 1955), and other Uroleucon species that have a fairly long rostrum. Another author, Eastop (1985), gives 1.4 and 1.7 as the extreme values for the proportion between the rostrum and the tarsus, with in which a high percentage of the specimens fall (68%), although 21% of the Picris group and 40% of the Andryala group remain outside, which also suggests that 22% of the specimens of the Andryala group would fall within the limits given by Eastop to Uroleucon cichorii s.lat.

Lastly, Wald-Anderson's linear discriminant function was calculated using the 14 variables and obtaining a linear combination equation of the original variables, which has a 0.1% margin of error. Other discriminant

functions were calculated with the pairs of variables which best separated both groups and good results were achieved, the formula is 7.569*r=IV+1.276 (Fig. 5), which has a 1% margin of error.

CONCLUSION

All the populations of one species have a set of general adaptations that enable them to survive under certain conditions. While a population is usually adapted to a particular biogeocenosis, a species is adapted, as a rule, to a system of homocenoses, i.e. biogeocénosis of the same type. Hence, we can speak of species adaptations typical of all populations of a species as well as of population adaptations promoting the well-being of the species within the limits of local conditions (Shaposhnikov, 1981).

In the Picris and Andryala groups there exist morphological differences which allow their separation. But, it is not wise to give a taxonomic status to these groups, in the absence of biological data that could decide whether these differences are only adaptations of the same species to different host or whether they are characteristic of two independent species.

We will not give taxonomic status to these groups until biological tests have been carried out to prove whether each one of the groups can complete their biological cycle on Picris hieracioides or P. echioides, and Andryala spp.

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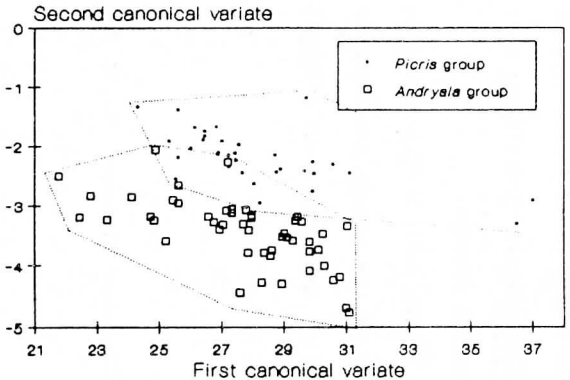


Figure 1.- Principal components

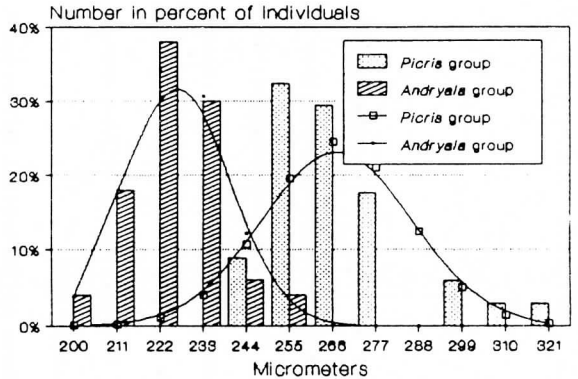


Figure 3.- Length of apical segment of rostrum

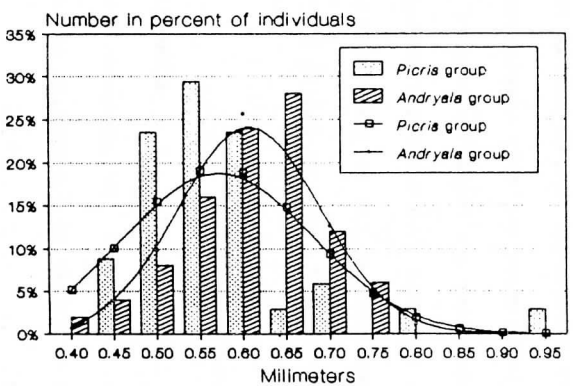


Figure 2.- Length of antennal joint IV

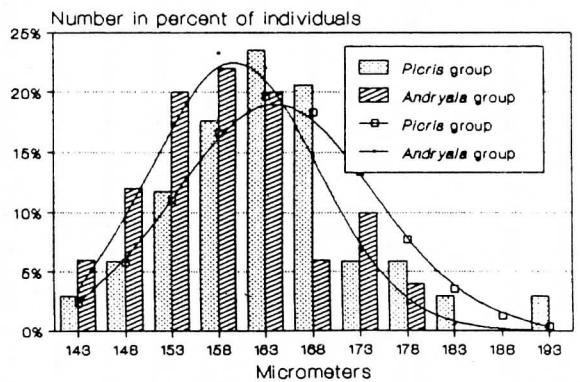


Figure 4.- Length of hind tarsal segment II

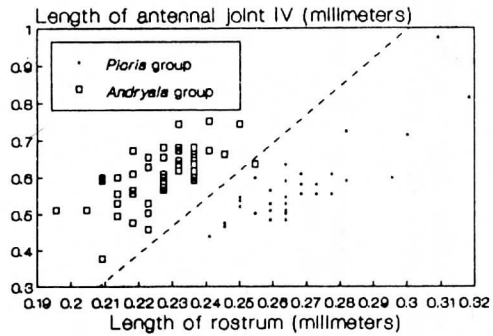
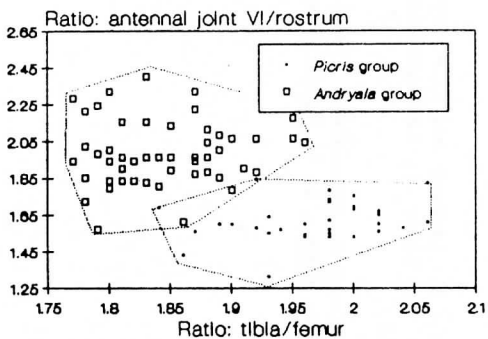


Figure 5.- (see text)



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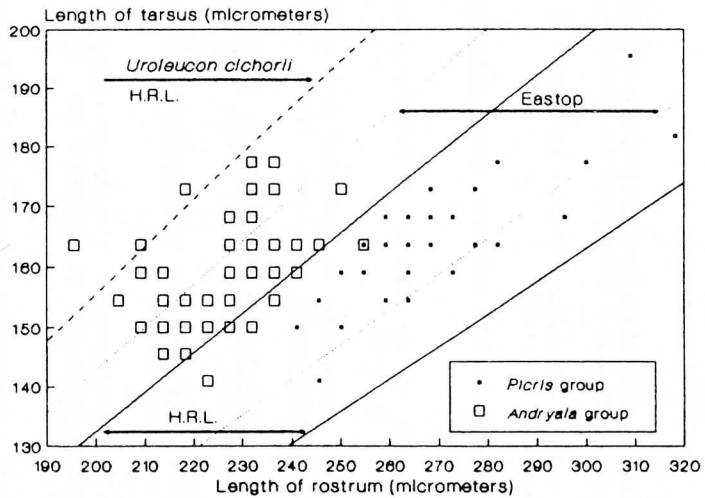

Figure 7.- (see text)

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