

APPLICATION OF SOIL AMENDMENTS AND ITS INFLUENCE ON SELECTED GRASS SPECIES UNDER UNFAVOURABLE CONDITIONS

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Abstract

During the next decades the Czech Republic will probably be affected by the expansion of the arid climate to a large portion of the country. A model project for reclamation of desiccated soil is running at a location, where critical water shortages are already occurring in places. Part of this project concerns the use of soil amendments for the reclamation of unfavourable soils. The experiment studied the effect of the application of amendments - hydroabsorbent, zeolite and lignite on the leaf area of selected grass species. The grass species were *Bromus inermis* 'Tabrom', *Festuca arundinacea* 'Finelawn' and *Festuca arundinacea* 'Scorpions'. There was statistically significant influence of the application of soil amendments on the leaf area in the species *Bromus inermis* 'Tabrom', the leaf area almost doubled after the application. In *Festuca* species the effect of amendments was not confirmed. The use of soil amendments could eliminate the unfavourable influence concerning the drought and to increase biodiversity in regions.

Introduction

At a dried out locality in Hodonínsko – a model project for the soil reclamation of a problematic area, representing the expected situation of expansion of an arid climate to an extensive region of the Czech Republic, is being simulated for the coming 50 years. Project is concerned with the options for use of soil amendments, autochthonic woody plants and lesser known drought-tolerant grasses and clovers for the soil recultivation of desiccated soils. This contribution brings partial results from a model project for reclamation of soil and includes the evaluation of soil amendments and their effects on selected grass species.



The measuring of leaf area

Soil amendments are being used increasingly often during the establishment and treatment of all types of lawns, mainly in cases where the structure of the soil and its other properties are not in an optimum state for the development of plants (Straka, 2003). The soil amendment means "a substance with no active amount of nutrients that affects soil in a biological, chemical or physical way, improves its condition or enhances the efficiency of fertilisers". The application thereof leads to a change or improvement in the soil properties and the correction of the harmful action of negative effects in the soil, e.g. an unsuitable soil pH or a high concentration of heavy metals (Straka et al., 2009). The use of soil amendments is also effective in revitalization of dumps after mining operations (Straková et al., 2009).

The types of soil amendments used improve soil properties – Agrisorb is a hydroabsorbent capable of absorbing water into its structure and passing it to the roots in the course of a vegetation period. Its action also results in the formation or improvement of a crumbly soil structure. With its sorption abilities and a high content of humus substances, lignite is also a suitable material for the improvement of soil properties. It supplies the soil with organic matter, it controls the release of elements, it adjusts the microbiological conditions of the soil, and it improves water retention of the soil. Zeolite is a mineral material that is able to capture in its pores substances of all states, thereby participating in ion-exchange processes.

Keywords: revitalisation, leaf area, hydroabsorbent, lignite, zeolite

Materials and Methods

The experiment was organized in randomized blocks of three repetitions. Before sowing, the soil amendments – hydroabsorbent, lignite and zeolite – were applied to the soil. Potassium based hydroabsorbent copolymer (polyacrylate) (in form of Agrisorb) was applied in dose of 20g.m⁻². Lignite is the geologically newest and least carbonized brown coal and it was applied (in form of TerraClean) in dose of 1,000 g.m⁻². Zeolite is a crystalline hydrated aluminosilicate of alkaline metals and alkaline earth metals (applied dose of 3 l.m⁻²). The experiment also featured a control variation without the application of any amendment.

Site description:

Soil: A soil sort – sandy. Grain size of sand. Low water retention capacity, extremely high aeration, pH 4.54 - strongly acidic.

Precipitation: long term annual average precipitation 569 mm, 355 mm of precipitation per vegetation period

The grass species involved in the study were *Bromus inermis* 'Tabrom', *Festuca arundinacea* 'Finelawn' and *Festuca arundinacea* 'Scorpions', species were chosen for their suitability in dry conditions. Thirty samples from each repetition (120 samples in one variation) were collected at the beginning of June 2009 (before heading and flowering).

The leaf area was measured using the AM 300 apparatus. In the species *Bromus*, one blade from the plant was sampled; in the species *Festuca*, considering the character of the plants, an entire bunch of one plant was sampled and subsequently scanned by the tillers and leaves. The number of leaves and tillers was expressed with a mean value and modus (the most frequently occurring value). The data were evaluated with the analysis of variance STATISTICA 9.0 (StatSoft Inc., USA).

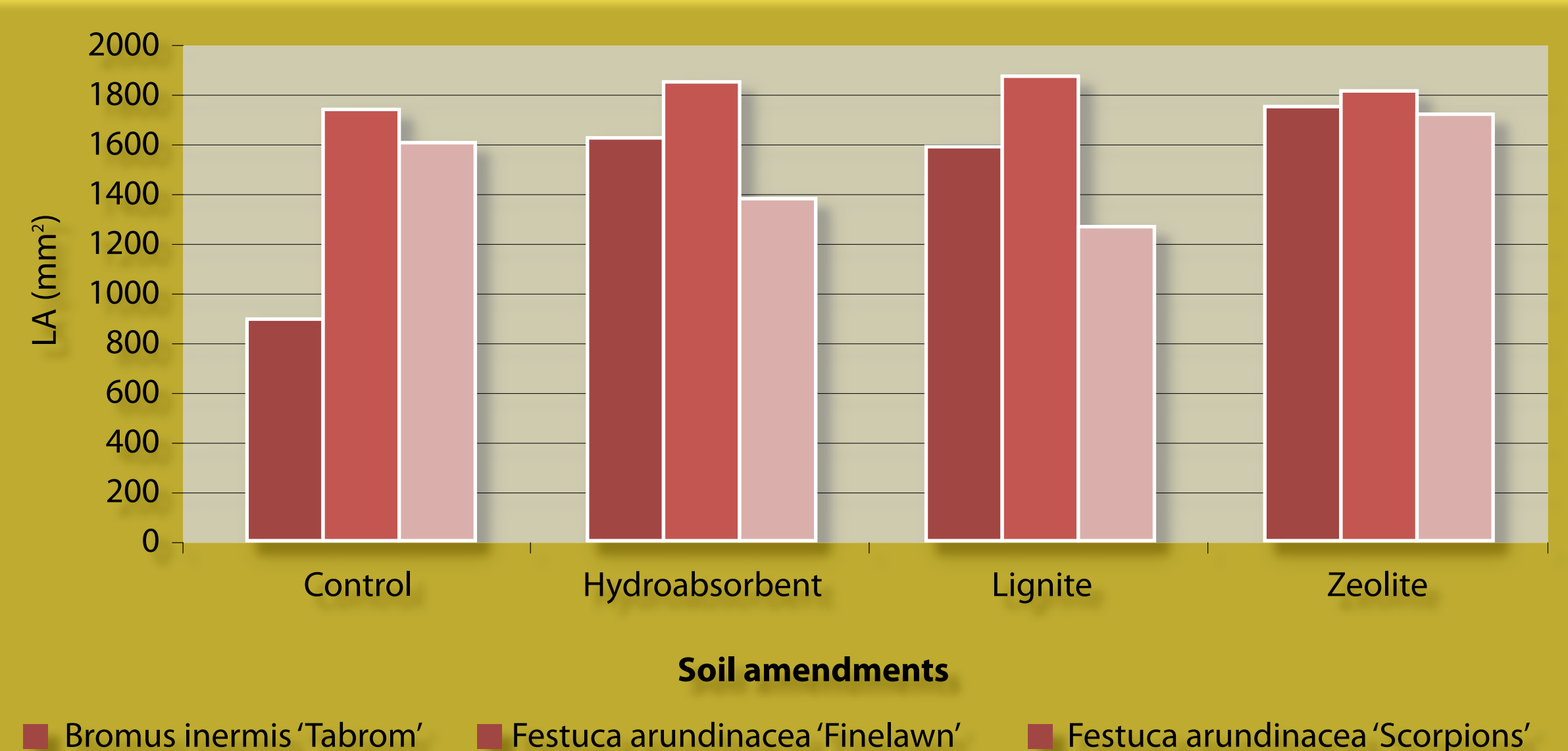
Results

The leaf area and the number of tillers and leaves after the application of soil amendments

| Grass species | Amendments | Control | Hydro-absorbent | Lignite | Zeolite |
|----------------------------------------|---------------------------------------|-----------------------|--------------------|-------------------|-------------------|
| <i>Bromus inermis</i> 'Tabrom' | LA (mm ²) | 896 ^a | 1622 ^b | 1582 ^b | 1747 ^b |
| | number of leaves | mean 4 modus 4 | 5 4 | 5 4 | 5 5 |
| | <i>Festuca arundinacea</i> 'Finelawn' | LA (mm ²) | 1732 ^a | 1848 ^a | 1865 ^a |
| number of tillers | | mean 4 modus 3 | 4 4 | 4 3 | 5 4 |
| number of leaves | | mean 11 modus 6 | 10 6 | 10 9 | 13 8 |
| <i>Festuca arundinacea</i> 'Scorpions' | LA (mm ²) | 1598 ^{ab} | 1373 ^{ab} | 1259 ^a | 1715 ^b |
| | number of tillers | mean 4 modus 4 | 4 4 | 5 4 | 5 5 |
| | number of leaves | mean 12 modus 9 | 11 12 | 13 9 | 13 10 |

a, b - means followed by the same letter within a row are not significantly different (P < 0,05)

The leaf area of selected grass species after the application of soil amendments



Conclusions

In the experiment, the effect of the application of soil amendments (hydroabsorbent, zeolite and lignite) on the leaf area was determined in the grass species *Bromus inermis* 'Tabrom'. The leaf area was almost doubled. On the contrary, in the *Festuca* species the effect of the substances on this characteristic was not confirmed.

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Application of zeolite



Application of hydroabsorbent



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