Errata

In the following publications :

QUÉNÉHERVÉ, P. Populations of nematodes in soils under banana, cv. Poyo, in the Ivory Coast. 3. Seasonal dynamics of populations in mineral soils. *Revue Nématol.*, 12 (2) : 149-160 (1989),

the line 7 of the " Résumé " should read :

« ... l'espèce endoparasite pionnière. Dans ces conditions, l'infestation racinaire par *H. multicinctus* apparaît secondairement. Cette... »

QUÉNÉHERVÉ, P. Populations of nematodes in soils under banana, cv. Poyo, in the Ivory Coast. 4. Seasonal dynamics of populations in organic soils. *Revue Nématol.*, 12 (2) : 161-170 (1989),

the Fig. 1 (p. 164) has to be replaced by the figure below.

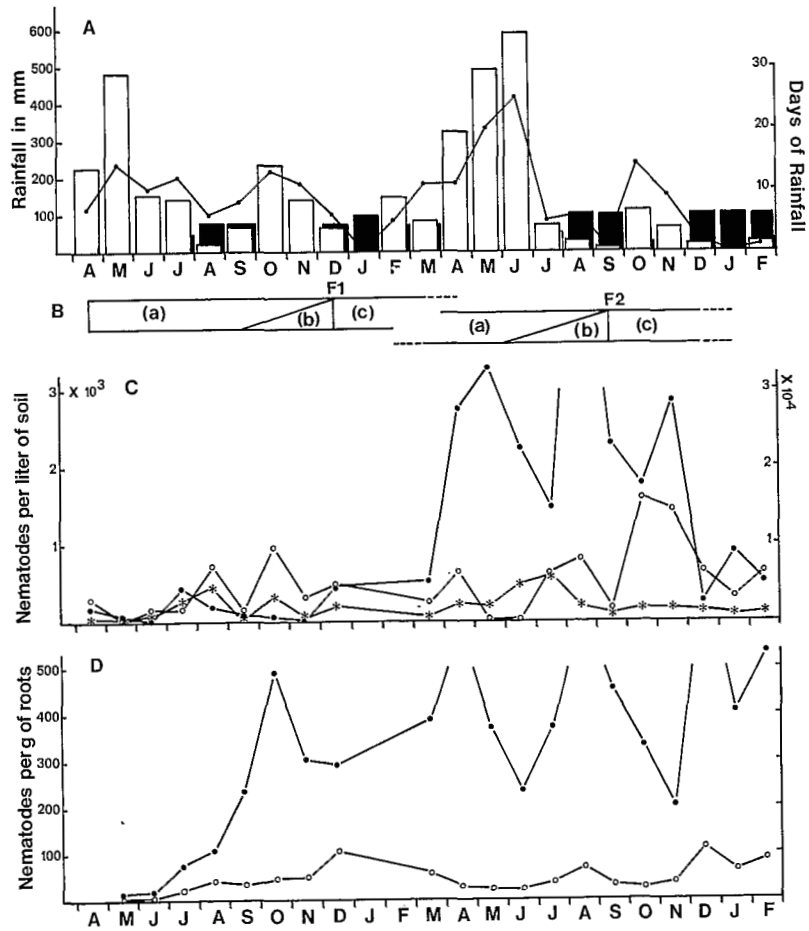

Fig. 1. Nematode population dynamics on site 1 (Agbo). A : Rainfall and irrigation (white bar : monthly rainfall; black bar : monthly irrigation; black circles and plain line : number of days of rainfall per month). B : Schematic representation of physiological stages of banana plant : (a) vegetative phase; (b) fruiting phase; (c) ripening phase; F 1, shot fruit of the plant crop; F 2, shot fruit of the first ratoon. C : Seasonal fluctuation in the soil. D : Seasonal fluctuation of the global root infestation [○ : *Radopholus similis;* ● : *Helicotylenchus multicinctus;* ∗ : *Cephalenchus emarginatus*].

An electron microscopy study of cell wall lysis by *Meloidogyne javanica* gelatinous matrix

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SUMMARY

The effects of the gelatinous matrix (GM) of *Meloidogyne javanica* on tomato cells were demonstrated in thin sections made in galls at the stage of early GM secretion. Cells adjacent to the GM border line were in a state of collapse and compression. Electron-micrographs of this area showed that cell walls adjacent to the GM were extremely swollen and their fibrous structure was severely disturbed. Cell walls in direct contact with the GM were in the process of dissolution, and fibrous matter was ingested within the GM. Remnants of cytoplasmic organelles probably from cells already dissolved, could be distinguished within the GM. The present observations suggest pectolytic, cellulolytic and proteolytic enzymatic activity of the GM.

RÉSUMÉ

Étude en microscopie électronique de la lyse des parois cellulaires par la sécrétion gélatineuse de Meloidogyne javanica

L'action de la sécrétion gélatineuse de *Meloidogyne javanica* sur les cellules de la tomate a été étudiée sur coupes ultrafines effectuées dans des galles à un stade précoce de cette sécrétion. Les cellules au contact de la sécrétion gélatineuse sont compressées et effondrées. Les clichés en microscopie électronique montrent que les parois cellulaires situées au voisinage immédiat de la sécrétion gélatineuse, sont considérablement épaissies et que leur structure fibrillaire est profondément modifiée. Les parois au contact direct de la sécrétion gélatineuse sont dissoutes et la matière fibrillaire s'y trouve absorbée. On peut observer, noyés dans la sécrétion gélatineuse, des résidus d'organelles provenant de cellules déjà désagrégées. Ces observations suggèrent une activité pectolytique, cellulolytique et protéolytique de la sécrétion gélatineuse.

The root-knot nematode (*Meloidogyne* spp.), gelatinous matrix (GM) is synthesised by six rectal gland cells and secreted through the anus as a voluminous globule into which the female deposits its eggs to form the egg mass. Maggenti and Allen (1960) described the structure and function of the rectal gland cells. Bird and Rogers (1965), Bird and Soeffky (1972), and Dropkin and Bird (1978) studied the ultrastructure and some histochemical characteristics of the GM, showing that the GM contains proteins, carbohydrates and certain enzymes which indicated that the GM played an active role in the root-knot nematode host interaction. In a previous paper (Orion, Loots & Orion, 1987) cell lysis activity of the GM, forming a canal from the female posterior end to the gall surface, was described. The present paper reports of electron microscope observations on the GM host cells interactions.

Materials and methods

The root-knot nematode *(Meloidogyne javanica)* was cultured monoxenically on tomato (*Lycopersicon esculentum* cv. E-203) excised roots as described previously (Orion, Wergin & Endo, 1980). Twenty days after inoculation, at the stage when the females started to produce GM secretion, galls were excised and infiltrated under weak vacuum with 2.5 % glutaraldehyde solution in 0.02 M phosphate buffer, pH 6.8, for 1 h at room temperature. The galls were trimmed and postfixed in 1 % osmic acid for 1 h. Serial dehydration was accomplished in 25 %, 50 %, 75 % and 100 % ethanol. The galls were embedded in Agar 100 (Agar Scientific Ltd, UK) sectionned with an Ultratome III (LKB) and observed in a Jeol JEM 100 CX electron microscope after uranyl acetate and lead citrate staining.

Results and discussion

Light microscope observations revealed that the cells adjacent to the GM border line were collapsed and compressed (Fig. 1 A). In electron-microscope observations of the same area (Fig. 1 B), two distinct reactions were evident : first, the swelling of the cell walls and second, the process of lysis. Cell walls adjacent to the

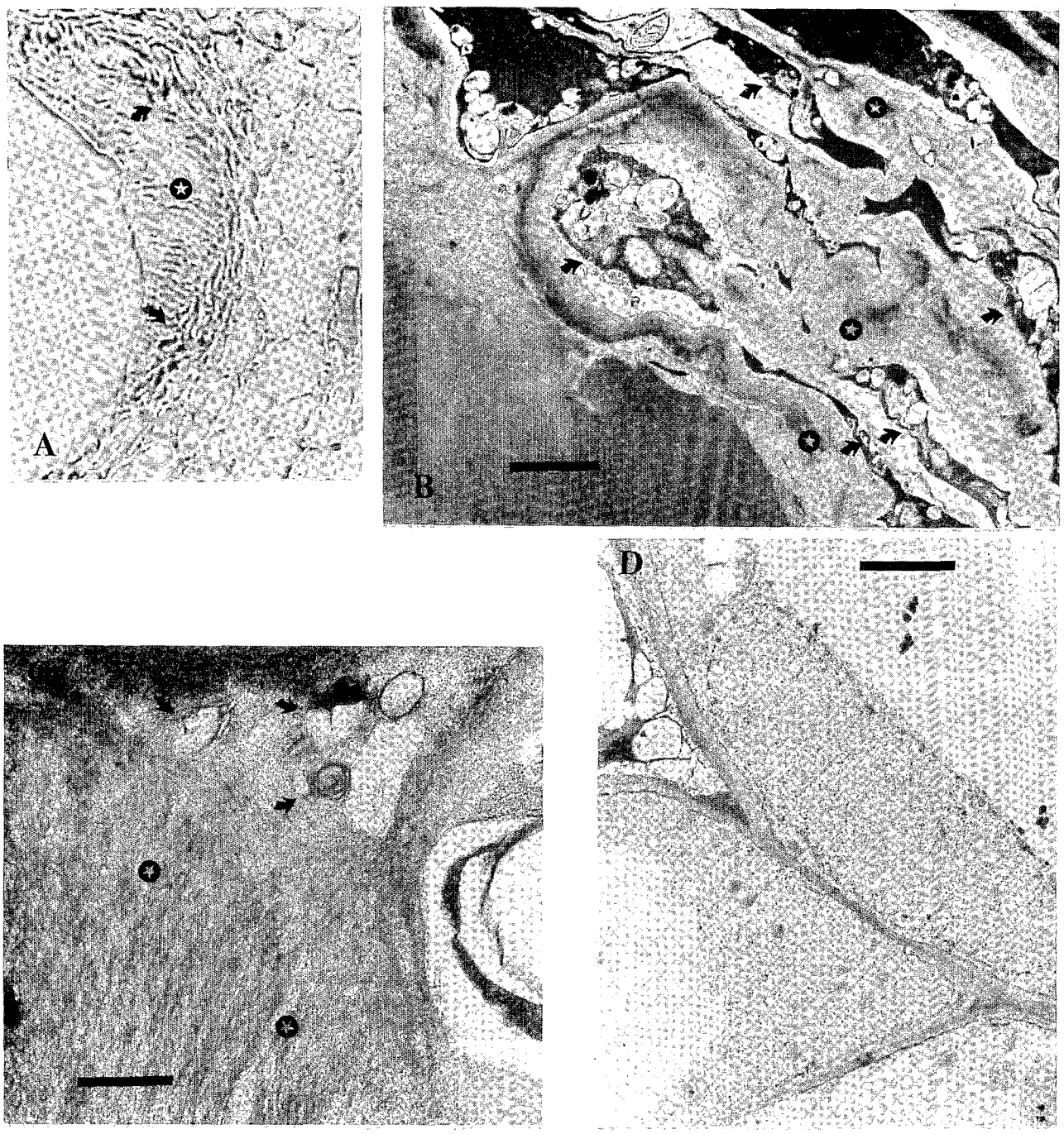

Fig. 1. The interaction of *Meloidogyne javanica* gelatinous matrix and tomato gall cells. A : Micrograph of a *M. javanica* gall at the early stages of gelatinous matrix (*) secretion. Note the collapsing compressed cells (arrows); B : Electron-micrograph of the gelatinous matrix - host-cells contact area. Note the swollen cell walls (*) and the condensed cell content (arrows); C : High magnification of B. Note the fibrous material dissolved in the gelatinous matrix (*) and detached cytoplasmic organelles (arrows); D : Parenchyma cells in an *M. javanica* tomato gall. Note the organized cell walls structure and the volume of the cells. (Bar equivalent : B, D = 2.5 µm; C = 0.5 µm.)

GM borderline were several times thicker than those of parenchyma cells in the same gall which were not exposed to the GM (Fig. 1 D). In the swollen cell walls the middle lamella seemed to be destroyed, vacant spaces could be seen instead, and the fibrous structure of the secondary wall was severely disturbed, resembling turbulent movement. These phenomena probably reflected the dissolution of the matrix in which the cellulose fibrils are embedded and which consisted mainly of pectins. This process occurred not only in cells in direct contact with the GM but also in cells farther away, suggesting that the substance(s) responsible for the pectin dissolution diffused beyond the GM borderline. Due to this activity the cell walls lost their rigidity, the entire cell collapsed, and the cytoplasm, cytoplasmic organelles and remnants of the vacuole were all compressed. Secondly, swollen cell walls directly exposed to the GM were in the process of lysis and fibrous material, probably cellulose microfibrils, was shown dissolved within the mass of the GM (Fig. 1 C). In this area detached cytoplasmic organelles such as plastids and endoplasmic reticulum units could be observed and could well be remnants of cells already dissolved by the GM. These organelles were found near the GM front line, suggesting that in time they would be completely destroyed and ingested by the GM, which appears to be a homogenous substance. From the findings presented in this study it can be concluded that the GM contained substances of pectolytic, celluloytic and proteolytic activity, some of which were reported by Bird and Rogers (1965). It is possible also that some of the carbohydrates and proteins found in the GM were actually derived from the host cells dissolved by the GM. As cell lysis is directed to form a canal (Orion, Loots & Orion, 1987), it could be argued that the most intensive lysis potential was concentrated at the GM front line, consisting of freshly secreted material, while the old, inactive GM is pushed to the edge of the cavity, not harming the host cells, and thus a canal of limited width leading to the gall surface was formed.

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