DISTRIBUTION OF A GREEN HUMIC ACID COMPONENT IN FOREST HUMUS LAYERS OF BRITISH COLUMBIA

The presence of a green component in some humic acid fractions has been reported in Japan and elsewhere (1, 2, 3). This component has been designated the Pg fraction, and is distinguished from the brown components of humic acid by the presence of distinct absorption maxima in the visible region. It has been suggested (2) that the Pg fraction is a fungal metabolite. This note reports the distribution of the Pg fraction in forest humus layers formed under different vegetation in British Columbia.

Horizon samples (4.0 g) from seven sites were extracted with 0.1 *N* NaOH, and the green humic acid fraction separated by gel filtration as described by Kumada and Hurst (2). Only the slowest moving (green) fraction was investigated. In all cases the alkaline Pg extracts were green in color and showed absorption maxima close to 440, 570 and 612 mμ. The relative distribution of Pg fraction (Table 1) was assessed by determination of the extinction coefficient of alkaline solutions at 450 mμ (E_{450}). Approximate estimates of Pg concentrations (Table 1) were obtained by determining the C content of the Pg extract of highest concentration by wet oxidation and assuming the same relationship of E_{450} to C concentration for the other extracts.

In general, well humified horizons (H or Ah) showed substantially higher Pg levels than L or F horizons, reflecting in part the higher contents of the humic acid fraction. However, when estimated Pg-carbon was expressed as percent of the humic acid-C, the larger contribution of Pg in well humified horizons became clear.

Table 1. Distribution of carbon and Pg fraction in forest humus layers

Vegetation	Hor.	pH (H_2O)	Total C %	Humic acid-C %	Relative Pg content*	Estimated Pg-C soil ppm	Estimated Pg-C as % HA-C
Sitka spruce	L	4.2	53.4	5.9	9	42	0.13
	F1	3.3	50.4	6.3	4	19	0.08
	F2	3.4	49.6	6.8	18	84	0.17
Hemlock	L	4.2	52.8	6.9	7	33	0.10
	F	3.5	48.5	9.1	25	117	0.18
	H	3.1	53.3	22.5	80	375	0.48
Lodgepole pine	L	3.8	50.4	6.6	6	28	0.08
	F	4.3	41.8	8.4	6	28	0.06
	H	4.3	29.9	7.6	24	112	0.24
Western red cedar	L	4.9	48.1	4.2	1	5	0.02
	F	5.4	36.6	4.7	0	0	0.00
	Ah	5.3	6.5	2.7	20	94	0.91
Douglas fir	LF	5.3	31.9	4.5	4	19	0.05
	Ah	4.8	7.5	1.4	15	70	0.80
Garry oak	L	4.3	49.5	5.3	4	14	0.05
	Ah	5.0	11.8	3.8	10	468	1.69
Broadleaf maple	L	5.4	45.2	4.9	1	5	0.03
	Ah	4.9	8.8	2.7	40	187	1.13

*Arbitrary units: $E_{450} \times 1000$ for Pg solutions in 0.1 *N* NaOH.

It was also noted that the Pg content of humic acids in Ah horizons formed under deciduous tree cover was markedly higher than that of well humified horizons under the coniferous species examined.

Pg contents of humic acid were higher in Ah than in H layers. In no case did the Pg content approach the 10% value reported for humic acids in some Japanese soils (4). No clear relationship was observed between Pg distribution and pH.

During the separations of Pg fractions by gel filtration, one sample (spruce F2), in addition to the Pg fraction, revealed a faster moving pink fraction with absorption peaks at 490, 520, 550, 600 and 630 mμ. This component was not observed in any other sample, but it may be similar to a purple fraction observed by Kumada and Sato (1) in cellulose column chromatography of an isolated humic acid fraction.

In view of the apparently widespread distribution of Pg and similar pigments in soils, further studies in Canada and elsewhere appear warranted, particularly in relation to humus formation. If, as has been suggested by Kumada and Sato, Pg and similar pigments are derived from porphyrins, then such studies may also be of interest in relation to association of trace metals with soil organic matter.

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