SCIENCE DU SOL n° 1986/1 - pp. 89-90 - PLAISIR-FRANCE

ROLE OF SYMBIOTIC AND NON SYMBIOTIC MICROFLORA ON BIOTITE WEATHERING AND MAIZE GROWTH : INFLUENCE OF PLANT GROWTH CONDITIONS

C. LEYVAL [1] **and J. BERTHELIN** [1]

(Science du Sol n° 1982-1)

Because plant growth depends on environmental conditions (e.g. temperature, humidity, mineral nutrition), rhizospheric interactions « plant-microorganisms-minerals » are probably also dependent on these conditions. In order to determine the influence of such factors and also to distinguish the role of the non symbiotic and the symbiotic microflora of the rhizosphere of maize and of their association on the weathering of a mica (biotite) and on the plant growth, we have performed four experiments (A, B, C, D) with different plant growth levels.

Plants were grown in axenic conditions in a laboratory device, in which the nutrient solution was deficient in potassium salts and where biotite was the potassium source. In different treatments, the roots were inoculated by symbiotic (endomycorrhizal fungi, *Glomus mosseae* or *Glomus epigaeus)* and/or by non-symbiotic microflora. In all these experiments, the rates of endomycorrhizal infection and the growth of the non-symbiotic microflora (essentially bacterial microflora) were high.

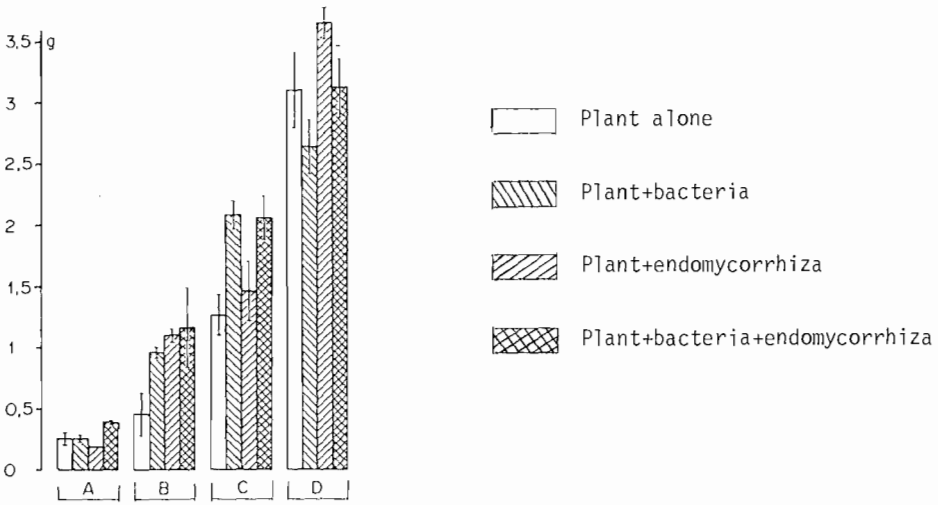

Figure 2 : Dry weight of shoots of maize after 7 (A and B) and 8.5 weeks of culture (C and D).

The symbiotic and non-symbiotic microflora were able to promote solubilization and absorption of potassium and iron from biotite. But their effect was dependent on growth conditions.

1) Centre de Pédologie Biologique du C.N.R.S., B.P. 5, 54501 Vandœuvre-les-Nancy Cédex.

— When the growth conditions were good (no potassium deficiency, high rate of humidity) (experiment D), maize growth was not significantly influenced by endomycorrhiza *(Glomus mosseae)* and/or by the non-symbiotic microflora (figure 2).

However, under these conditions, endomycorrhizal infection and non-symbiotic microflora slighty increased or slighty decreased plant growth respectively.

Rhizospheric microbial populations did not really modify potassium mobilization except in the presence of the plant-bacteria association, where potassium mobilization had decreased. An inexplicable absence of iron mobilization was observed in the endomycorrhizal system, but iron mobilization was greater in presence of the plant-bacteria association.

— When the growth conditions were medium (experiments B and C) endomycorrhizal infection and non-symbiotic microflora increased plant growth significantly. The association of both microflora also promoted plant growth, but not significantly. Each type of microflora and their association increased potassium and iron mobilization from biotite. But the non-symbiotic microflora (essentially bacterial) was the most efficient in promoting potassium and iron mobilization from biotite (experiment C) (Table V).

— When the growth conditions were bad (experiment A), only the association of symbiotic and non-symbiotic microflora promoted plant growth and potassium mobilization significantly.

Table V : Amounts of K and Fe from biotite (Qm (K) and Qm (Fe) mobilized by the different plant treatments (results in mg of K and Fe per plant).

		Plant alone	Plant + bacteria	Plant + endomyc.	Plant + bacteria + endomyc.
Qm (K)	A	1,9	0,8	2,1	2,3
	B	1,9	2,3	2,1	2,8
	C	4,6	5,5	4,7	5,2
	D	4,4	3,3	4,8	4,6
Qm (Fe)	C	4,5	6,6	4,4	4,8
	D	2,8	4,0	0,0	3,4

Thus, non-symbiotic and symbiotic microflora were able to stimulate plant growth and the mobilization and absorption of mineral elements. But, on our experiments, the effect of non-symbiotic microflora on potassium and iron mobilization was more significant than that of symbiotic microflora.

The mechanisms involved in these processes are poorly understood.

Rhizospheric microflora such as endomycorrhiza may absorb directly the mineral elements and transfer them to the plant. But bacteria and fungi can also produce hormonal substances that promote plant growth, or they can form acid compounds, able to solubilize mineral elements, thus making them available to the plant.