Extended abstract No. 168

THE VARIATION OF THE AMOUNT OF INORGANIC CONSTITUENTS IN SOME COMMON MIRE PLANTS DURING THE VEGETATIVE SEASON

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SUMMARY

Seasonal changes in the inorganic elements of the mire plants common in peat such as *Sphagnum fuscum, Eriophorum vaginatum* and *Ledum palustre* were studied in eastern Finland. The first sample collection was made 12th May and the last one 13th October 1992. Altogether 19 elements Al, B, Ba, Ca, Co, Cr, Cu, Fe, K, Mg, Mn, Ni, P, Pb, S, Sr, Ti, V and Zn were analysed. The concentrations of Ca, K, P and Mg, effect as nutrients, increased considerably during the vegetative season. The consentration of B, Ba, Cu and Mn is much higher in the mire plants than in the surface peat, where as Al, Pb, Sr and Ti exist in greater quantities in the surface peat compared with the plants.

KEYWORDS: nutrients, trace elements, *Sphagnum fuscum, Eriophorum vaginatum, Ledum palustre, peat*

INTRODUCTION

The purpose of this investigation was to study the effect of seasonal changes on the inorganic elements of some mire plants common in peat. This is a primary study and the selective mire plants were *Sphagnum fuscum, Eriophorum vaginatum* and *Ledum palustre.*

STUDY AREA, STUDY METHODS AND METEROLOGIC CONDITIONS

Study area was Varkaansuo –mire in Kuopio, eastern Finland (N 62° 46.833' ; E 27° 30.908'). It is an oligotrophic bog, the area 30 ha and the thickness of peat is 2.5 -3.0 m. (Leino 1985). The cover type is *Sphagnum fuscum* –hummocky cottongrass pine bog. The size of the study area was 20m x 20m during the whole vegetative season.

Mire plants were collected at 3-4-week intervals during the vegetative season 1992. The first collections were made on May 5 and the last on October 13 after the first snow.

On each occasion one sample about 200 g wet weight was sampled from each population. Individual plants were dried at room temperature (+ 22 ^{0}C) and the shrubs were divided into leaves and younger and older stems. Before the final analysis the plants were pulverized homogenized and dissolved in the micro-oven with nitric acid. The samples were analysed for Ca, K, P, Mg, Al, B, Ba, Co, Cr, Cu, Pb, Fe, Mn, Ni, S, Sr, Ti and Zn by an ICP-AES analyser.

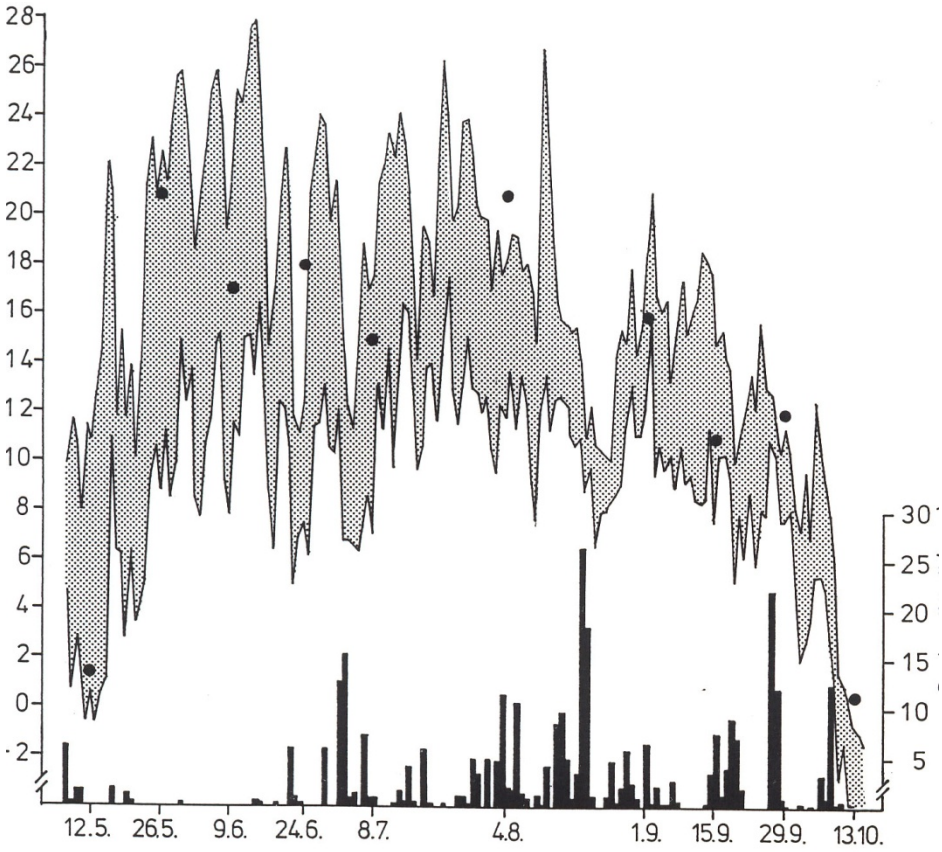

Fig 1. The meteorologic variations during the vegetative season 1992. The black columns show the precipitation (mm/day). The gray area shows the variations of minimum and maximum daily temperatures. The black dots show the temperatures during the sampling time.

RESULTS

The concentration of Ca in the leaves of the mire plants is relatively equal all through the vegetative season contrary to calcium in the stems of the shrubs which grows heavily till the end of the vegetative season. (Table 1., Fig 2.). The concentration of Ca in the younger shoots in late June is much higher than the one in the older shoots. In the surface peat layer we have calcium as much as in the peat forming mire plants such as *Sphagnum fuscum* and *Eriophorum vaginatum.* The concentration of Ca in the other mire plants is multiple compared to the surface peat layer.

The concentration of K was increasing with all the mire plants excluding *Sphagnum fuscum* during the vegetative season. (Table 1., Fig. 2). In the leaves of the mire plants the amount of potassium was about 20-30 % higher in June than in May. The upward trend of potassium in the mire plants stays high all through the vegetative season. There are about ten times more potassium in these shrubs compared to the surface peat layer. With *Sphagnum fuscum* the ratio is three to one toward the surface peat layer.

The concentration of P in the mire plants does not alternate much during the vegetative season. (Table 1., Fig. 2). In early July there is a strong upward trend in the concentration of P within the stems of the shrubs. In the mire shrubs and *in Eriophorum vaginatum* the concentration of P is higher than in the surface peat layer.

Table1. Element concentrations in mire plants and surface peat

	Al	*B*	*Ba*	*Ca*	*Co*	*Cr*	*Cu*	*Fe*	*K*	*Mg*
Sphagnum fuscum	150 - 350	< 3	15 - 27	1950 - 4630	< 0,5 - 0,7	< 0,5 - 1,0	3,0 - 3,9	200 - 390	1800 - 3300	540 - 740
Ledum palustre leaves	60 - 80	11 - 16	54 - 72	4990 - 6170	< 0,5	< 0,5	4,1 - 5,6	60 - 90	3100 - 4500	112 - 126
Ledum palustre stems	30 - 60	6 - 11	68 - 125	2770 - 5960	< 0,5 - 0,6	< 0,5 - 0,6	5,8 - 9,4	40 - 80	1700 - 4600	420 - 810
Eriophorum vaginatum	60 - 150	< 3	19 - 27	910 - 1 120	< 0,5 - 0,7	< 0,5 - 0,6	2,9 - 4,3	110 - 340	2600 - 5300	550 - 840
Surface peat (0-20cm)	480 - 730	0,4 - 1,2	16 - 24	1320 - 1920	0,2 - 0,6	0,7 - 1,2	1,9 - 3,6	700 - 1000	270 - 570	350 - 530
	Mn	*Ni*	*P*	*Pb*	*S*	*Sr*	*Ti*	*V*	*Zn*	
Sphagnum fuscum	156 - 275	0,8 - 2,1	310 - 403	4 - 13	716 - 972	2,9 - 3,6	7,6 - 190	1,6 - 2,7	33 - 46	
Ledum palustre leaves	468 - 1040	< 0,5 - 0,9	040 - 1110	< 3	900 - 1060	2,8 - 6,9	1,4 - 3,3	< 0,3 - 0,8	29 - 37	
Ledum palustre stems	631 - 1490	< 0,5 - 1,0	542 - 992	< 3	435 - 636	2,7 - 9,3	1,6 - 3,2	< 0,3 - 1,1	20 - 36	
Eriophorum vaginatum	39 - 161	0,8 - 1,7	571 - 1090	4 - 8	854 - 1210	3,9 - 5,8	3,1 - 7,4	0,7 - 1,6	50 - 61	
Surface peat (0-20cm)	12 - 42	1,2 - 2,1	480 - 530	18 - 22	1300	14 - 19	13 - 20	1,7 - 3,4	20 - 51	

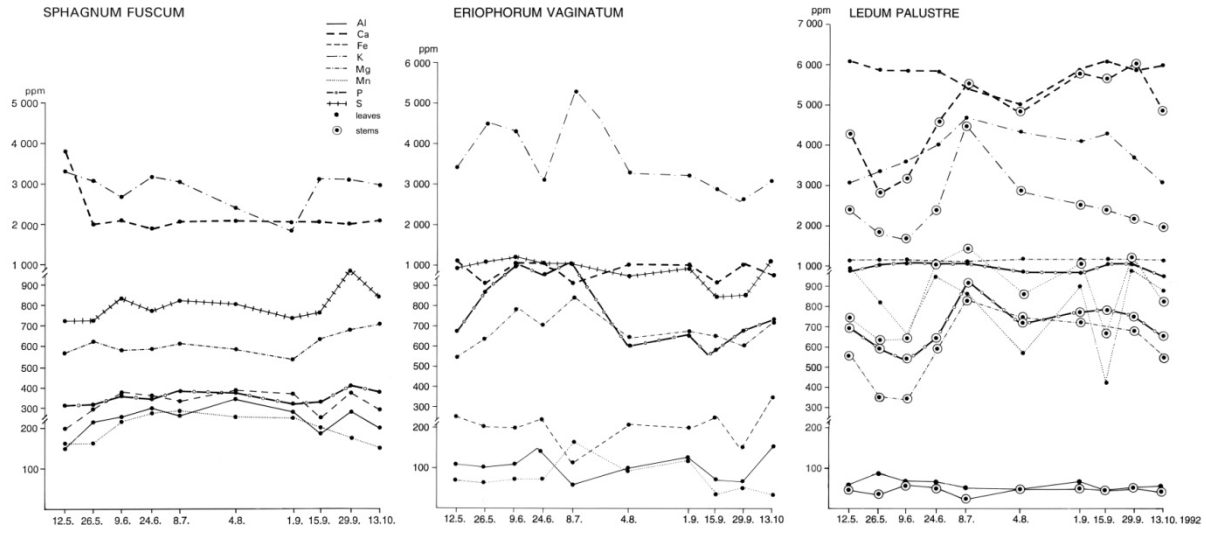

Fig. 2. The variation of the amount of elements during the vegetative season. *(Sphagnum fuscum, Eriophorum vaginatum, Ledum palustre).*

The concentration of Mg in the stems of the shrubs does not alternate much either during the vegetative season. (Table 1.,Fig 2.). In early July there is a same kind of upward trend with magnesium like it is with phosphorus. The concentration of Mg is much higher in the leaves of the shrubs and in *Eriophorum vaginatum* than in the surface peat layer. In the stems of the shrubs and in *Sphagnum fuscum* the amount of magnesium is similar to the surface peat layer.

The amount of sulphur in mire plants is equal with the sulphur in the local surface peat layer. The concentration of S is highest in the leaves of the shrubs and lowest in the older stems of the shrubs. The amount of sulphur in leaves is double as compared with the amount in stems. (Table 1., Fig. 2,).

The concentrations of trace elements like B, Ba, Cu and Mn are much higher in mire plants than in the surface peat layer (Table 1.). In the surface peat layer the concentrations of Al, Pb, Fe, Sr and Ti are much more higher than the ones in the mire plants (Table 1., Fig 2., Fig 3). Salmi has used peat and bog plants as indicators of ore minerals (Salmi 1956).

The Mn/Fe ratio in the surface peat layer is 0,017 - 0,040. The Mn/Fe ratio is 3 - 50 in mire shrubs, 0,4 - 1,7 in *Sphagnum fuscum* and 0,4 - 1,4 in *Eriophorum vaginatum.* (Table 1.)

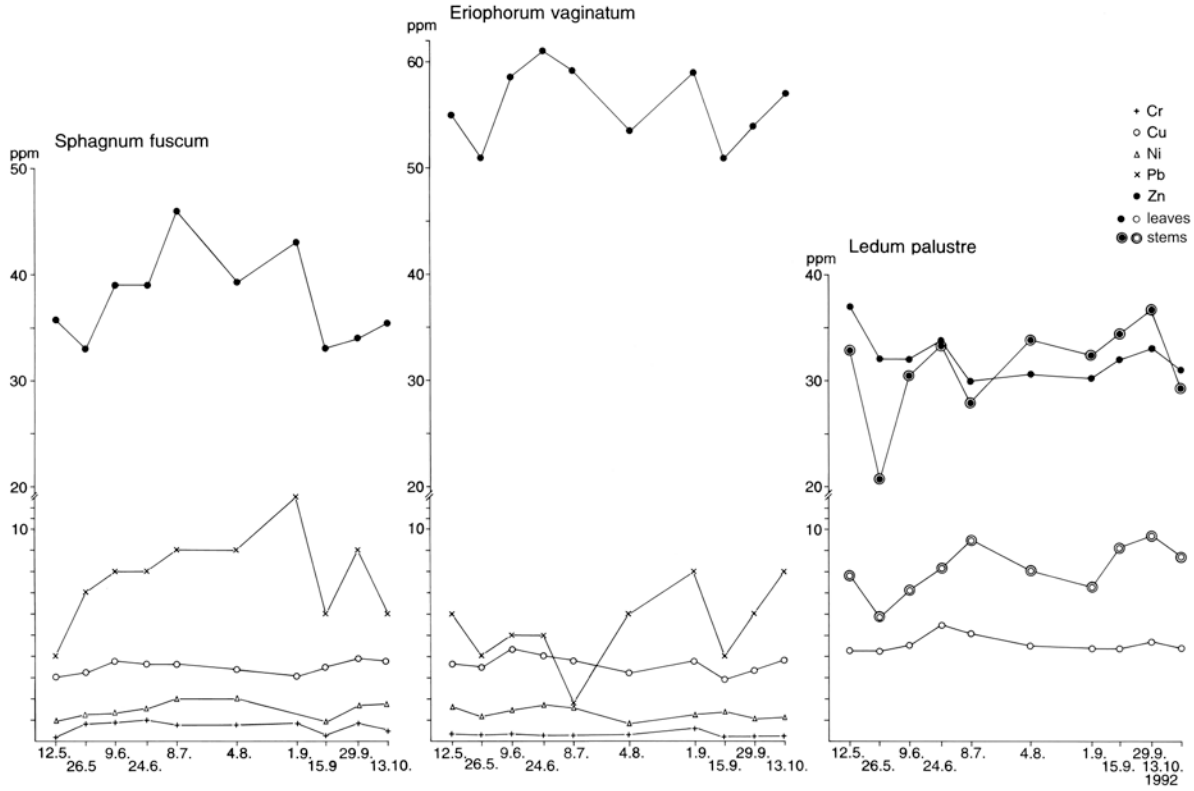

Fig. 3. The variation of the amount of some trace metals during the vegetative season. *(Sphagnum fuscum, Eriophorum vaginatum, Ledum palustre)* .

CONCLUSIONS

The nutrient elements (K, P, Ca, B, Cu) was higher concentration in mire plants than in surface peat layer during the vegetative season. The concentrations of harmful metals (Al, Pb, Sr, V) was higher in surface peat than in plants.

The nutrient concentrations in plants grow strongly in the beginning of June, which is the beginning time of vegetative season in study area. The same reversed trend has been recognized in mire water. Beginning of vegetative season potassium concentration in mire water reduces strongly (Damman 1986, Bragazza 1993).

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