Use of the esterase phenotype in the taxonomy of the genus *Meloidogyne*. 1. Stability of the esterase phenotype

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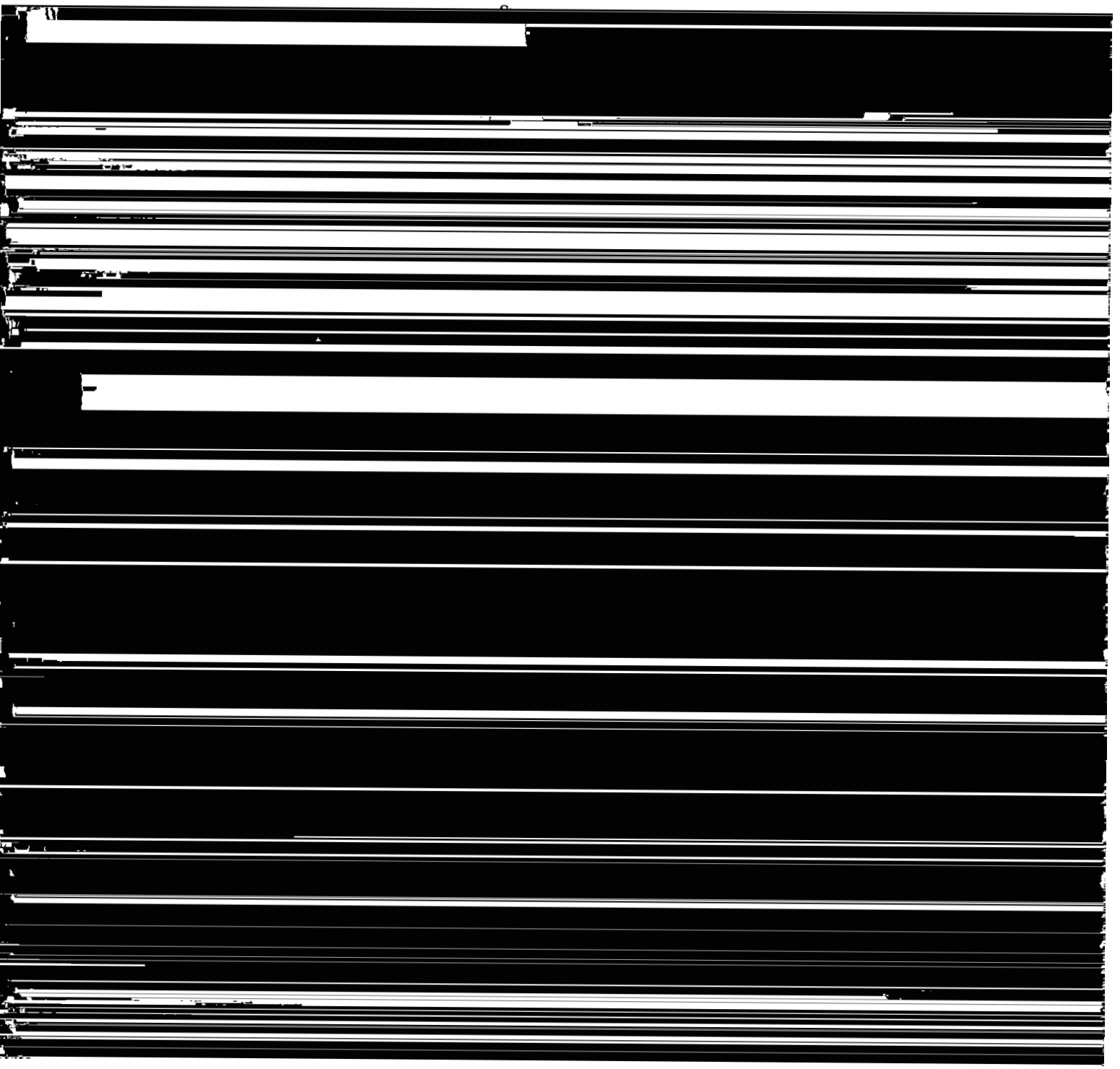


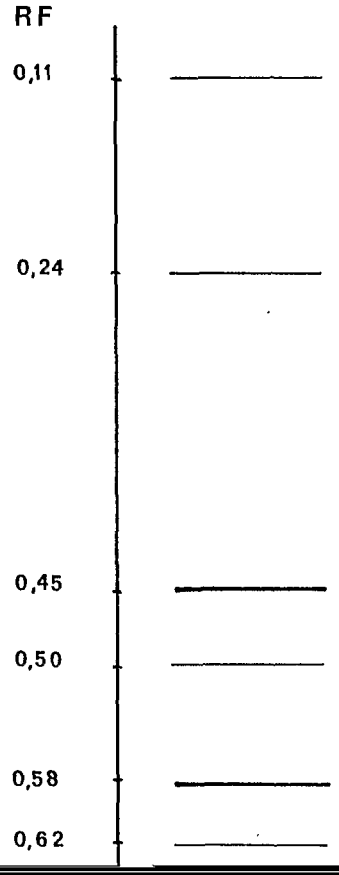
Material and methods

All experiments were made using a single egg-mass

EXPERIMENT III : EFFECT OF AGING OF SECOND-STAGE LARVAE ON THE ESTERASE PHENOTYPE

other weaker (Rm 0.76). In experiments I, III, IV, V, VI, where females were individually squashed, no variation in the esterase phenotype could be observed. No discernable differences in esterase phenotype could be attributed to the different biological parameters tested : hatching rank and age at inoculation of the second-stage larva, age of the host at time of inoculation, host type and influence of a *Meloidogyne* resistant cultivar.

When homogenates from several females were analyzed, additional proteins, in concentrations normally too low to be detected in extracts from single females, could be observed. In experiment II, up to nine bands could be observed : Rm 0.11, 0.24, 0.45, 0.50, 0.58, 0.62, 0.71, 0.76, 0.82 (Fig. 1). Some apparently quantitative variation has been noticed depending on the age of the females (Fig. 2). The frequency is expressed as a ratio between the number of females showing a phenotype and the total number of females of each batch.



— The two upper bands (0.11, 0.24) are very weak and do not appear in each batch. There is no clear relationship between their occurrence and the age of the nematode. (They are not taken into account in Fig. 2.)

— The lowest band (0.82) seems to be associated with the young stages : it is always present on $J_0 + 15$, $J_0 + 20$, $J_0 + 25$ whereas in later stages its intensity and its occurrence decrease. It is not observed after $J_0 + 50$.

— Bands 0.45 and 0.58 are first observed at $J_0 + 20$ and remain present until the end of the experiment. From $J_0 + 20$ until $J_0 + 40$, the bands 0.50 and 0.62 are also present but disappear afterwards.

— Band 0.76 appears on $J_0 + 20$ and remains stable during the whole experiment.

— Band 0.71 is always present from the beginning to the end of the experiment. Its intensity is weak on $J_0 + 15$ but from $J_0 + 20$ until the end of the experiment it has turned stronger.

Bands 0.71 and 0.76 belong to the b esterase system as defined by Dalmasso and Bergé (1978). Bands 0.11 and 0.24 belong to the same system but they are not as useful as bands 0.71 and 0.76 because homogenates must be prepared of several females in order to detect their presence. The 0.45, 0.50, 0.58, 0.62, 0.82 bands seem to belong to the β esterase system.

Discussion

Two main kinds of esterase bands are revealed by the electrophoresis of *Meloidogyne* after staining with α and β naphthyl acetate. The major bands can be detected by electrophoresis of individual females whereas minor bands can only be demonstrated when samples com-

fore the phenotype can be determined using individual females, independently of their age. In most cases females are squashed about five weeks after inoculation. At that time they are white and swollen and the major bands are sufficiently distinct to be clearly detected in single females.

It is difficult to judge whether the frequency of the minor bands depends on the age of the females or on the quantity of material analyzed. In practice it is almost impossible to distinguish between these two factors which moreover are closely correlated.

In these experiments we did not observe any effect of the host on the esterase phenotype. These results are in line with those of Dickson, Huisingh and Sasser (1971). Ishibashi (1970), however, found that the nature of the host had an influence on the esterase phenotype. According to Dickson, Huisingh and Sasser (1971), Ishibashi's results could be explained by considering the extraction method of females from roots by subsequent freezing and thawing. Host cells were damaged and released proteins which contaminated the homogenates of the nematodes. Apart from a single observation by Bergé and Dalmasso (1975), who observed that the esterase phenotype of a population of *M. hapla* parasitizing marrow differed considerably from the esterase phenotype obtained when this population was cultivated on tomato or cowpea, the esterase phenotype of *Meloidogyne* populations have been stable. The stability of the esterase phenotype has been confirmed by other studies. Thus, Fargette (1987) studying 57 populations belonging to three *Meloidogyne* species found that the nature of the host did not influence the esterase phenotype of the nematodes.

The results of this article demonstrate that various conditions did not influence the esterase phenotype of the population studied. Consequently the esterase phenotype may be considered as a reliable and usefull tool in the taxonomy of the genus *Meloidogyne.*

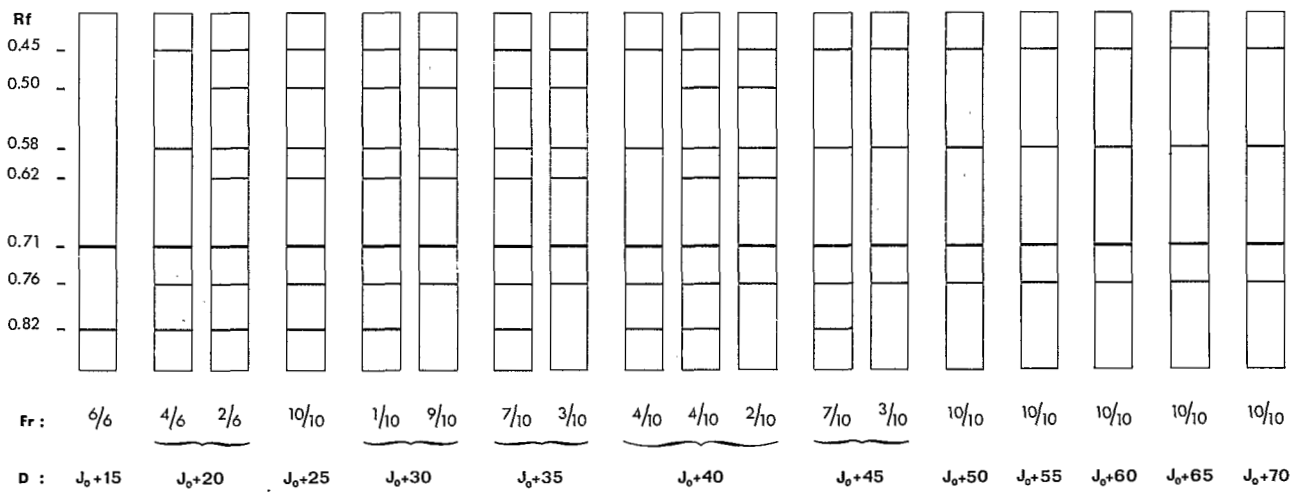


Fig. 2. Esterase phenotypes of aging females (Exp. II). For each date (D) of squashing, the different phenotypes are given with their frequency of occurrence (Fr). The slow bands 0.11 and 0.24 of Fig. 1 are not taken into account here because they were much irregularly visible.

References

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