SCIENCE DU SOL n° 1986/1 - pp. 137-138 - PLAISIR-FRANCE

EVALUATION OF IRON FORMS BY CHEMICAL EXTRACTANTS : applications to brunified and podzolic soils

E. JEANROY [(1)], **B. GUILLET** [(1)], **R. ORTIZ** [(2)]

(Science du Sol n° 1984/3)

With total iron and Fe extractable by citrate-bicarbonate-dithionite, oxalate, pyrophosphate and tetraborate, five soil iron compartments can be defined. Fe in silicates, in well-crystallized and poorly-crystallized oxides, respectively correspond to the differences $Fe_{total} - Fe_{CBD}$, $Fe_{CBD} - Fe_{oxalate}$, $Fe_{oxalate} - Fe_{pyro}$. The hydroxyferric organic complexes are assumed to be of two types. The more polymerized hydroxyferric complexes (Type II) are quantified by the difference $Fe_{pyro} - Fe_{tetra}$. The less polymerized hydroxyferric complexes (Type I) and monomeric Fe (III) - organic complexes (close to chelates) are extractable by tetraborate and quantified by this reagent. EDTA Na_4 at pH 10 extracts mineral and organic amorphous iron. The efficiency of these different chemical reagents in regard with the iron compartments is summarized in Table II.

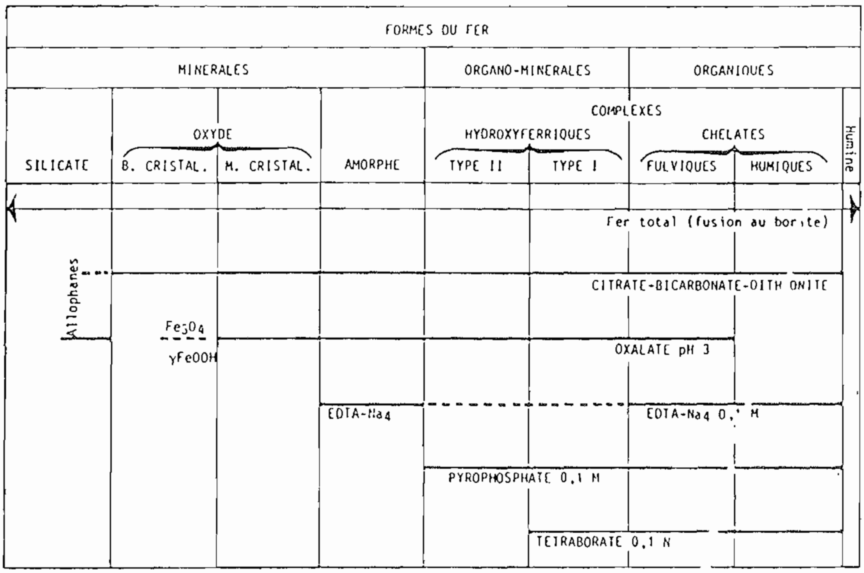

Table II : Comparative efficiency of the chemical reagents in regard with the various forms in soils.

The extractants were applied to three brunified soils and a prodzolic soil. Fe xtractions are illustrated on figure 1. For all the soils, the relative efficiency of the ron extractants was as follows : dithionite > oxalate > EDTA > tetraborate. The urves of Fe extracted by pyrophosphate varied. In the *Sol brun mésotrophe*, the rate f pyrophosphate extractable iron was lower than EDTA extractable iron. For the wo other brunified soils (*sol brun acide* and *sol brun ocreux*) the rate of pyrophosphate xtractable iron was higher than EDTA extractable iron, and lower than oxalate extractable iron. These results suggest that the hydroxyferric complexes are not only in morphous form.

1) Centre de Pédologie biologique du CNRS - B.P. 5, 54501 Vandœuvre-les-Nancy Cédex.
2) Facultad de Ciencias. Departemento de Geologia, Murcia (Espagne).

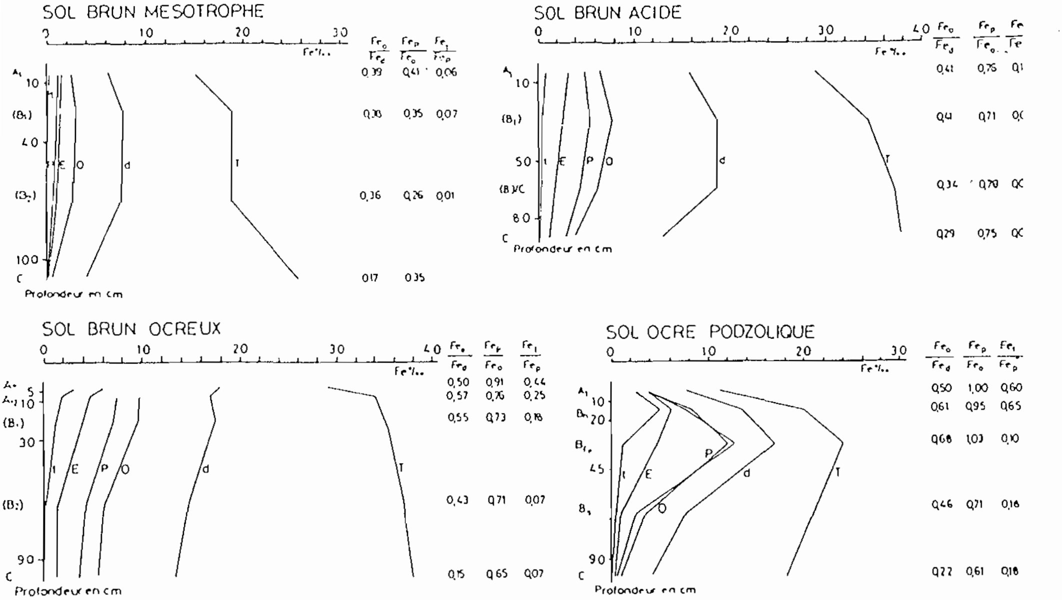

Figure 1 : Total Fe (T) and Fe extracted by five reagents (in mg per g of soil) : d = CBD - O = oxalate - P = pyrophosphate - E = EDTA - t = tetraborate.

The distribution of the various iron forms in brunified and podzolic soil horizons depends on the organic matter contents which have a great influence upon the organization of hydroxyferric polymers that are formed when silicates are weathered. As indicated on Figure 2 and in Table III, the are few organic-Fe complexes in a *sol brun mésotrophe*, poor in oragnic matter, where iron is especially individualized as well - or poorly - crystallized oxides.

In the soil *brun acide* and the *sol brun ocreux*, the most abundant organic matter favors the development of hydroxyferric complexes. The largest development of these complexes happened in spodic and A_1 horizons of the *sol ocre podzolique*.

Table III : Relative distribution of iron in horizons, expressed as per cent of total iron. Amorphous iron rate (100 Fe_1/Fe_T).

	Hor.	Silicates	Oxydes		Complexes hydroxyferriques		$\frac{Fe_E}{Fe_T}$ (x 100)
			Bien cristal.	Mal cristal.	Type II	Type I + chélates	
Sol brun mésotrophe (SBM)	A_1	60	24	9	6	< 1	9
	(B_1)	59	25	10	5	< 1	7
	(B_2)	60	25	11	4	0	6
	C	85	12	2	1	0	1
Sol brun acide (SBA)	A_1	46	31	5	15	3	11
	(B_1)	46	32	6	15	1	8
	(B)/C	50	33	5	11	1	4
	C	65	25	2	7	< 1	3
Sol brun ocreux (SBO)	A_{11}	38	31	3	16	13	22
	A_{12}	50	21	7	16	6	14
	(B_1)	50	22	7	17	4	11
	(B_2)	62	22	5	10	1	4
	C	64	21	5	9	< 1	4
Sol ocre podzolique (SOP)	A_1	31	34	0	14	21	34
	B_h	33	26	≈ 0	14	26	31
	B_{Fe}	30	20	≈ 0	45	5	20
	B_s	65	18	5	10	2	4
	C	78	17	1	3	1	1