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IMPACT OF GROWTH INHIBITOR BERCEMA ON SHOOTS REGROWTH OF PERENNIAL RYEGRASS AND COCKSFOOT

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ABSTRACT
In a pot experiment conducted in a greenhouse, the effect of CCC Bercema growth inhibitor to reduce vegetative shoot growth of perennial ryegrass and cocksfoot was studded. The experiment was set up in triplicate. Growth regulator was applied once, in a form of an aqueous solution. The following experimental objects were specified: control object, Bercema with a concentration of 10%, 20% and 30%. Ten measurements were performed every 3 days. The study was conducted under conditions of 12-hour artificial light daily. The results were statistically analyzed using two-factorial variance analysis . It was found that the greatest shoot growth reduction of ryegrass due to the highest inhibitor concentration (B- 30%), but for cocksfoot under the influence of the minimal concentration (B- 10%), compared to the control object. It has been noted that cocksfoot is more sensitive to the applied growth regulator, resulted in significantly greater inhibition of shoot regrowth than for ryegrass. In the experiment with the perennial ryegrass significant differences in the growth of shoots were found under the influence of inhibitor application at a concentration of 30%, compared to the control object. In the case of cocksfoot, all the concentration increases of Bercema inhibitor significantly differentiated the shoots regrowth.

Keywords: growth regulator Bercema, perennial ryegrass, cocksfoot.

INTRODUCTION

Plants' physiological processes can be modified by organic compounds, called growth regulators [10, 11, 13, 6]. The application of growth regulators can affect: inhibition of cell elongation in stems, stalks' thickening, increased protein content, chlorophyll, minerals up-taking, increased resistance to weather stress [8, 5, 9]. The use of growth inhibitors in agricultural crops, horticultural crops and fruit can contribute significantly to the reduction of cultivation cost, which is an important economic element [1, 2]. One of the most common and earliest used in the cultivation of cereals is Bercema. Exogenous inhibitor containing chloride 2-chloroectylothreemehlamine with a short period of activity, is used primarily as antiloder. In the cultivation of grasses fertilized with nitrogen lodging it is a big problem. Thus, the selection of appropriate substance for regulating the shoots' regrowth of grasses is the subject of many studies.

The aim of the study was to determine the effect of the Bercema inhibitor used in various concentrations on the regrowth of vegetative shoots of perennial ryegrass and cocksfoot.

MATERIALS AND METHODS

The experiment was conducted in 2008, in the laboratory conditions. From the permanent grassland the soil samples with two grass species: perennial ryegrass and orchard grass. The grasses were collected in development phase BBCH 32 in quantities of 24 units. The soil has characterized by low abundance in phosphorus (64 mg $P_2O_5 \cdot kg^{-1}$ of soil), and potassium (88 mg $K_2O \cdot kg^{-1}$ of soil),

and the average of magnesium (41MgO·kg^{-1} of soil), with KCl pH = 5.44. Plastic vases were filled with cut turf, about 2 kg of soil·vase^{-1}. In the experiment, CCC Bercema growth inhibitor containing an active substance 2-chloroectylothreemehlamine chloride was used. Growth regulator was used once, in a form of aqueous solution, on 7 May 2008. The experiment was established as follows: control object, Bercema with a concentration of 10% (B-10%), 20% (B-20%) and 30% (B-30%). The experiment was carried out in triplicate. Ten measurements were performed every 3 days, in the period from 7 May to 6 June 2008. The study was conducted under conditions of 12-hour artificial light daily with an average intensity of 4000 lux. On the first day of the study (May 7) tested grasses were cuted to a height of 10 cm – perennial ryegrass and 12 cm – orchard grass, and then growth regulator was applied. The results were statistically analyzed using analysis of variance for two-factors experiment. The significance of differences was verified using Tukey's test at a significance level of $p \leq 0.05$.

RESULTS AND DISCUSSION

In the experiment with the use of growth inhibitor Bercema the differences of perennial ryegrass regrowth under the influence of the largest 30% concentrations were significant, as compared to the control object (Table 1).

A similar relationship in their research indicate [7] for the growth of ryegrass under the influence of Flordimex inhibitor. Statistical analysis showed a significant effect of all the Bercema inhibitor concentrations on the regrowth of cocksfoot, compared to the control, except for the first measurement term (after 3 days). Changes in regrowth of vegetative shoots of grasses tested fluctuated on different measurement dates.

In the experiment with perennial ryegrass a considerable reduction of shoots re-growth was found under the influence of the preparation Bercema concentrations used (Figure 1). With the increase of inhibitor concentration inhibition of regrowth of the tested grass was observed most.

The greatest reduction of shoot regrowth of perennial ryegrass was found between 5 and 15 days of the experiments after inhibitor application at a concentration of 30% and it amounted to, between 6.3 and 6.8 cm respectively. Inhibitor concentration of 20% and 10% at the beginning of the measurements resulted in a much smaller decrease in regrowth of perennial ryegrass in 9 day of measurements amounted to between 4.6 cm and 3.1 cm respectively. At a subsequent measurement, starting from 18th day of the experiment there was a much smaller differences in the reduction of vegetative shoot growth of perennial ryegrass in relation to the control object, than during the initial period. Inhibitor Bercema 30% during this period of reduced regrowth an average about 4 cm, B – 20% about 0.8 cm, B – 10% about 1.2 cm. In the last period of the measurement, after

Table 1. The shoots regrowth of perennial ryegrass and cocksfoot (cm) depending on the concentration of growth inhibitor in various periods of measurement

Inhibitor concentration	Dates of measurements – growth of shoots (cm)											
	1	3	5	9	12	15	18	21	24	27	30	Mean for growth
	Lolium perenne											
0%	–	7.7	12.3	17.8	21.5	23.7	26.0	29.3	31.0	31.8	32.7	23.4
B 10%	–	6.0	10.3	14.7	19.7	22.3	23.8	29.0	29.8	31.0	31.3	21.8
B 20%	–	5.5	9.7	13.2	17.0	20.5	25.0	29.0	30.0	31.0	33.3	21.4
B 30%	–	4.0	6.0	11.0	14.7	17.4	22.3	24.7	26.7	27.3	28.5	18.3
Mean	–	5.8	9.6	14.2	18.2	21.0	24.3	28.0	29.4	30.3	31.5	21.2
$LSD_{0.05}$ for: A – concentration A = 4.01 B – dates of measurements B = 25.6												
Dactylis glomerata												
0%	–	11.3	18.7	26.0	28.8	29.5	31.7	33.3	33.5	33.7	34.0	28.1
B 10%	–	8.7	11.8	13.7	14.3	14.0	13.0	14.7	14.7	13.7	14.0	13.3
B 20%	–	7.0	11.7	14.8	16.0	17.0	18.0	19.3	18.3	19.0	20.3	16.1
B 30%	–	6.0	9.0	11.3	12.7	14.3	15.2	15.3	15.8	15.3	16.3	13.1
Mean	–	8.3	12.8	16.5	18.0	18.7	19.5	20.7	20.6	20.4	21.2	17.7
$LSD_{0.05}$ for: A – concentration A = 6. 6 B – dates of measurements B = 13.2												

30 days, the acting of this inhibitor at 20% dose resulted in a higher regrowth than the tested grass on the control object. The highest concentration of Bercema (30%) resulted in inhibiting perennial ryegrass of the regrowth. The most intense impact takes place within two weeks after its application. Jankowski et.al [6] demonstrated the inhibitory effect of the regulator trinexsapac-ethyl on the growth of several grass species including perennial ryegrass. Grzyś et.al, Stachecki and Praczyk [4, 12] confirmed the inhibitory effect of retardants on the blades regrowth of spring wheat in their study.

Bercema inhibitor at a concentration of 30% inhibited the regrowth of cocksfoot shoots to 12 days of the experiment most (Figure 2).

At a subsequent measurement terms the strongest inhibitory effect was observed when the tested concentration of the growth regulator was 10%, producing an average of 18.6 cm of growth.

In the last days of the experiment (in 27 and 30 days) the greatest reduction of shoots regrowth of cocksfoot was under the influence of the smallest concentration of the inhibitor, amounting to 20 cm. However, after application of 20% Bercema, the regrowth inhibition of the tested grass, compared with the control object increased, at the beginning of the experiment and from 12th day, remained at the same level, average 13.8 cm. For this reason, grass species the lowest concentration of inhibitor (B – 10%) most effectively inhibited the growth of the vegetative shoots, with respect to the control object. The strongest limiting effect the growth of cocksfoot occurred in two weeks after the application of the tested inhibitor (B – 10%).

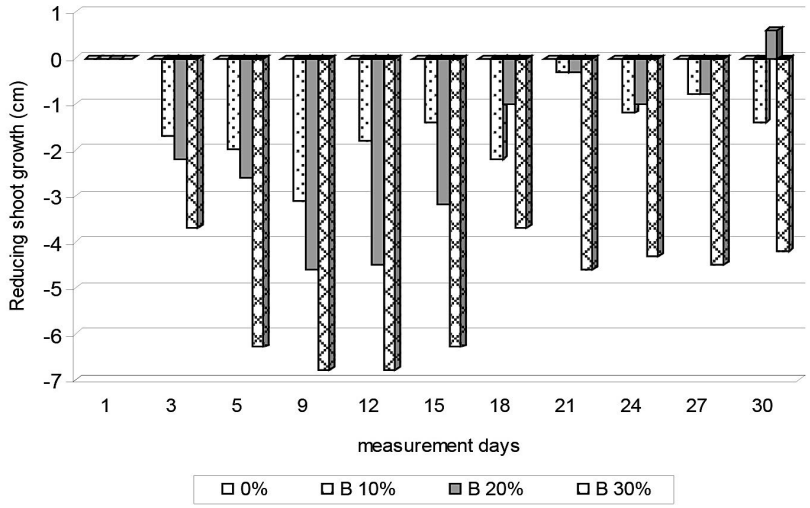

Figure 1. Inhibition in the growth of shoots of perennial ryegrass, depending on the concentration of the growth inhibitor, in relation to the control objects in the individual measurement dates

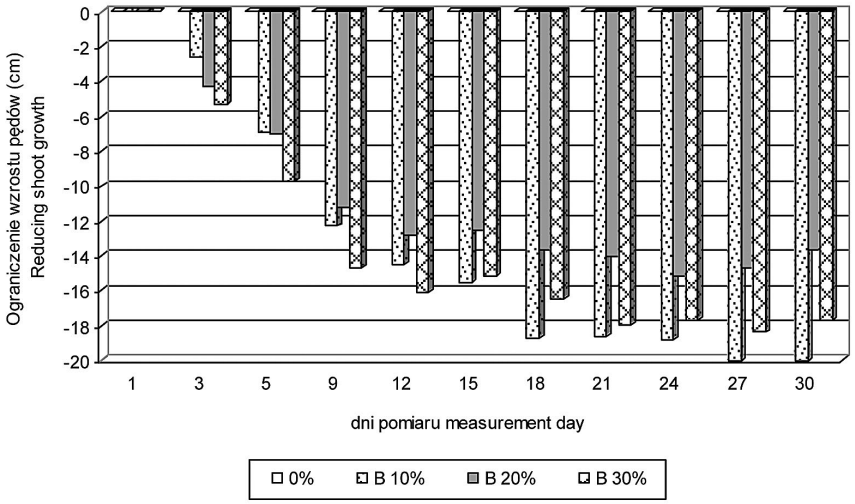

Figure 2. Inhibition in the growth of shoots in cocksfoot, depending on the concentration of the growth inhibitor in relation to the control of the individual measurement dates

In plants the cultivation, in synthetic versions of natural plant hormones is very often used [10]. According to many authors [3, 4] retardant treated the plants maintain a constant photosynthetic efficiency, photochemical activity and hydration of the cells and are more resistant to lodging. The use of inhibitors limits the frequency of mowing lawns, causing intense sodding. According to [6] the use of growth regulators influenced lawns in maintaining in a good condition especially in the summer, when the extent of their use is highest.

CONCULSIONS

1. In the experiment the use of different concentrations of Bercema inhibitor the largest regrowth inhibition of perennial ryegrass stems were stated under the influence of the largest concentrations (B – 30%), but for cocksfoot the minimal concentration (B – 10%) in comparison to the control object.
2. Cocksfoot was noted to be more sensitive to the application of growth regulator, what resulted in significantly greater inhibition of shoot regrowth than for ryegrass.
3. In the experiment with the perennial ryegrass significant differences in the growth of shoots were found under application of an inhibitor at a concentration of 30%, compared with the control object. In case of cocksfoot, all Bercema inhibitor concentrations significantly differentiated shoots regrowth, as compared to the control object.

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