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FRACTIONATION OF FULVIC ACIDS USING POLYVINYL PYRROLIDONE AS A MEANS OF DISCRIMINATING BETWEEN ACID SOILS OF PLATEAU DE MILLEVACHES (FRANCE)

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A study of the podzols in the "Landes du Médoc" (RIGHI, 1977) demonstrated that fulvic acids (FA) in spodic horizons may have two origins : the first origin is the illuviation of FA from the A_0 and A_1 horizons and their accumulation in the spodic B horizon ; the second origin is the in situ transformation of remnants of dead roots. FA of the first origin have a prominent polyphenolic character, in the other hand FA of the second origin have an important polysaccharidic fraction (RIGHI et al., 1976).

Recently, LOWE (1975, 1980) proposed a simple method to determinate the ratio of polyphenolic or polysaccharidic components in a FA sample. By using this method we tried to demonstrate the more or less polyphenolic character of the FA from the A_1 Bh and Bs horizons of the soils of the Plateau de Millevaches, a more pronounced polyphenolic character giving an indication of a more pronounced podzolization process.

Six soils of the Plateau de Millevaches were tested. According to the morphological differenciation of the spodic B horizon they were classified as follow : (1) « Ranker podzolique » (RP) with clearly separated A_1 and Bh horizons ; (2) « sol ocre podzolique » (OP) with a well expressed spodic B horizon ; (3) « sol brun ocreux » (BO_1, BO_2, BO_3) with a A_1Bh horizon which distinguish from the A_1 horizon by a higher bulk density and a more compact structure ; (4) « Sol brun acide humifère » (BA) without any spodic B. Three other samples were added and used as "references". They were the A_1 and Bh horizons of a strongly differenciated podzol (3 LAG) and the A_1 horizon of a sandy hydromorphic soils (6 BER). The FA from these three horizons have been previously studied in detail (RIGHI, 1977 ; RIGHI et al., 1976). FA from the spodic B of the podzol 3 LAG are typically illuvial FA, in contrast FA from the A_1 horizons are the result of an in situ humification.

The fractionation of FA in two fractions, the first one adsorbed on the polyvinyl pyrrolidone (PVD) and rich in polyphenolic components (CA fraction), the second one predominantly of a polysaccharidic nature (CAFC fraction), allowed to follow the different stages in the translocation of organic compounds during the process of podzolization (Table II).

In non podzolic soils or soils with a weak podzolization process, polyphenolic fraction of fulvic acids accumulates in A_1 horizons. In these soils, fulvic acids located in (B) horizons do not indicate a translocation or organic matter. They are produced by in situ decomposition and humification. When the podzolization process is more active polyphenolic fraction starts to move downwards. In Bs horizon the polyphenolic components is more effective. Fulvic acids in Bh horizon are predominantly rich fraction of biological origin. In case of strong podzolization redistribution of polyphenolic components is more effective. Fulvic acids in Bh horizon are predominantly of polyphenolic nature and they are mainly polysaccharidic in the A_1 horizon (figure 3).

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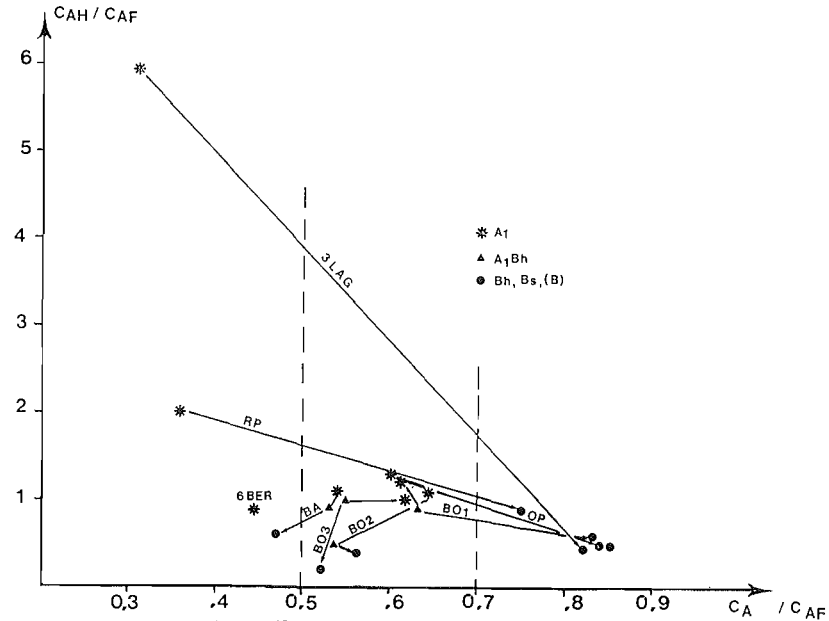

Figure 4 : Humic carbon (C_{AH})/fulvic carbon (C_{AF}) versus polyphenolic fraction of fulvic carbon (C_A)/fulvic carbon (C_{AF}).

Table II : Fractionation of total carbon with Na pyrophosphate and of fulvic acids with P.V.P.

Horizons		C_{AH} (% T.S.)	C_{AF} (% T.S.)	C_{AH} (% C_T)	C_{AF} (% C_T)	C_A (% T.S.)	C_{AFC} (% T.S.)	$\frac{C_{AH}}{C_{AF}}$	$\frac{C_A}{C_{AF}}$
RP	A_1	2,14	1,08	19,0	9,6	0,39	0,68	2,0	0,36
	Bh	2,50	2,76	34,9	38,5	2,08	0,68	0,9	0,75
OP	A_1	1,95	1,53	23,7	18,6	0,94	0,59	1,3	0,61
	Bh	0,65	1,32	16,5	33,1	1,11	0,20	0,5	0,84
	B_S	1,09	2,18	23,2	46,3	1,86	0,32	0,5	0,85
BO_1	A_1	2,09	1,66	23,1	18,3	1,01	0,65	1,2	0,61
	A_1Bh	1,24	1,29	27,9	29,2	0,82	0,47	0,9	0,63
	B_S	0,91	1,50	24,1	39,9	1,24	0,26	0,6	0,83
BO_2	A_1	2,11	1,85	28,1	24,6	1,18	0,67	1,1	0,64
	A_1Bh	0,94	1,74	21,3	39,3	0,92	0,82	0,5	0,53
	(B)	0,56	1,50	21,8	58,9	0,84	0,66	0,4	0,56
BO_3	A_1	3,18	3,10	20,1	19,6	1,92	1,18	1,0	0,62
	A_1Bh	1,72	1,68	24,6	23,9	0,93	0,75	1,0	0,55
	(B)	0,07	0,46	6,6	44,9	0,24	0,22	0,2	0,52
BA	A_{11}	1,37	1,19	25,4	22,1	0,64	0,55	1,1	0,54
	A_{12}	0,78	0,86	23,7	26,1	0,45	0,41	0,9	0,53
	(B)	0,46	0,76	21,6	36,1	0,36	0,41	0,6	0,47
3 LAG	A_1	0,57	0,10	20,3	3,4	0,03	0,07	5,9	0,31
	Bh	0,52	1,03	36,0	71,1	0,85	0,18	0,5	0,82
6 BER	A_1	0,51	0,54	18,4	19,7	0,24	0,30	0,9	0,44