

## ELECTROPHORETIC STUDIES ON THE TOTAL SOLUBLE PROTEIN IN IMAGO FORMS OF *APIS MELLIFERA* L. (HYMENOPTERA; APIDAE)

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### Abstract

Applying electrophoresis in polyacrylamide gel, an investigation was made on 500 adult specimens from 15 families of 3 culture populations of bees in Bulgaria.

The action of 19 gene loci in imago forms was found. No polymorphism has been reported for 16 of them. Description has been made of the gene activity in male and female specimens, substantiated most probably by sex dimorphism, fertility and sterility.

**Key words:** *Apis mellifera*, electrophoresis, proteins.

**Introduction:** The proteins in bees have been the subject of study for many authors, as well as in some previous investigations of ours (Halberstadt, 1980; Suter et al, 1981; Sebatini et al, 1981; Liesche, 1982; Li Shao Wen et al, 1982; Krieg et al, 1982; Gliniski et al, 1985, 1986; Kramer et al, 1982; Ivanova, 1991; Fluri et al, 1992).

A large part of the results obtained concern quantitative peculiarities of the soluble proteins. The qualitative studies concern the presence mostly of globulin and albumin-similar ingredients in the haemolymph of bees. Information is also available for the change of the protein contents, depending on the different degree of invasion in honey bees (Domatzkaya et al., 1980).

The present study aims, on the basis of electrophoresis in polyacrylamide gel, to reveal the peculiarity of genotype control on the total soluble proteins in imago forms of *Apis mellifera*, depending on the sex and the fertility of the specimens.

**Materials and methods:** We used electrophoresis in polyacrylamide gel according to Maurer's first system (1968). An analysis was made on 500 adult specimens (worker bees, drones and a queen) from 15 families of *Apis mellifera*, inhabiting Central Sredna Gora, the West Rhodopes and Yambol region.

**Results and discussion:** Considering the range of water-soluble proteins in male and female adult specimens, we found availability of 19 fractions. We used designations for the fractions that were accepted in our preceding works, from the front to the start (Ivanova, 1991).

Fraction M is observed only in the male specimens. It is found also in the sample of a queen.

Fraction N can be found only in the female specimens (Fig. 1).

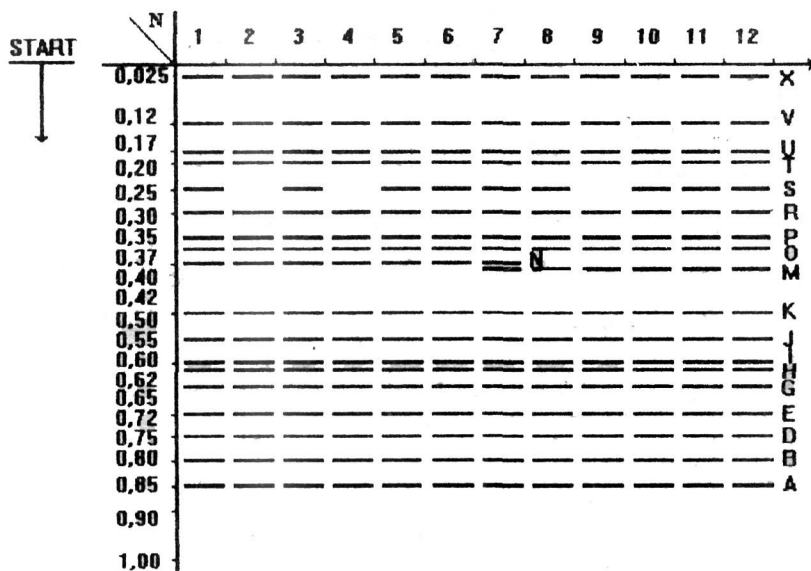


Fig. 1. Electrophoregram of total soluble protein in Polyacrylamid gel (imago — 1-6 — female workers; 7 — queen; 8-12 — male)

In our opinion, these two fractions are products of the action of two separate loci, the first of them being related to fertility (M) and the second — depending on the sex (N). The positions of the two fractions are very close (Electrophoretic mobility /EPHm 0,40 and 0,42, respectively), which might be due to a change in the aminoacid contents of one and the same protein molecule, influencing the charge or the weight of it. Most probably, it is connected with the fertility of the queens and the drones, and the sterility of the worker bees.

Fraction S can be found in 95% of the studied specimens. Its absence in the other 5%, in our opinion, is due to the presence of a zero allele — twoallele genous action is found.

Except the fractions S, M and N, all the other fractions are expressed everywhere. This monomorphism is a result of the action of monoallele genes, responsible for the corresponding protein syntheses.

The presence of fraction M in drones and queens is related to their fertility. The synthesis of this fraction is controlled by one monoallele gene.

Fraction N can be found only in female imago forms (queen, workers); it is controlled by one monoallele gene and, according to us, demonstrates sexdependent heredity.

The absence of polymorphism in the larger part of the expressed gene loci in bees, provides us evidence to accept the existence of invariance concerning total soluble protein, which might be used in interspecies comparisons, as well as for analysing of various in type ailment rate in *Apis mellifera*.

## CONCLUSIONS

1. The synthesis of the soluble proteins in imago forms of honey bees is controlled by 19 gene loci.
2. Twoallelity was reported for one of the studied gene, with the action of a zero allele.
3. Monolocus differences are found in male and female imago forms.
4. Monolocus gene control on the fertility of male and female specimens occurs.

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**ЕЛЕКТРОФОРЕТИЧНИ ИЗСЛЕДВАНИЯ  
НА ОБЩ РАЗТВОРИМ БЕЛТЪК ПРИ ИМАГИНАЛНИ  
ФОРМИ НА *APIS MELLIFERA* (HYMENOPTERA: APIDAE)**

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*(Резюме)*

Чрез електрофореза в полиакриламиден гел са изследвани 500 индивида (стадий имаго) от 15 семейства на 3 културни популации пчели в България.

Установено е действието на 19 генни локуси при имагиналните форми. Не е констатиран полиморфизъм при 16 от тях. Описани са разлики в генната активност при мъжки и женски индивиди, обусловени вероятно от полов диморфизъм, фертилност и стерилност.