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THE INFLUENCE OF ENVIRONMENT CONDITIONS ON CHEMISM OF SOME MEADOW PLANT SPECIES

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A b s t r a c t. The research was carried out on two meadow objects with clearly different geochemical conditions of the soil environment (a small Ciemięga river valley and meadows surrounding three lakes of Uściwierz, Bikcze, and Nadrybie). Soil and plant samples (6 species - mainly meadow grasses) were taken in 2 vegetation periods - 1995 and 1996.

The results showed that soils from the fertile valley of the Ciemięga river, as the ones derived from low peat silted-up by carbonates and loess silt, had a neutral reaction and a great content of basic components - especially calcium compounds. Boggy soils occurring in the second object, derived mainly from weakly decomposed low or transitional peat, had low ashness and a very acid reaction.

In the chemical composition of almost all plant species there is a clearly more favourable situation in the samples from the Ciemięga river valley meadows. That allows to conclude that the trophism of meadow habitats to a great degree depends on the amount of Ca in the environment, because Ca - by deciding on the soil reaction - indirectly affects the mobility and, therefore, also availability of other nutrients for plants.

K e y w o r d s: Lublin region, meadow, habitat, geochemistry, plant species chemism.

INTRODUCTION

Investigations of the chemism of particular species, and whole groups of meadow plants have already been numerous [4,5,9,10,12,17] - most of all in the aspect of studying relations between the species composition of greenness growth and the nutritional value of the gathered hay [6,11,12,17]. In previous research works searched were answers to the question of what role is played here by the influence of soil environment, climate conditions, and the fertilization applied [4,11,15,16].

What has been discovered till now has indicated that the influence of soil conditions on the chemical composition of meadow plants is mainly related to such

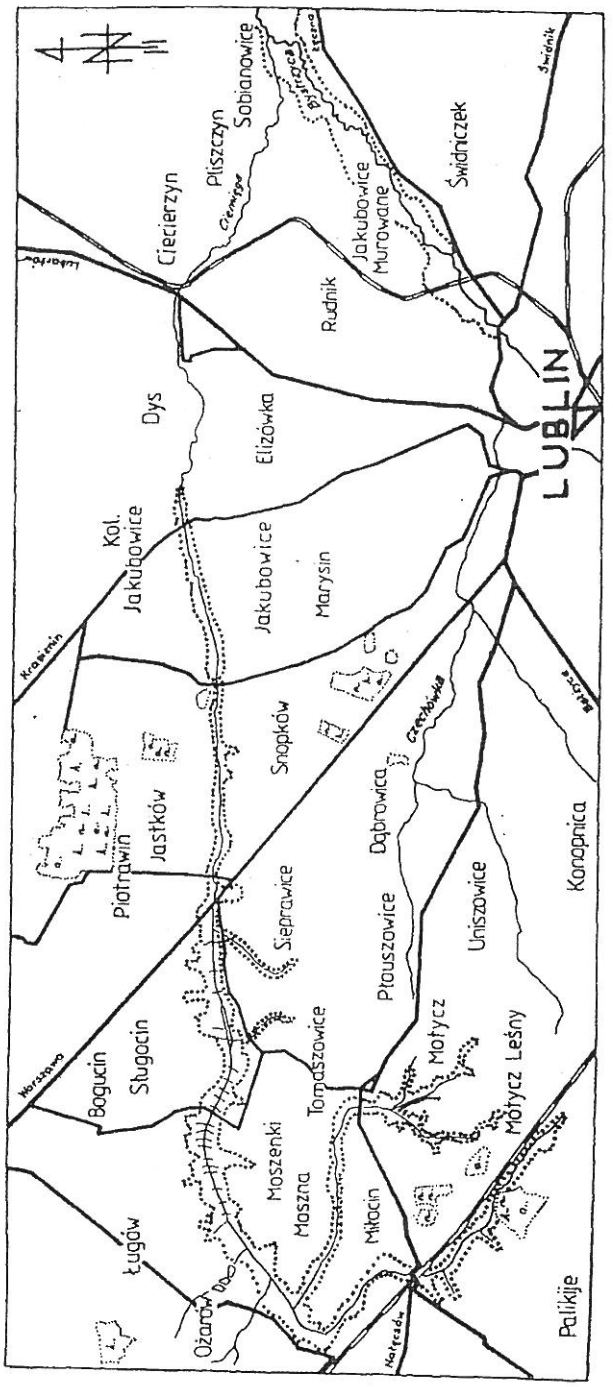

Fig. 1. Sketch map of the Ciemięga river valley.

Table 1. Chemical composition of soils in the studied meadow objects

Object	Sample No.	Soils	pH		Org. matter (%)	$CaCO_3$ (%)	Content in % d.m.					
			H_2O	KCl			P_2O_5	K_2O	Na_2O	CaO	MgO	Fe_2O_3
I Ciemięga	33	Boggy soils and peat-muck soils	6.4* 7.5**	6.0 6.5	30 70	2.0 40.0	0.15 1.60	0.06 0.23	0.06 0.30	2.0 25.0	0.40 2.50	1.30 6.20
II Uściwierz-Nadrybie	38	Boggy soils and peat-muck soils	4.3 5.7	4.1 4.8	75 97	0.0 0.0	0.07 0.18	0.01 0.12	0.02 0.12	0.9 2.4	0.15 0.42	0.20 0.77

*min., **max.

Geochemical conditions in the second object appeared to be totally different. The boggy soils occurring here, derived mainly from weakly decomposed low peat or transitional peat - had low ashness and very acid reaction (Table 1).

In the described habitat conditions stated was a clear (several times higher) content of all components analysed in soils of the Ciemięga valley (Table 1). Similarly favourable situation was in the chemical composition of particular species of plants collected from both objects (Table 2).

While describing each of the measured components, it must be emphasized that nitrogen should be treated differently from the rest of the elements because of high total content of N in all organic soils [1]. Total N amount does not tell us much about the content of the available form of this component to plants. It can only be assumed that soils derived from well decomposed low peat - rich in bases - enable better plant supply with nitrogen [2]. It is partly proved by plant samples collected in both objects. Those samples, except clover, showed shortage of N (Table 2).

Much higher contents of phosphorus in peat soils of the first object is reflected in the content of that element in the chemical composition of meadow plants (species) of both investigated objects (Table 2).

From among grasses, the greatest (twice as large) differences occurred in the composition of meadow-grass. Much smaller differences occurred in cocksfoot and Deschampsia grass, while the smallest differences occurred in red fescue. Generally, we can assume that in the chemical composition of hay collected from the meadow of the object I, the content of P (0.53%) remains near the limit value. The same index for plants of the object II shows a significant shortage of P (0.33%).

Characteristic low content of potassimu for all organic soils, which - in these soils - decides of the fertility of the habitat, occurred here with all the sharpness - especially in soils of the IInd object (0.02-0.06% K_2O). Much higher (even 10 times) contents of K in soils of the Ist object may be explained by a greater content of mineral parts in peat and generally higher level of the agricultural culture of those meadows (due to fertilization).

According to the situation in soils, the content of potassium in plant samples (species) appeared to be also low - especially in those collected in the object II (hay 0.85%). Clearly higher content of K (1.23 %) in the hay of the Ist object is also far from the content assumed to be the optimum one for good hay (2%).

showed a sufficient content of Mg in the hay of the Ist object (0.42 % Mg) - and a clearly too small content in the IInd one (0.17%).

The highest magnesium uptake was shown by white clover (0.96% Mg - I, 0.37% - II), while grasses showed smaller uptake (among which cocksfoot had the highest Mg uptake). In other grass species, the content of Mg was relatively equal (Table 2).

Soils in the Ciemięga valley contain great amounts of iron compounds (1.3-6.2% Fe_2O_3). However, at richness of bases and a neutral reaction, the mobility of Fe and its availability to plants can be highly limited [2].

In the very acid soils of the IInd object, there was a 6-8 times lower content of Fe. In such conditions it is easily mobilized and quickly exhausted from the soil (also transported deeper into the profile). In such a situation, the possibilities of fulfilling the needs of plants in terms of iron may be similar in such different conditions. It is proved by the results for hay of both objects - (0.04% - I and 0.02% Fe - II). At a given limit value of Fe 0.01% (100 mg/kg), we can assume that the problem of supplying meadow plants with iron does not exist.

It can be stated that a somewhat higher and more equalized ability to take Fe was shown by the species collected in the Ciemięga river valley (0.03-0.05 %) than by the analogous species existing in ecological conditions of the IInd object (0.01-0.02 % Fe) - with one exception of Deschampsia grass, which reacted in an opposite way.

CONCLUSIONS

1. The meadow objects chosen for research - occurring within peat-lands situated far from each other - represented different ecological and geochemical conditions.

2. Soils of the object I are different from those of the object II by a higher content of mineral parts, lack of acidity, and higher contents of all measured chemical components.

3. The stated ecological variability of both investigated meadow habitats affected significantly the differentiation of chemical composition of the analyzed plant species.

4. The content of analysed elements was significantly higher in plant species collected from meadows of the fertile valley of Ciemięga, especially the content of calcium.

5. The trophism of meadow habitats in conditions of peat soils depends on the content of calcium which decids on soil reaction and indirectly affects the mobility of elements in soil and their availability to plants.