

Influence of concentration gradients of salts on the movement of second stage juveniles of *Meloidogyne javanica*

Jean-Claude PROT

Laboratoire de Nématologie, ORSTOM, B.P. 1386, Dakar, Sénégal.

SUMMARY

The movement of juveniles of *M. javanica* (Treub, 1885) Chitwood, 1949 was studied in salt gradients. Twelve different salts (NaCl; CaCl₂; KCl; MgCl₂; FeCl₂; NaNO₃; Ca (NO₃)₂; KNO₃; KH₂PO₄; NaH₂PO₄; MgSO₄; FeSO₄) were tested on agar under sterile conditions. With the exception of FeSO₄ which failed to exhibit a significant repulsion, all other salts exhibited repulsion at concentration close to those found in the soil. In effect, juveniles placed in gradients created in agar by salt solutions between 0.125×10^{-2} and 0.5×10^{-2} M/l moved preferentially toward the region having the lower salt concentration.

Li⁺, K⁺, and Mg⁺⁺ (Ward, 1973). Dusenbery (1974) classified ions on their relative attractiveness to *C. elegans* and reported the following sequences : Na⁺, K⁺, 1/2 Mg⁺⁺, 1/2 Ca⁺⁺ and Cl⁻, 1/2SO₄⁻⁻, NO₃⁻, CH₃COO⁻.

The present study was undertaken to determine if concentrations of mineral salts close to those observed in cultivated soils influence the movement of 2nd-stage juveniles of *Meloidoane*

a small plug of « Kleenex » was introduced into the opening ; without this precaution, the nematodes stay in the water film existing on the agar surface.

The number of nematodes present in the liquids in both branches of the U-tube were counted 48 h after their introduction.

Table 1
Concentrations of salts tested for their effects on movement of juveniles of *Meloidogyne javanica*

Salts	Concentrations of solutions ($M \times 10^{-2}/l$)							
	2	1	0.5	0.25	0.125	0.062	0.031	0
NaCl	+	+	+	+	+	+		+
NaNO ₃	+		+		+		+	+
NaH ₂ PO ₄	+		+		+		+	+
KCl	+		+		+		+	+
KNO ₃	+		+		+		+	+
KH ₂ PO ₄	+		+		+		+	+
CaCl ₂	+		+		+		+	+
Ca (NO ₃) ₂	+		+		+		+	+
MgCl ₂	+		+		+		+	+
MgSO ₄	+		+		+		+	+
FeCl ₂	+		+		+		+	+
FeSO ₄	+		+		+		+	+

Thirty replications were used for the various solutions of NaCl; twenty replications were used for all concentrations of the other salts tested.

With the exception of FeSO₄ all the salts tested exhibited a significant repulsion, juveniles moving preferentially toward the region having the lower salt concentration.

No correlation could be made between the repulsive effect and differences of osmotic pressure calculated or differences of pH and red-ox potential measured between the various test solutions and demineralized water.

In the experiments on the influence of sucrose and glucose on the movement of juveniles of *M. javanica*, no significant differences were found for either sugar at the concentrations employed.

Discussion

Among the twelve salts whose effects on the movements of juveniles of *M. javanica* were tested, only FeSO₄ failed to exhibit a significant repulsion. For all of the other salts, the repulsion was observed at salt concentrations close to those found in the soil. In effect, juveniles

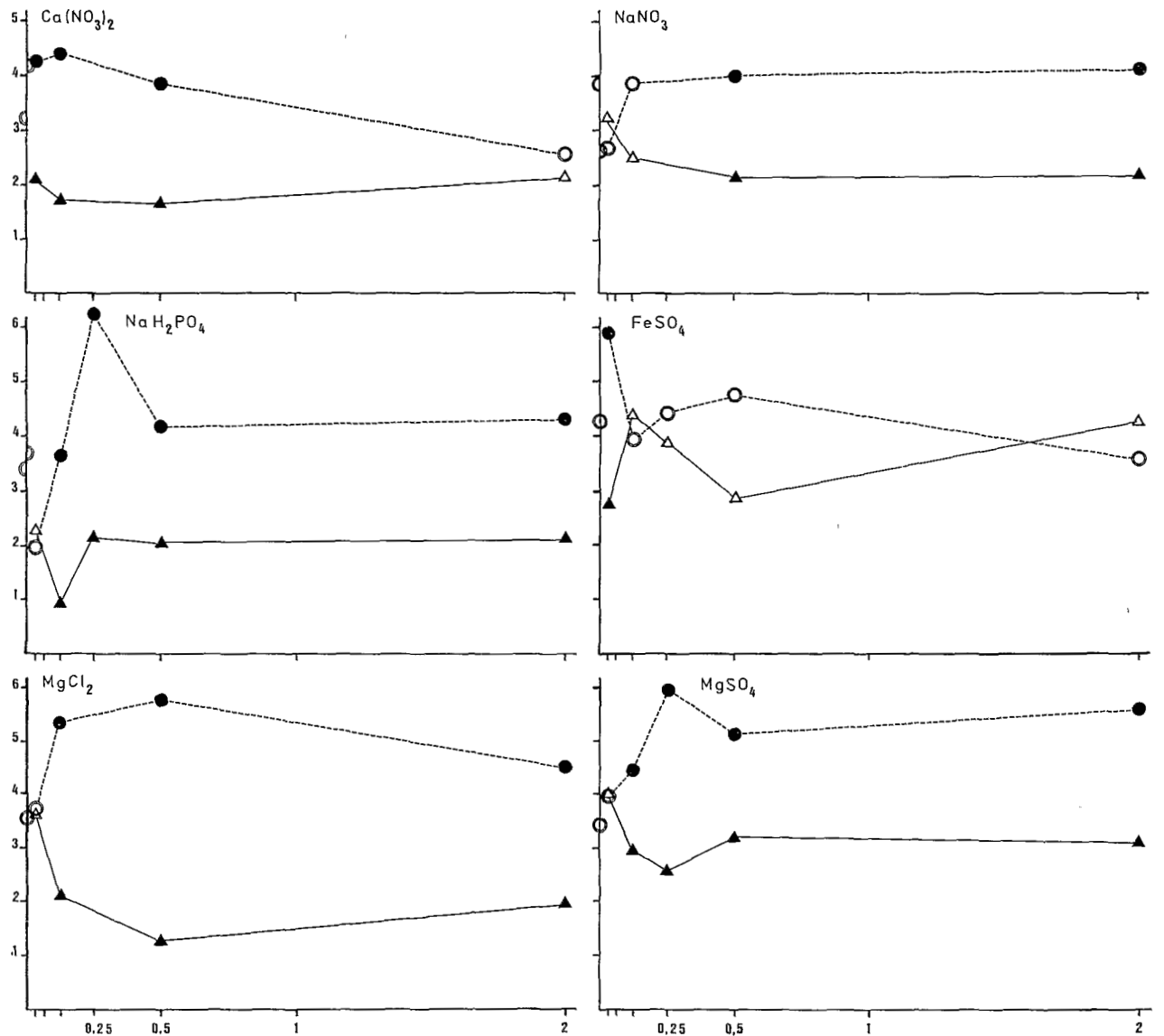


Fig. 2. Influence of twelve mineral salts on the movement of juveniles of *Meloidogyne javanica*. *Abscissa* : concentration of the salt solution as $M \times 10^{-2}/l$. *Ordinate* : number of juveniles recovered in : demineralized water (circles and dotted line) salt solution (triangles and solid line). Black circles and triangles indicate existence of a significant difference (Wilcoxon test at a probability of 0.05) between the numbers recovered in the two branches of the tube. On the contrary white circles and triangles indicate that the differences were not significant for that concentration.

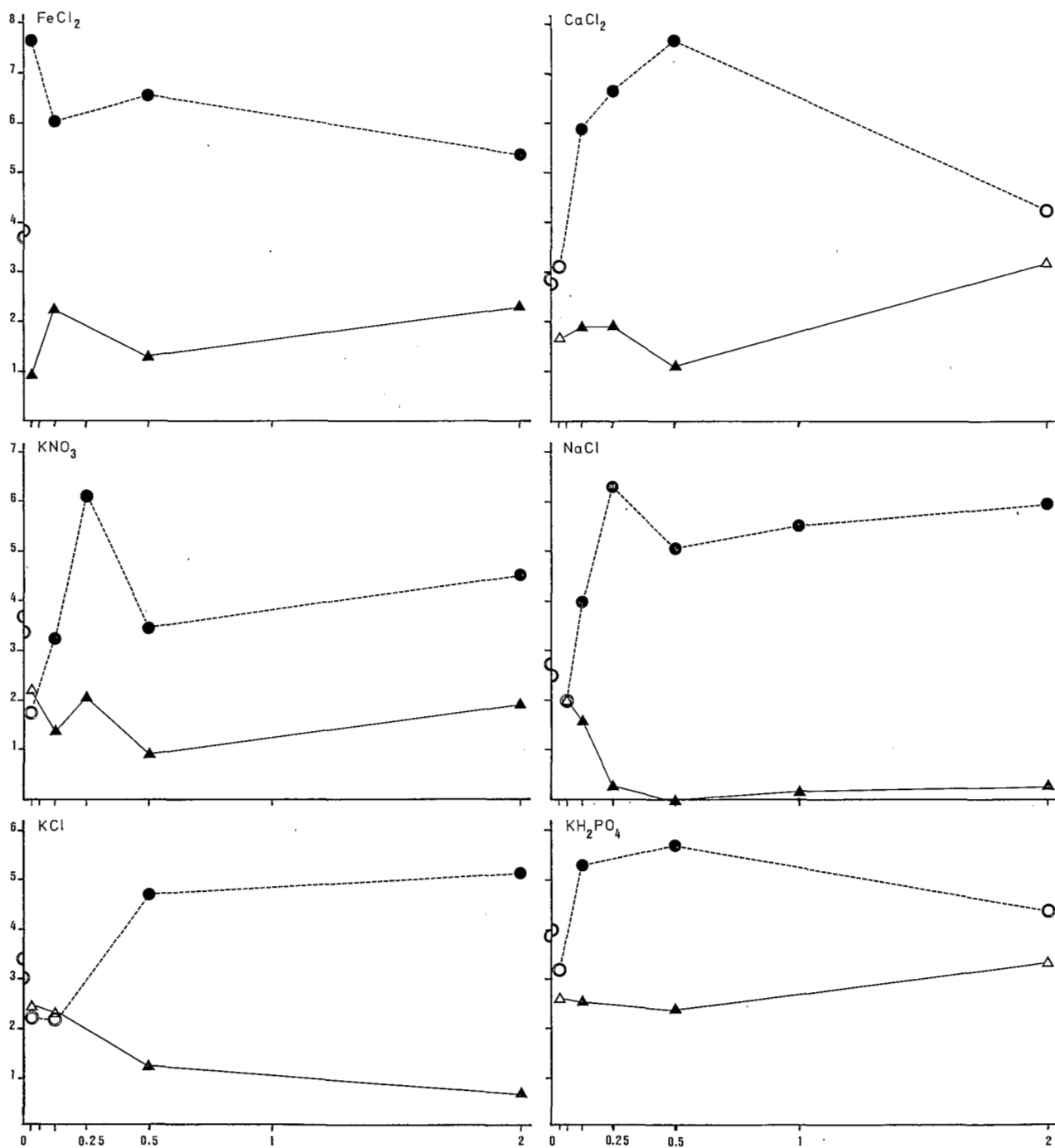


Fig. 2. Continued.

If osmotic pressure, pH and red-ox potential cannot explain the negative tropism exhibited to mineral salts by juveniles of *M. javanica*, it seems logical to conclude that the cause is of chemical nature. Perhaps the influence of the later masks the effects of the three others. This chemical sensitivity could explain why certain salts (NaCl, FeCl₂, CaCl₂) appear to be more repulsive than the others and why no significant repulsion was observed with FeSO₄. This chemical repulsion can also explain the observed significant repulsion of weak concentrations (CaCl₂ from 0.125 to 0.5×10^{-2} M/l) whereas there was no further effect at higher concentrations (2×10^{-2} M/l). At these higher concentrations, it is possible that the concentration at the point of introduction of the nematode was too high to permit orientation to occur.

Further investigations on this phenomenon are in progress.

Accepté pour publication le 8 août 1977.

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