

QUANTITATIVE STUDY OF HUMIC AND FULVIC ACIDS EXTRACTED FROM A MOUNTAIN ACID SOIL (Umbric Dystrochrept) a methodological discussion

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This paper deals with a critical study of classical procedures (fig. 1) of fractionation and purification of soil humic and fulvic acids in the case of the A 12 and B horizons of an acid mountain soil (Umbric Dystrochrept). At each step of the fractionation procedure of the extracts obtained with sodium hydroxide at pH 10 and 12, the losses of carbon and nitrogen were determined (Table I and Table III), and the degree of representativeness of the compounds which were finally recovered, was discussed.

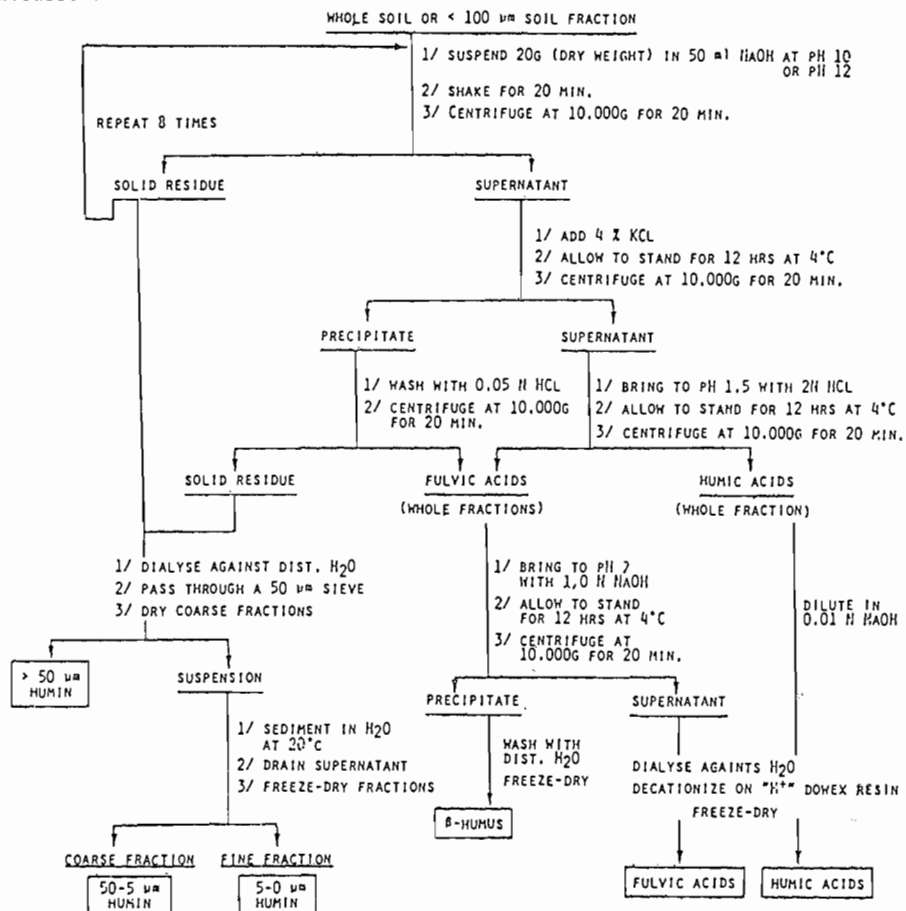


Figure 1 : Procedure of extraction, fractionation and purification of humic compounds.

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The main mineral elements which were removed at each step were also determined (Table IV), and their effect on the percentages of humic compounds recovered was discussed. The following materials were successively isolated during the purification process :

— A fraction of organic compounds associated to fine soil mineral colloids, which were flocculated by adding adequate amounts of KCl, and centrifuged (fig. 2 to 4 ; Table II).

— A fraction of fulvic acids selectively adsorbed on soil aluminum hydroxy-polymers (fig. 5). This fraction was present mostly in the extracts at pH 12, and was more abundant in the (B) horizon.

— Small molecules, which were lost during the dialysis process. This fraction represented about 50 % of the crude fulvic acid fractions.

— Nitrogen-rich, and probably polycondensed compounds having a cationic charge were removed from the crude humic acid fraction, when passed through a cation-exchange resin.

These purification methods were relatively gentle, and lead to fulvic acids with low ash contents, and humic acids with ash contents from 10 to 20 % when extraction pH did not exceed 10. The final percentages of recovered material were from 80 to 88 % for humic acids, and from 12 to 34 % for fulvic acids. Due to the absence of a technique allowing a higher recovery, especially for fulvic acids, these compounds must be considered as representative of soil humified organic matter. In addition, an attempt was made to relate some of their properties (e.g. salt flocculation, coprecipitation with aluminium hydroxypolymers) with possible soil processes. However, the authors are conscious that the disregarding organic monomers and oligomers causes a loss of information concerning the initial steps of humification in the soil studied.

Table III : Recovery of carbon and nitrogen at the different steps of the purification process of humic and fulvic acids extracted at pH 12 and pH 10 from the A 12 and B horizons.

	RECOVERY AT EACH STEP				C/N OF		
	% C		% N		RECOVERED MATERIAL		
	pH 12	pH 10	pH 12	pH 10	pH 12	pH 10	
HUMIC ACIDS							
A ₁₂	CRUDE	100	100	100	100	12,3	14,2
	DIALYZED	93	98	97	97	12,2	14,3
	DECATIONIZED	88	85	85	89	13,2	13,6
(B)	CRUDE	100	100	100	100	12,1	12,8
	DIALYZED	98	99	99	98	11,9	13,0
	DECATIONIZED	88	80	92	78	11,5	13,1
FULVIC ACIDS							
A ₁₂	CRUDE	100	100	100	100	12,4	16,3
	β-HUMUS	45	87	59	66	9,6	21,3
	DIALYZED	25	49	29	51	10,7	15,6
	DECATIONIZED	17	34	19	41	11,2	13,6
(B)	CRUDE	100	100	100	100	13,5	18,0
	β-HUMUS	33	70	55	75	8,1	16,9
	DIALYZED	15	45	21	50	10,0	16,1
	DECATIONIZED	12	34	12	35	13,2	17,4