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# INFLUENCE OF THE KIND OF MOORSH AND THE STATE OF ITS TRANSFORMATION ON THE GERMINATION AND GROWTH OF *LOLIUM PERENNE* IN THE POT PLANT EXPERIMENT DURING SPRING-SUMMER CYCLE*

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A b s t r a c t. The influence of the kind of moorsh and the state of its transformation, as expressed in numerical values of the water absorption index $W_1$, on the germination conditions of *Lolium perenne* seeds and further growth of young plants have been studied. It was found out that the main factor differentiating these conditions was grain structure of the moorsh mass that determined water conductive properties of the studied soil. The highest number of germinated seeds (40-85%) and the best plant growth was observed on peaty moorshes ($Z_1$) of fine fibrous character with fresh humus admixture. Considerably worse conditions for darnel germination and growth (25-50% of germinated seeds) were found on proper fine-grained moorsh ($Z_3$). It was confirmed by a relatively low dry mass yield of plants collected on these soils after completion of the experiment. The highest differentiation of seedlings, and at the same time the poorest germination were found on the proper degraded moorsh with crumble-grained structure with poor conductivity, and on peaty fibrous moorsh that formed a macro-porous layer on the soil surface in the conditions of intensive insolation and high air temperatures. This macro-porous layer efficiently limited capillary rise and evaporation. It was observed that the state of transformation of moorsh formations expressed with numerical values of the $W_1$ index did not exert any visible influence on the conditions of plant vegetation. The above observation proved that the $W_1$ index is only vaguely connected with the soil conductive properties.

K e y w o r d s: moorsh formation, secondary transformation of peat formations, *Lolium perenne* germination and growth.

## INTRODUCTION

In the group of environmental factors that influence stability and life of valuable and high yielding grass varieties on peat meadows, water conditions are the

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basic ones. When they get worse that is often due to unfavourable changes in the structure of the soil organic matter resulting from the secondary transformation processes, productivity and stability of the grassland deteriorate. For example, in the prognostic drying soil-moisture complex (C) characterized by unfavourable water conditions and high susceptibility to soil drying as a result of limited water rising abilities and little reserve of easily available water, highly productive grass associations survive for 6-10 years and then usually undergo degradation [8]. In the green it is manifested by such phenomena as: loosening of its compactness, simplification of botanical composition, predominance of some varieties of high grasses, and an increasing contribution of green nitrogen-seeking plants including weeds [7,10]. Since attempts at improving meadow quality and soil sodding by means of semi-technical treatments is often of little efficiency, there is a need to renew meadows by their full cultivation consisting in the ploughing of old sod and sowing new seeds. However, the above mentioned treatment is labour consuming and expensive and it is not always successful due to the sowing failure [10]. There are several factors that decide on the success of the renovation treatments of degraded meadows on the peat-moorsh soils, and among them, special attention should be paid to the degree of peat mass transformation under the influence of moorshing processes, and accuracy with which cultivation treatments are applied, as well as the time of sowing [8].

The aim of the present work was to determine the influence of the kind of moorsh and the state of its transformation on the germination and growth of *Lolium perenne* during spring-summer period, i.e., in the conditions of high temperatures and intensive insolation of the soil.

## MATERIALS AND METHODS

Moorshes with various degree of transformation, collected from the peat-moorsh soils of Polesie Lubelskie and the Biebrza river Basin (Kotlina Biebrzanska) were the study material for the present experiment. These were peaty moorshes - $Z_1$ (4 soils), and proper (grained) moorshes $Z_3$ (10 soils) collected at the depth of 5-10 cm (weakly moorshified soils-MtI) and 5-20 cm (medium and strongly moorshified soils MtII-III).

Plastic buckets with the volume of 11.8 l and upper diameter of 24 cm served as pots. They had a plastic pipe that watered the soil samples from the bottom. According to the assumed description of the profile structure of the meadow [9], 30 cm of pot height was equal to the thickness of the grass root layer. Two levels of moisture were applied, the first reflecting 80% of full soil water capacity, and the second -

close to the lower limit of water capacity easily available for grass. It corresponds to the moistures level equal to pF 2.7 and increased by 10%. The basis for the determination of the second moisture level was pF 2.7 evaluation carried out on the volumetric samples collected at the same time and location as the soil material for the pots. Taking into consideration the fact that water retention of the soil material in the pots can be different from the soil water capacity in nature, as it largely depends on the bulk structure and density, additional determinations of the moisture level at pF 2.7 in the soil collected from the trial pots before sowing and after the grass was cut, was carried out.

The experiments were carried out in four repetitions. For each of the soil samples that were weighed and specially prepared before filling the pots, 100 ml of Knop's nutrient solution was sprayed into each pot during soil mixing. The test plant was darnel - *Lolium perenne* L. var. Arka, a grass variety that grows quickly and is widely used in grass mixtures for pastures and alternating cropland [1,5,6]. Fifty seeds were sown into each pot. The experiment started on May, 29th and was carried out for 6 weeks.

Pot studies were carried out in the vegetation house of the University of Agricultural in Lublin. During the whole experimental period constant moisture level was maiantained in the pots. Any water losses in the soil were supplemented every day by adding water to the bottom of the pots up to a constant level as determined by the calculation of their mass. On hot days water was added twice a day. A detailed description of soil preparation procedure before sowing and experimental methods was given elsewhere [4].

Physical and water properties of the studied soils were determined by the methods used at the Institute For Land Reclamation of Grassland Farming (IMUZ) [12], and the state of secondary transformation of peat soils was determined on the basis of the water retainability index $W_1$ [2].

The moorsh materials used in the present experiment (Table 1) represented formations formed from proper peats that are characterised by the ash content lower than 25%. Soil No.3 was an exception as its mineral content was 38%. The state of moorsh transformation as determined by means of the numerical $W_1$ index value ranged from 0.44 to 0.82 (Table 1). The lowest value of the index was found in the soil No. 12 from Sosnowica. The above soil represented fibrous, very weakly moorshified moss-sedge peat, and the highest one in the soil No. 5 from Modzelówka-Wykowo that represented grained moorsh.

As far as soil reaction was concerned acidic soils were dominant (10 soils). For these soil samples pH determined in the 1 N KCl solution ranged from 4.5-5.5. Two soils (No. 7 and 11) were very acid (pH<4.5), and two soils (Nos 2 and 8) - slightly

**Table 1.** Physical and chemical properties of the investigated soil

| No. of soil | $W_I$ | Kind of moorsh | Ash content % d.m. | Bulk density g $cm^{-3}$ | Total porosity vol. % | pH | | mg 100 $g^{-1}$ of soil | | | mg 100 $g^{-1}$ of soil | | mg 1000 $g^{-1}$ of soil | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $H_2O$ | 1 N KCl | $P_2O_5$ | $K_2O$ | Mg | N-$NH_4$ | N-$NO_3$ | B | Cr | Zn |
| 12 | 0.44 | $Z_1$ | 22.69 | 0.21 | 88.5 | 5.13 | 4.54 | 26.0 | 16.9 | 30.0 | 7.31 | 23.34 | 4.4 | 4.0 | 83.5 |
| 11 | 0.48 | $Z_1$ | 20.54 | 0.28 | 84.7 | 4.72 | 4.23 | 49.0 | 9.6 | 9.0 | 4.53 | 29.03 | 3.6 | 3.5 | 22.0 |
| 1 | 0.55 | $Z_1$ | 17.56 | 0.25 | 84.6 | 5.48 | 5.18 | 60.0 | 19.3 | 60.0 | 1.07 | 37.76 | 8.0 | 50 | 33.0 |
| 10 | 0.60 | $Z_3$ | 21.24 | 0.34 | 81.4 | 5.44 | 4.97 | 34.0 | 15.7 | 21.0 | 2.05 | 18.52 | 4.4 | 4.0 | 17.5 |
| 13 | 0.61 | $Z_1$ | 15.14 | 0.24 | 85.2 | 5.84 | 5.33 | 41.0 | 8.4 | 7.0 | 1.67 | 14.23 | 7.1 | 0.5 | 8.5 |
| 3 | 0.63 | $Z_3$ | 37.81 | 0.46 | 74.9 | 5.17 | 4.64 | 37.0 | 13.3 | 40.0 | 0.49 | 19.90 | 4.6 | 5.5 | 55.0 |
| 6 | 0.65 | $Z_3$ | 20.52 | 0.32 | 82.5 | 5.38 | 4.93 | 87.0 | 10.8 | 60.0 | 1.47 | 22.99 | 8.4 | 4.5 | 119.0 |
| 9 | 0.65 | $Z_3$ | 18.94 | 0.31 | 80.9 | 5.45 | 4.97 | 34.0 | 9.6 | 8.0 | 2.75 | 17.39 | 3.4 | 3.5 | 18.0 |
| 7 | 0.67 | $Z_3$ | 16.26 | 0.28 | 82.7 | 4.75 | 4.23 | 34.0 | 28.9 | 40.0 | 1.32 | 23.58 | 9.5 | 4.0 | 26.0 |
| 4 | 0.71 | $Z_3$ | 15.80 | 0.31 | 80.9 | 5.70 | 5.32 | 46.0 | 15.7 | 30.0 | 2.67 | 24.22 | 6.8 | 5.0 | 16.5 |
| 8 | 0.71 | $Z_3$ | 22.77 | 0.30 | 83.6 | 6.15 | 5.75 | 64.0 | 10.8 | 30.0 | 2.88 | 19.93 | 8.0 | 4.5 | 24.0 |
| 2 | 0.72 | $Z_3$ | 18.03 | 0.36 | 77.8 | 4.95 | 4.49 | 18.0 | 15.7 | 50.0 | 1.15 | 21.01 | 7.5 | 4.5 | 19.0 |
| 14 | 0.74 | $Z_3$ | 21.47 | 0.29 | 84.1 | 5.78 | 5.33 | 64.0 | 12.0 | 12.0 | 2.96 | 13.41 | 12.4 | 2.0 | 12.5 |
| 5 | 0.82 | $Z_3$ | 22.27 | 0.39 | 78.7 | 5.54 | 5.00 | 37.0 | 9.6 | 40.0 | 0.16 | 13.69 | 6.6 | 4.0 | 25.0 |

Symbols used: $W_I$ - index of secondary transformation of moorsh material, $Z_1$ - peaty moorsh, $Z_3$ - proper (grained) moorsh.

acid (pH 5.5-6.5). The $P_2O_5$ contents of the studied soils was of a very low range (7 soils <40 mg100 $g^{-1}$ of dry mass), low range (4 soils - 41-60 mg100 $g^{-1}$), medium range (2 soils - 61-80 mg 100 $g^{-1}$), and high range (1 soil 81-120 mg100 $g^{-1}$). Half of the studied soils had low magnesium content (21-40 mg 100 $g^{-1}$), 4 soils - very low magnesium content (<20 mg 100 $g^{-1}$) and three soils - medium Mg content (41-80 mg 100 $g^{-1}$). Whereas all the studied soils showed very low potassium content (<30 mg 100 $g^{-1}$ of dry soil) which classed in the last fifth grade in this respect [11].

## RESULTS AND DISCUSSION

### Influence of the kind of moorsh and state of its transformation on the darnel seeds germination

In the first moisture variant that corresponded to 80% of the maximum soil saturation, the number of germinated seeds on the peat moorshes ($Z_1$) ranged from 15 to 85.5%, whereas on the grained moorsh formations ($Z_3$), with the exception of the soil No. 3 on which there was no germination observed, from 1.5 to 53% (Table 2).

The wide spread in the numerical intervals describing percentages of germinated seeds showed that even on the same type of moorsh formation, and with equal moisture level conditions for plant germination were very different. It is undoubtedly related to some specific physical properties of the soil mass, water properties in particular, that differentiate soils in their conductive capabilities, and hence, also susceptibility to drying even though they are formed from the same type of moorsh. Analysing the reasons for the differences observed in the seed germination rates one should pay attention to these soil properties that directly influence water conditions in the soil in the immediate surroundings of seeds and seedling roots. No doubt, grain structure of the soil mass is one of these properties. Soil conductive properties, and hence also the abilities to satisfy plants water requirements by means of capillary rise play an important part here. When there are no rainfalls, the efficiency of rise in the natural conditions is especially important during the first stages of plant growing including seed germination and seedlings growth. When the efficiency of rise is low, surface soil layer 0-2 cm in which there are grass seeds, dries out quickly even to the air dry state [7]. This phenomenon is intensified significantly in the conditions of strong insolation and high air temperatures, enhanced by the black surface of moorsh that absorbs radiation. Without any doubt, very poor germination of darnel on the soil samples Nos 2,5,6,7,9 and 10 (from 1.5 to 20%), or no germination at all (soil No. 3), were closely related to the specific character of the soil mass formed during the process of secondary peat transformation. These were the moorshes with differentiated grain and

**Table 2 continuation**

| No. of soil | Kind of moorsh | Ash content % d.m. | $W_1$ | Soil layer in the pot in cm | Moisture level, vol. % | | | | | Water capacity at pF 2.7 of the soil in pot vol. % | | Germination capacity in % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I | | II | | | | | | |
| | | | | | Ia | Ib | IIa | IIb | IIc | IId | IIe | I (%) | II (%) |
| 14 | Z3 | 21.5 | 0.74 | 2-7 | 60.3 | 54.2 | 56.9 | 62.6 | 56.6 | 51.41 | 54.76 | 26.5 | 54.5 |
| | | | | 10-15 | | 61.9 | | | 64.1 | | | | |
| | | | | 20-25 | | 67.9 | | | 72.6 | | | | |
| 5 | Z3 | 22.3 | 0.82 | 2-7 | 56.58 | 52.5 | 46.7 | 51.4 | 48.4 | 61.19 | 50.38 | 13.2 | 1.3 |
| | | | | 10-15 | | 60.5 | | | 58.2 | | | | |
| | | | | 20-25 | | 66.4 | | | 66.2 | | | | |

$W_1$ - index of secondary transformation of moorsh material; Ia - soil-moisture level experimentally determined as corresponding to 80% of full soil saturation; Ib - real moisture content determined after completion of pot experiment; IIa - soil-moisture as corresponding to pF 2.7 determined in field samples; IIb - soil-moisture experimentally determined as corresponding to pF 2.7 enlarged by 10%; IIc - real moisture determined after completion of pot experiment; IId - soil-moisture as corrresponding to pF 2.7 determined in samples taken from preexperimental pots; IId - soil-moisture as corrresponding to pF 2.7 determined in samples taken from experimental pots after completion of pot experiment.

**T a b l e 2 continuation**

| No. of soil | Kind of moorsh | Ash content % d.m. | $W_1$ | Soil layer in the pot in cm | Moisture level, vol. % | | | | | Water capacity at pF 2.7 of the soil in pot vol. % | | Germination capacity in % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I | | II | | | | | | |
| | | | | | Ia | Ib | IIa | IIb | IIc | IId | IIe | I (%) | II (%) |
| 6 | Z3 | 20.5 | 0.65 | 2-7 | 59.0 | 54.9 | 46.1 | 50.7 | 46.5 | 42.53 | 53.57 | 20.0 | 0 |
| | | | | 10-15 | | 63.2 | | | 60.8 | | | | |
| | | | | 20-25 | | 71.5 | | | 69.9 | | | | |
| 9 | Z3 | 18.9 | 0.65 | 2-7 | 59.8 | 55.5 | 54.8 | 60.3 | 55.4 | 55.42 | 62.71 | 8.5 | 13.0 |
| | | | | 10-15 | | 68.1 | | | 65.7 | | | | |
| | | | | 20-25 | | 69.5 | | | 70.8 | | | | |
| 7 | Z3 | 16.3 | 0.69 | 2-7 | 63.8 | 56.8 | 46.6 | 51.2 | 44.9 | 48.27 | 55.58 | 18.0 | 0 |
| | | | | 10-15 | | 71.0 | | | 57.7 | | | | |
| | | | | 20-25 | | 72.4 | | | 61.9 | | | | |
| 4 | Z3 | 15.8 | 0.71 | 2-7 | 57.2 | 55.2 | 54.8 | 60.3 | 54.1 | 57.5 | 56.54 | 53.0 | 35.0 |
| | | | | 10-15 | | 62.8 | | | 58.5 | | | | |
| | | | | 20-25 | | 64.7 | | | 64.2 | | | | |
| 8 | Z3 | 22.8 | 0.71 | 2-7 | 63.2 | 56.4 | 45.7 | 50.2 | 38.6 | 47.48 | 52.46 | 48.0 | 0 |
| | | | | 10-15 | | 64.2 | | | 51.9 | | | | |
| | | | | 20-25 | | 64.2 | | | 55.1 | | | | |
| 2 | Z3 | 18.0 | 0.72 | 2-7 | 59.0 | 57.9 | 52.0 | 57.2 | 41.8 | 53.58 | 55.94 | 1.5 | 0 |
| | | | | 10-15 | | 64.1 | | | 63.9 | | | | |
| | | | | 20-25 | | 69.3 | | | 69.4 | | | | |

**T a b l e 2.** Germination capacity of *Lolium perenne* L. at differently transformed moorsh soils

| No. of soil | Kind of moorsh | Ash content % d.m. | $W_1$ | Soil layer in the pot in cm | Moisture level, vol. % | | | | | Water capacity at pF 2.7 of the soil in pot vol. % | | Germination capacity in % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | I | | II | | | | | | |
| | | | | | Ia | Ib | IIa | IIb | IIc | IId | IIe | I (%) | II (%) |
| 12 | Z1 | 22.7 | 0.44 | 2-7 | 66.7 | 63.1 | 68.6 | 75.4 | 74.5 | 60.21 | 60.17 | 85.5 | 63.0 |
| | | | | 10-15 | | 75.0 | | | 75.9 | | | | |
| | | | | 20-25 | | 76.6 | | | 78.3 | | | | |
| 11 | Z1 | 20.5 | 0.48 | 2-7 | 64.1 | 60.7 | 55.7 | 61.3 | 54.4 | 57.69 | 66.36 | 15.0 | 9.0 |
| | | | | 10-15 | | 72.0 | | | 67.3 | | | | |
| | | | | 20-25 | | 73.1 | | | 73.7 | | | | |
| 1 | Z1 | 17.6 | 0.55 | 2-7 | 65.4 | 59.1 | 68.4 | 75.2 | 74.1 | 64.69 | 63.00 | 40.5 | 56.0 |
| | | | | 10-15 | | 76.2 | | | 76.6 | | | | |
| | | | | 20-25 | | 77.2 | | | 78.5 | | | | |
| 10 | Z3 | 21.2 | 0.60 | 2-7 | 62.4 | 58.3 | 53.1 | 58.4 | 47.0 | 57.32 | 66.53 | 4.5 | 0 |
| | | | | 10-15 | | 68.9 | | | 64.8 | | | | |
| | | | | 20-25 | | 69.9 | | | 70.1 | | | | |
| 13 | Z1 | 15.1 | 0.61 | 2-7 | 66.3 | 62.2 | 52.9 | 58.2 | 54.1 | 50.91 | 50.53 | 62.5 | 4.5 |
| | | | | 10-15 | | 67.4 | | | 64.1 | | | | |
| | | | | 20-25 | | 73.1 | | | 67.6 | | | | |
| 3 | Z3 | 37.8 | 0.63 | 2-7 | 55.7 | 42.7 | 54.3 | 59.7 | 55.6 | 52.52 | 54.71 | 0 | 0 |
| | | | | 10-15 | | 62.0 | | | 64.2 | | | | |
| | | | | 20-25 | | 68.2 | | | 67.0 | | | | |

crumble structure formed by the hydrophobic humus mass strongly condensed in grains. Without rainfalls these types of moorsh dry out very quickly due to their poor absorption and conductive properties. In the soil No. 3 collected close to the dead basin of the river Ełk, an additional factor that worsened soil conductive properties was a considerable admixture of clayey material.

Quick drying of the sun-warmed surface layer of moorsh and loss of capillary contact with its deeper layers with sufficiently moisturised soil mass do not appear only in the moorsh soils with grained - crumble structure. They are also observed in the soils formed from peaty moorsh formations with characteristic fibrous structure. In the process of quick drying, moorsh mass of these soils gets partially loosened due to the increasing elasticity of drying out fibres. A thin, loose felt-like layer of moorsh is formed on the surface of the pot. It loses its conductive properties due to its macroporous structure. In the case of soil No. 11 very poor germination (15% of germinated seeds) was undoubtedly due to the specific influence of soil properties that result from the fibrous character of the moorsh mass, on the water relations in the surface soil layer, and hence also on the conditions for seed germination. Moreover, the presence of this layer efficiently limits evaporation which is confirmed by much lower amounts of water added to the pots. The remaining peat moorshes (soils Nos 1,12,13) are characterised by loose, fibrous - lumpy structure and contain a certain admixture of fresh humus in their mass, as well as the soils formed from finely grained proper moorsh (soils Nos 4,8,14) created mostly favourable environment for grass germination and its growth in the conditions of the first moisture variant. Hence, the number of darnel seeds that germinated on these soils was considerably higher and ranged from 40.5 to 85%, and from 26.5 to 53%, respectively.

The study results presented in Table 2 and Figs 1-4 according to soil ranking taking into consideration the degree of their secondary transformations as determined by the water retainability index $W_1$, show that this state did not exert any significant influence on the results of the present study. No trend was observed in the number of germinated seeds and young plants growth in relation to the increasing values of the $W_1$ index.

In the conditions of the second variant of soil moisture that corresponded to the water content at the pF 2.7 increased by 10%, the number of germinated darnel seeds on the peaty moorshes (soils Nos 1,11,12) were on the whole similar to the ones (9.0 to 63%) observed in the first moisture variant. It was undoubtedly related to the favourable water conditions. The second level of humidity did not change moisture conditions in most of the studied soils in any significant way (Table 2, columns Ia and Ib). They were in general similar, and in the soils 1 and 12 (peaty

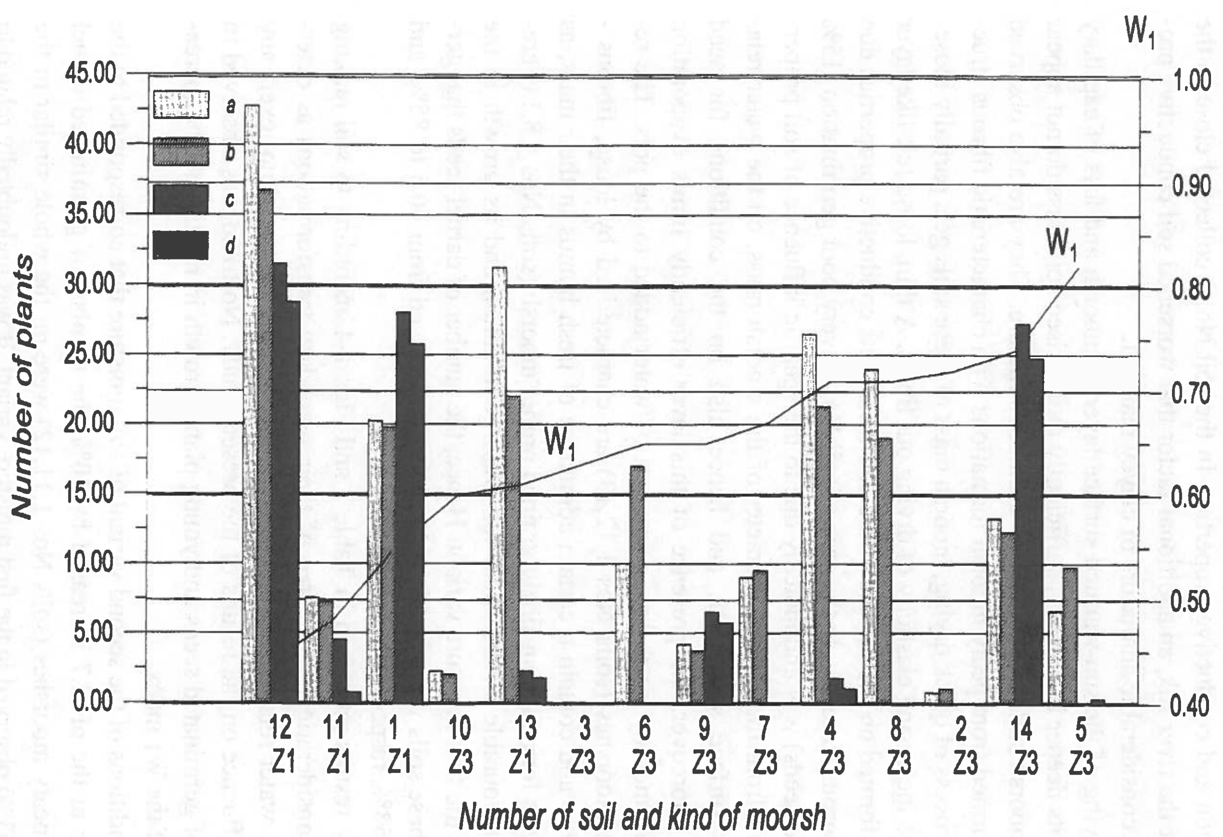


**Fig. 1.** Changes of number of plants of *Lolium perenne*.
a - number of plants at the 14-th and b - at the 42nd day after sowing in the first soil-moisture variant; c - number of plants at the 14th and d - at the 42nd day after sowing in the second soil-moisture variant.

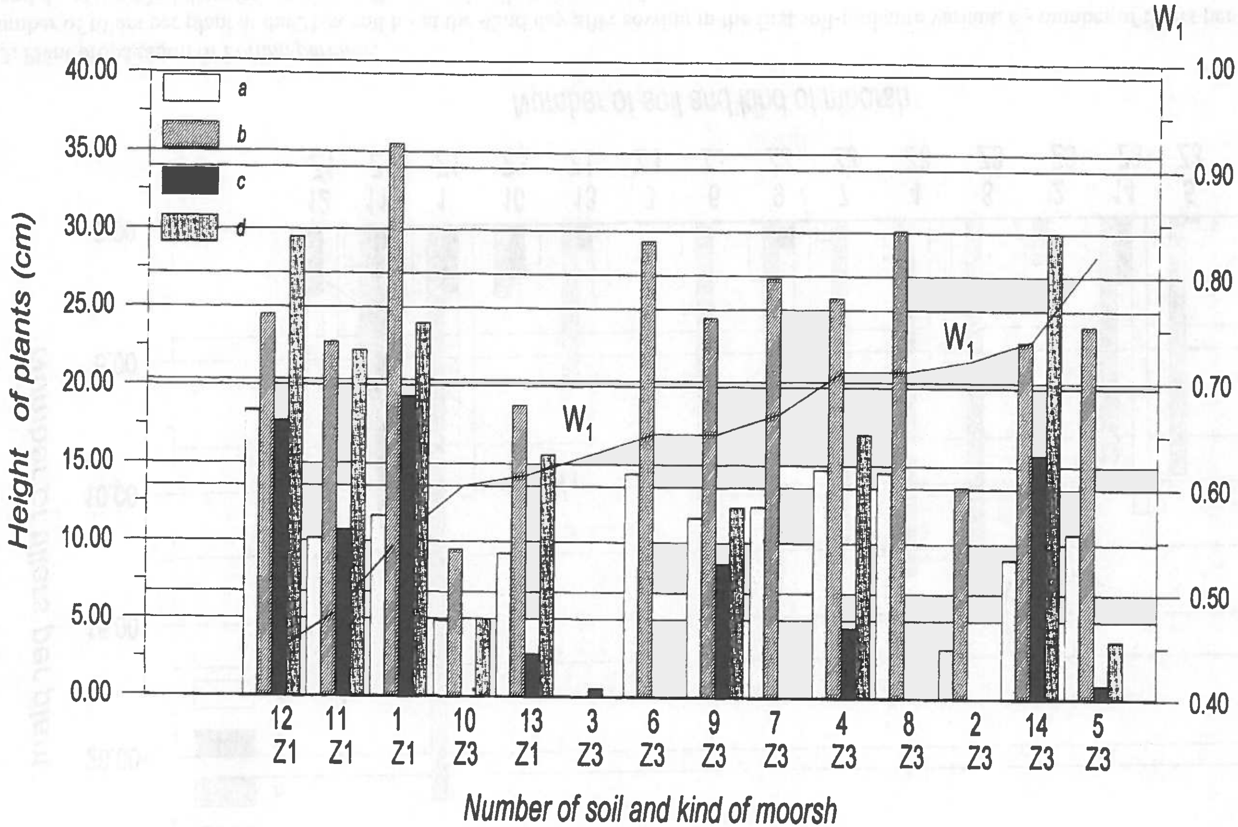


**Fig. 2.** Changes height of *Lolium perenne*.
a -plant height on the 21st and b-on the 42nd day after sowing in the first soil-moisture variant, c-plant height on the 21st and d-on the 42nd day after sowing in the second soil-moisture variant.

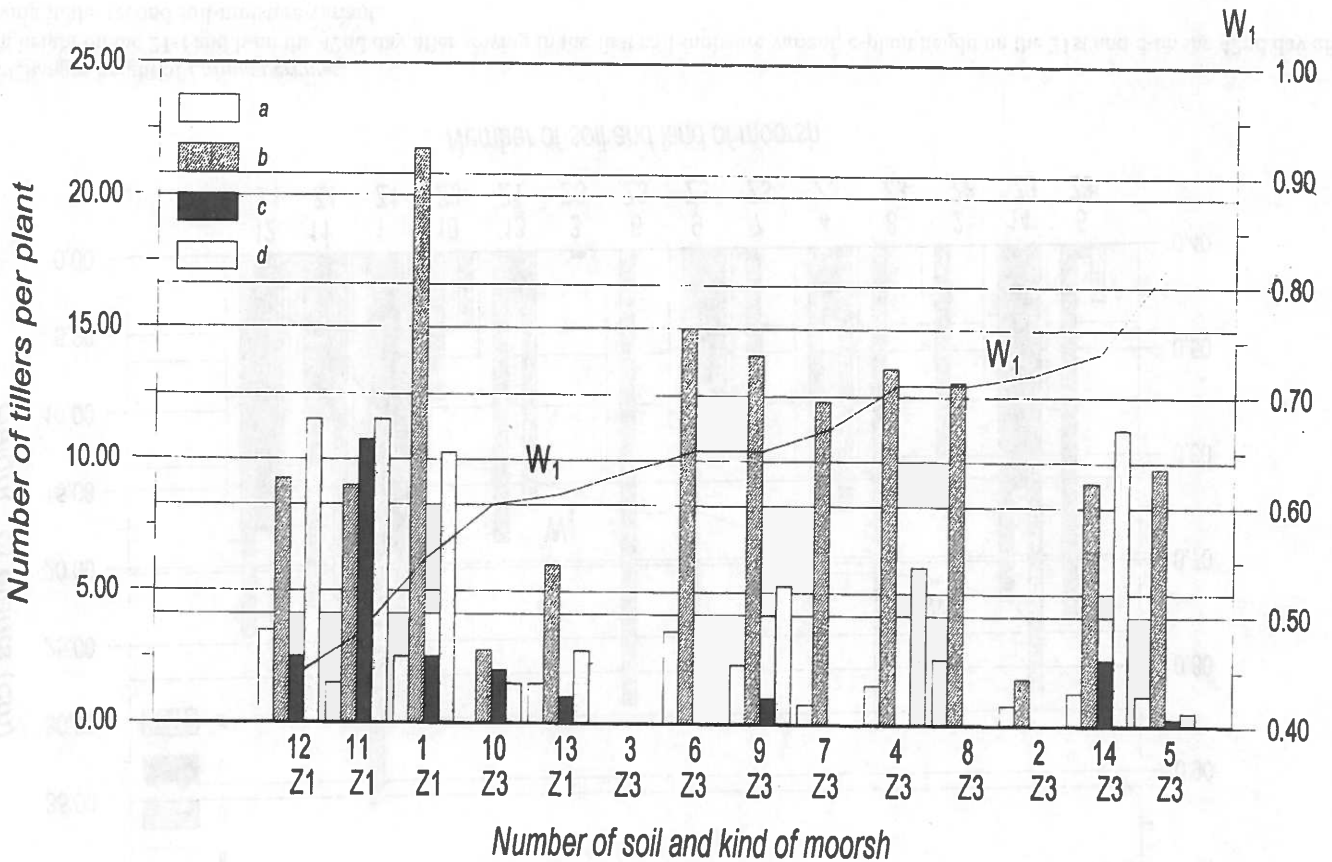


**Fig. 3.** Plant propagation of *Lolium perenne*.
a - number of tillers per plant at the 21-st and b - at the 42nd day after sowing in the first soil-moisture variant; c - number of tillers per plant at the 21st and d - at the 42nd day after sowing in the second soil-moisture variant.

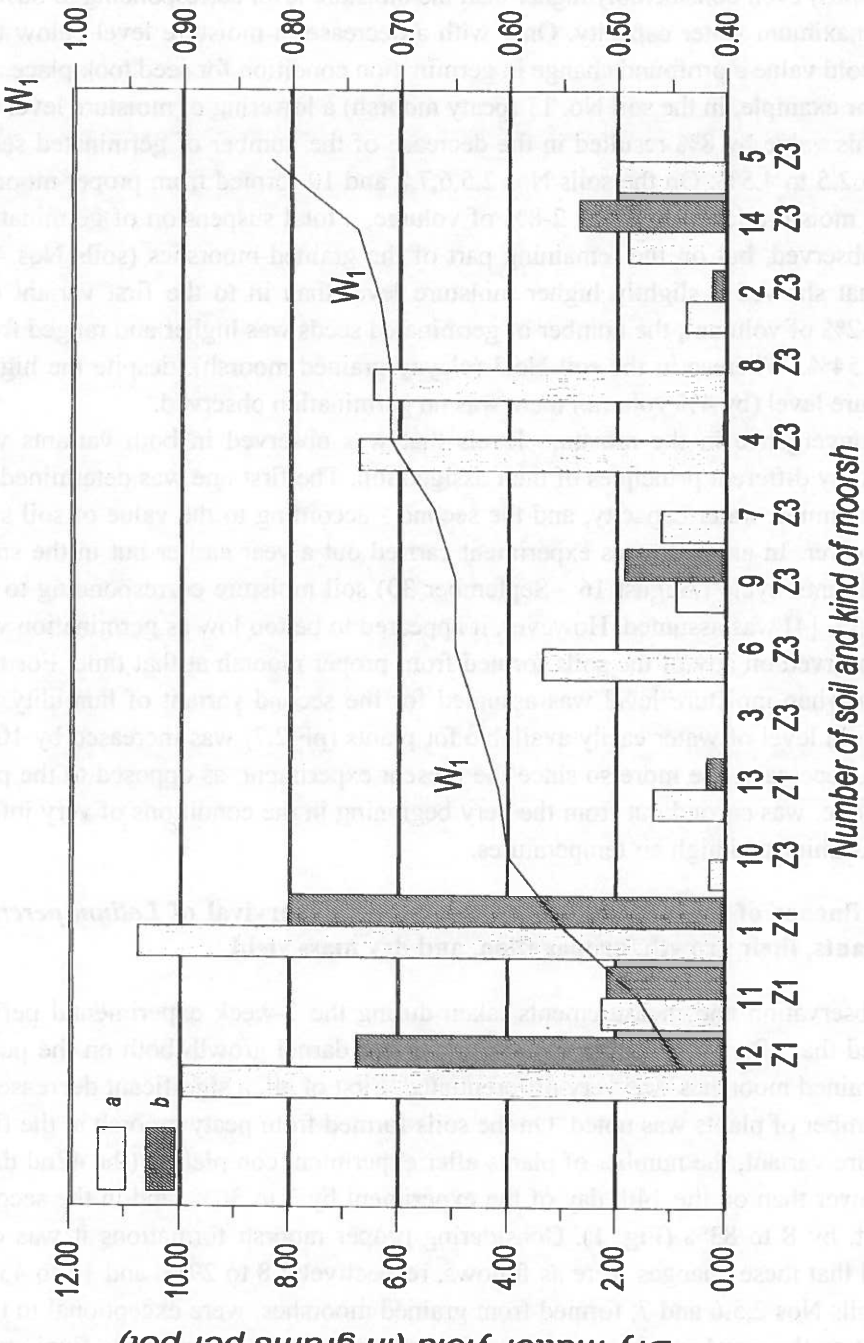


**Fig. 4.** Dry matter yield of *Lolium perenne*. a - dry matter of plants yielded in the first and b - in the second soil moisture variant.

moorshes) even considerably higher than the moisture level corresponding to 80% of their maximum water capacity. Only with a decrease in moisture level below this threshold value a profound change in germination condition for seed took place.

For example, in the soil No. 13 (peaty moorsh) a lowering of moisture level below this value by 8% resulted in the decrease of the number of germinated seeds from 62.5 to 4.5%. On the soils Nos 2,5,6,7,8 and 10 formed from proper moorsh, at the moisture level lower by 2-8% of volume, a total suspension of germination was observed, but on the remaining part of the grained moorshes (soils Nos 4,9, 14) that showed a slightly higher moisture level than in to the first variant (by about 2% of volume), the number of germinated seeds was higher and ranged from 13 to 54%. Whereas in the soil No.3 (clayey grained moorsh), despite the higher moisture level (by 4% volume) there was no germination observed.

Convergence in the moisture levels that was observed in both variants was caused by different principles of their assignation. The first one was determined by the maximum water capacity, and the second - according to the value of soil suction power. In an analogues experiment carried out a year earlier but in the summer-autumn cycle (August 16 - September 30) soil moisture corresponding to pF 2.7 + 5% [4] was assumed. However, it appeared to be too low as germination was not observed on any of the soils formed from proper moorsh at that time. For that reason when moisture level was assumed for the second variant of humidity the threshold level of water easily available for plants (pF 2.7) was increased by 10%. It was necessary, the more so since the present experiment, as opposed to the previous one, was carried out from the very beginning in the conditions of very intensive sunshine and high air temperatures.

### Influence of the kind of moorsh mass on the survival of *Lolium perenne* plants, their growth, propagation, and dry mass yield

Observation and measurements taken during the 7-week experimental period showed that after germination the rate of further darnel growth both on the peaty and grained moorshes was very differentiated. First of all, a significant decrease of the number of plants was noted. On the soils formed from peaty moorsh in the first moisture variant, the number of plants after experiment completion (the 42nd day) was lower than on the 14th day of the experiment by 3 to 30%, and in the second variant, by 8 to 83% (Fig. 1). Considering proper moorsh formations it was observed that these changes were as follows, respectively: 8 to 29%, and 12 to 43%. The soils Nos 2,5,6 and 7, formed from grained moorshes, were exceptional in this respect as the number of plants in the first experimental variant at the final stage was higher by 5 to 70% than the number recorded on the 14th day after sowing.

The increase in the plant height between the 21st and 42nd vegetation day was also very differentiated. On the peaty moorshes it ranged from 33 to 205% in the first moisture variant, and from 24 to 474% in the second variant. Whereas on the proper moorshes plant height in the same period and at the same soil moisture levels increased, respectively, by 75 to 332% and 42 to 332%.

The most reliable evaluation of the conditions created for the young plants by the moorsh formations used in the present experiment was, without any doubt, a dry mass of plant yield since it was summing up all the fragmentary effects of this experiment that included, on one hand, the number of germinated seeds that survived, and on the other hand - intensity of green mass increase on these plants as conditioned by the sprouts and leaves growth, and propagation presented in Table 2.

The highest dry mass yield, given as the mean value of four pots, was gathered on the soils Nos 1 and 12 formed from peaty moorsh (Fig. 4). It was, respectively, 10.75 and 9.95 g in the first moisture variant, and 8.0 g and 6.75 g in the second variant. Dry mass of plant yield that was lower by, respectively, 25 and 32%, in the second variant when compered to the first variant seemed to show that the moisture level in these soils (higher by 10% volume than in the first variant) influenced conditions of vegetation in a negative way (see Table 2, columns Ia, Ib and IIb, IIc). On the remaining peaty moorshes and on the majority of soils formed from grained moorsh, the yield collected was, as a rule, low and oscillated around 1-2 g. Soils Nos 4, 8 and 6 were exceptional in this respect, as at the moisture level equal to 80% of their maximum water capacity the yield collected was, respectively, 6.73, 6.47 and 3.36 g. The cases of higher yield in the conditions of the second moisture variant were scarce. They were only observed on the grained moorshes (soils Nos 9 and 14). In percentage they were quite high (higher than in the first variant by, respectively, 100 and 50%), but insignificant in terms of absolute values (dry mass increase by 0.9 g).

## CONCLUSIONS

Pot experiments carried out during spring-summer season of 1995 on the influence of kind of moorsh mass and the conditions of its transformation on the germination and growth of the young *Lolium perenne* plants allowed for drawing the following conclusions:

1. The basic factor that differentiate germination conditions for the *Lolium perenne* seeds on the post-bog peat soils, is the structure of the moorsh mass. It decides on the efficiency of capillary rise, and, what follows, also on water inflow to the most superficial and, hence the quickest to dry in intensive sunshine, soil layers in which there are grass seeds.

2. The most favourable conditions for the germination, sod development, and growth of the young darnel plants can be found on peaty moorshes as its soil mass consists of fine fibrous particles saturated with fresh humus.

3. Clearly less favourable environment for the plant growth is formed on proper moorshes with fine-grained structure. That can be seen in the poorer seed germination (25-50%) and very low dry mass yield collected from that soils after the experiment had been completed.

4. The worst conditions for grass germination and growth were formed on degraded proper moorshes with crumble-grained structure, poor conductivity, and on fibrous peat moorsh that form a macroporous superficial layer that limits capillary rise and evaporation in the conditions of intensive insolation and high air temperatures.

5. The state of secondary transformation of the peat mass as expressed by the numerical values of $W_1$ index does not exert any visible influence on the conditions of plant vegetation, which undoubtedly proves that the above mentioned index is only vaguely connected with the soil conductive properties.

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