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ИСПРАВЛЕНИЕ ГАЗОНОВ, ЗАРАЖЕННЫХ БОРОДАЧОМ ОБЫКНОВЕННЫМ *(BOTHRIOCHLOA ISCHAEMUM)*, МЕТОДОМ ПОДСЕВА

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Ключевые слова: *Bothriochloa ischaemum, подсев, Lolium perenne, Poa angustifolia, Bromus inermis, Dactylis glomerata.*

Бородач обыкновенный (*Bothriochloa ischaemum*) является естественным элементом венгерской флоры, но из-за его беспорядочного распространения могут возникать монодоминантные очаги, которые нежелательны как при управлении пастбищами, так и для сохранения природы. Эксперимент с подсевом для подавления сорняков был проведен в горах на севере Венгрии на 40-летнем паровом поле, оставшемся после виноградника, которое в данный момент используется в качестве пастбища для овец. Мы использовали: *Lolium perenne, Poa angustifolia, Bromus inermis, Dactylis glomerata*. Экспериментальный участок имел размеры 5 × 4 м. На протяжении эксперимента (в течение трех лет) мы не смогли значительно подавить бородача обыкновенного в этой чрезвычайно сухой среде обитания, но сумели остановить его инвазию. *L. perenne* мог бы быть полезным компонентом в оптимальной смеси семени из-за его изначально агрессивного темпа роста, но только во влажных сезонах из-за высокой потребности в воде. Посев чистых семян, однако, является рискованным в естественной среде обитания бородача обыкновенного, которая, как правило, отличается засушливостью и имеет дефицитные питательные почвенные условия. *D. Glomerata* для посева рекомендуется для производства кормов, его способность сокращать число видов на пастбище является производной от его высокой производительности и пролиферации. Применение *P. angustifolia* в смеси семян могло также служить задачам охраны окружающей среды, он подавил бородача обыкновенного и имел положительное влияние на видовой состав, поэтому его целесообразно применять как отдельно, так и в смеси семян. *B. inermis* не смог преобладать при чрезвычайных условиях.

IMPROVE PLAINS BLUE-STEM INFESTED SWARD WITH OVERSEEDING

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The plains blue-stem *(Bothriochloa ischaemum)* is a natural element of the hungarian flora, but due to disturbance monodominant spots may occur, which is not desirable to both grassland management and nature conservation. We have set our overseeding experiment on a 40-year-old fallow field left after a vineyard in Northern Hungarian mountains, which is utilized as a sheep pasture, to suppress this unpleasant species. We have utilized: *Lolium perenne, Poa angustifolia, Bromus inermis, Dactylis glomerata*. The experimental-plot size was 5 × 4 m. During the experiment (3 years) we have failed to significantly suppress the plains blue-stem at this extremely dry habitat, but managed to stop infestation. The *L. perenne* could be a useful component in optimal seed-mixture because of it's initial aggressive growth rate, but only in wet years due to high demand of water. The pure seed sowing however is risky on natural habitat of plains blue-stem, which has typically dry and nutrient deficient soil conditions. *D. glomerata* as pure seed is recommended for forage production, it's ability of reducing the number of species on pasture is derived from it's high productivity and prolification. Applying in seed mixture could serve nature conservation as well. *P. angustifolia* has suppressed the plains blue-stem and also had positive effect on species composition, therefore very useful both as pure seed or in mixture. *B. inermis* could not prevail under extreme conditions.

Положительная рецензия представлена Б. Тоттмерес, доктором биологических наук, профессором Университета Дебрецена (Венгрия).
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In Hungary the plains blue-stem is a character species on dry upland- and rangeland-steppe grasslands (Festuca Brometea Br.-Bl. et Tuxera ex SOO, 1947), but rarely can be found on semi-arid grasslands as well. It's mass scale spreading caused by agricultural disturbance on natural grasslands, like intensive grazing and erosion. (e. g. Viragh and Fekete, 1984; Zolyomi and Fekete, 1994), burning (Penksza et al., 1994), turf collection (Bartha, 2007), former mining activity (Bauer, 1998). The shrub clearing and abiotic stress (e.g. dry years) (Bartha, 2007) may create ideal conditions for monodominant patches. In a well structured lawn, if the stress factor eliminated the adaptable grass species could suppress the plains blue-stem easily. However, if the dominant true grasses disappear (e. g. micro-scaled limitation of propagulum), the plains blue-stem still flourishing even in non favourable environment. If the regular disturbance opens the sward, clear soil patches will appear. The local space-dominant plains blue-stem can occupy the open spots fairly quickly, helping to close the canopy again, and reduce soil erosion (Illyes et al., 2007). It's mending role is part of the natural dynamics of the vegetation which is acceptable until not setting back the true grass immigration or not preventing sward regeneration (Horvath and Kovacs 2008). The high coverage of plains blue-stem evolves because the degradation of natural true grass composition (Viragh and Fekete, 1984; Zolyomi and Fekete, 1994, Kelemen, 1997) or it is a phase in degraded pasture-, fallow regeneration process (Bartha, 2007). Grasslands where plains blue-stem is dominant, can accumulate thick grass litter. This species has dense root system and forms tussocks. Between them significant amount of slow degrading grass litter builds up, which may prevents germination of plants (Illyes et al., 2007), immigration and survival of less competitive species (Bartha, 2010). The plains blue-stem's spread and growth of dominance have negative effect on physiognomian structure of grasslands. Induces biodiversity degradation, reduces compositional diversity (Viragh, 2002, Viragh and Somodi, 2007; Szabo et al., 2008; Szentes et al., 2011, 2012). It's nitrogen content less than the C3 species (Yuan et al., 2007), therefore the protein content and feed value is lower as well. The morphological characteristics are adverse too, so livestock usually doesn't graze at all, which increases the accumulation of grass-litter. The expansion of this species is undesirable for both grassland management and nature conservation.

Purpose and methods of research. Our aim was to examine whether possible to hold back plains blue-stem and improve grass species composition with the help of agro-technology. The eperimental plot is at Kisfuzes, border slopes of North Hungarian Mountains. The average annual temperature is 9 °C, while the average temperature is 16 °C during the vegetational period. The average annual precipitation is 560 mm, 360 mm falls in the vegetational seasons. The soil type is luvisol. The trial has been set on a sheep farm, on 100 ha of pasture in 5 paddocks, with 150 Texel ewes and lamb. The inspected sward is situated in a North-NorthWest and South-South East directional valley on a 40-year-old vineyard fallow. Hard to classify the plant composition, dominant species are *Bromus inermis* and *Poa angustifolia*. Common species are *Achillea nobilis*, *Plantago lanceolata*, *Verbascum phoeniceum* and the plains blue-stem *(Bothriochloa ischaemum).* The average grass coverage is about 40–70 % depends from phenological state. The experiment has been set up in a 20 ha paddock, South-South Western steep slope 246 to 247 m above sea level. Because of the exposure and sloping area, dry and warm microclimate has evolved, beside strong erosion, which slows down natural succession. We set up 30 5 × 4 m plots in the autumn of 2009. Plots were randomly distributed. We analized 15 of these for this paper. Five treatment and one control in three repeat. The treatments were: overseeding of *Lolium perenne, Poa angustifolia, Bromus inermis, Dactylis glomerata*. This method was chosen because of the significant risk of erosion due to the steep slope. We locked down the paddock after overseeding and sheep grazing, till November of 2010. We left sufficient time for growth of the renewal. The recording dates are shown in table 1.

In 2011 and 2012 we skiped the conological recording due to the serious drought. We set the coverage value in percentage.

Results of research. *Conformation of species composition.* At the first two years *Lolium perenne* over-

Table 1
Parcel recording dates

Year	Conological recording
2009	10.8.
	5.7.
2010	7.8.
	10.10.
	5.5.
2011	7.5.
	–
	5.9.
2012	7.3.
	–

Таблица 1
Даты наблюдений

Год	День и месяц ценологических исследований
2009	8 октября
	7 мая
2010	8 июля
	8 октября
	5 мая
2011	5 июля
	–
	9 мая
2012	3 июля
	–

seeding was successful (fig. 1). It had more than 40 % coverage by the end of 2010, and it would not let plains blue-stem spread, but in 2012 entirely disappeared, so the total coverage of true grasses decreased to the 2009 level. The legumes had the highest coverage in 2010 with 34 %. The dicotyledons' coverage fluctuated, but in July 2011 they well compensated the decreasing true grasses. The coverage of plains blue-stem reduced from 6 % to 3–4 % by the end of the trial. The grass-canopy at the Lolium-overseeding has been grown from 60 to 97 %, followed with this cultivar's total disappearance (short lifetime) ending with the original composition.

The overseeding with *Poa angustifolia* resulted top coverage in October 2010, then slowly declined, but in 2012 was still double of the initial coverage (fig. 2). *B. inermis* coverage has been increased in the rainy periods. Plains blue-stem was steady at about 3–4 %. True grasses' coverage increased to 50.8 % by October 2010

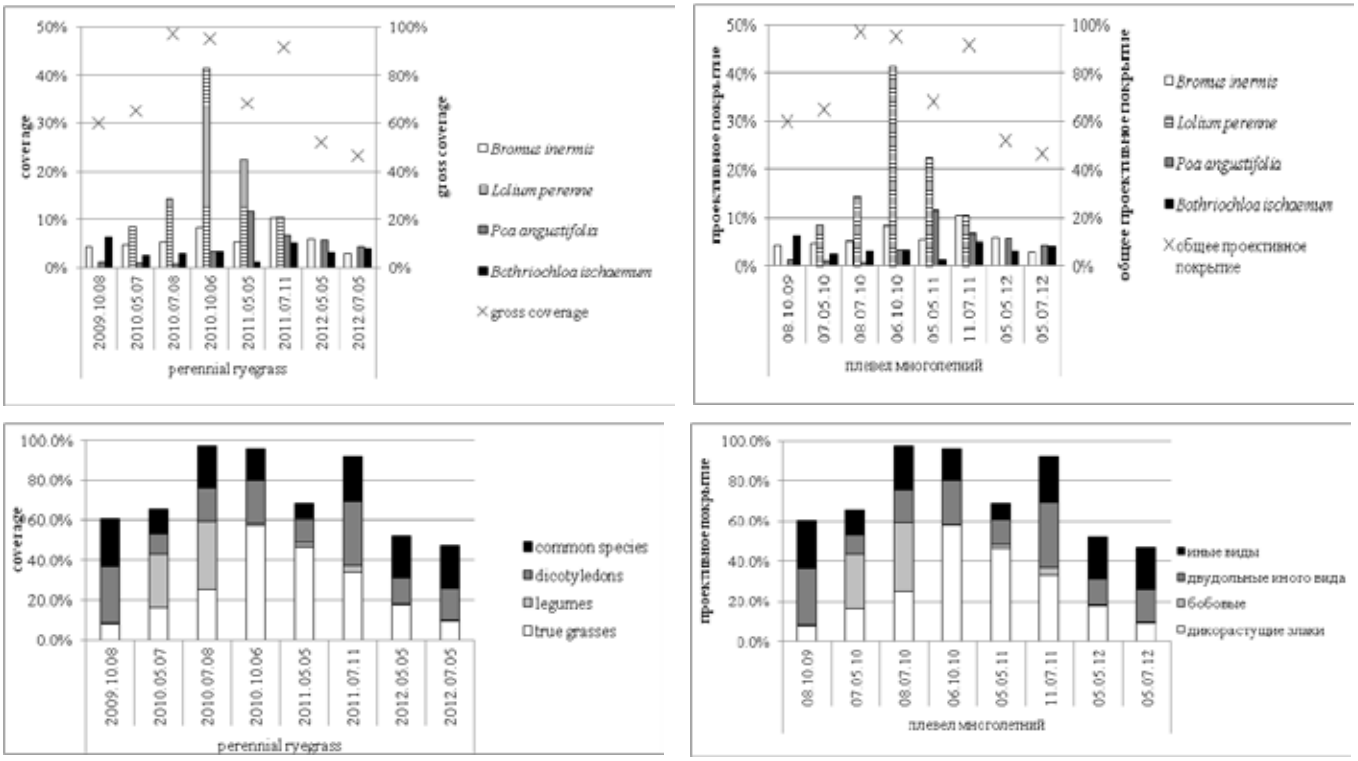

Fig. 1
Рис. 1

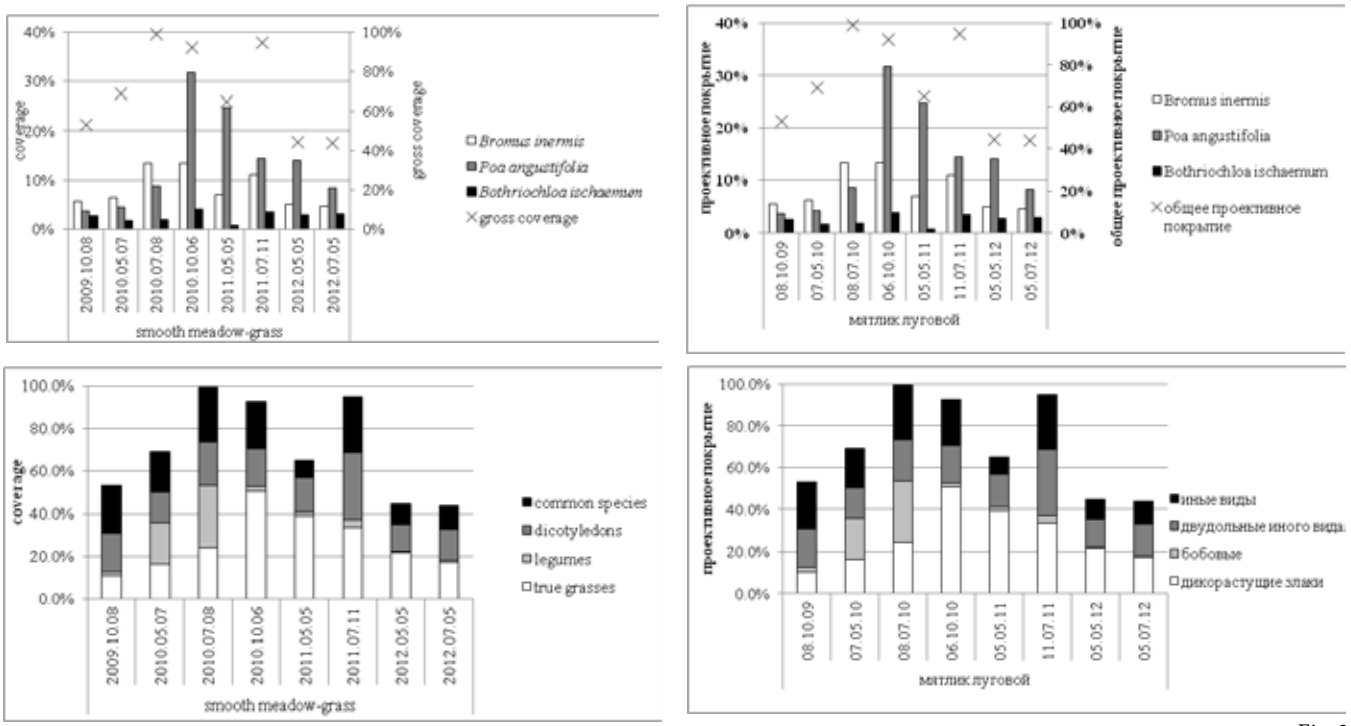

Fig. 2
Рис. 2

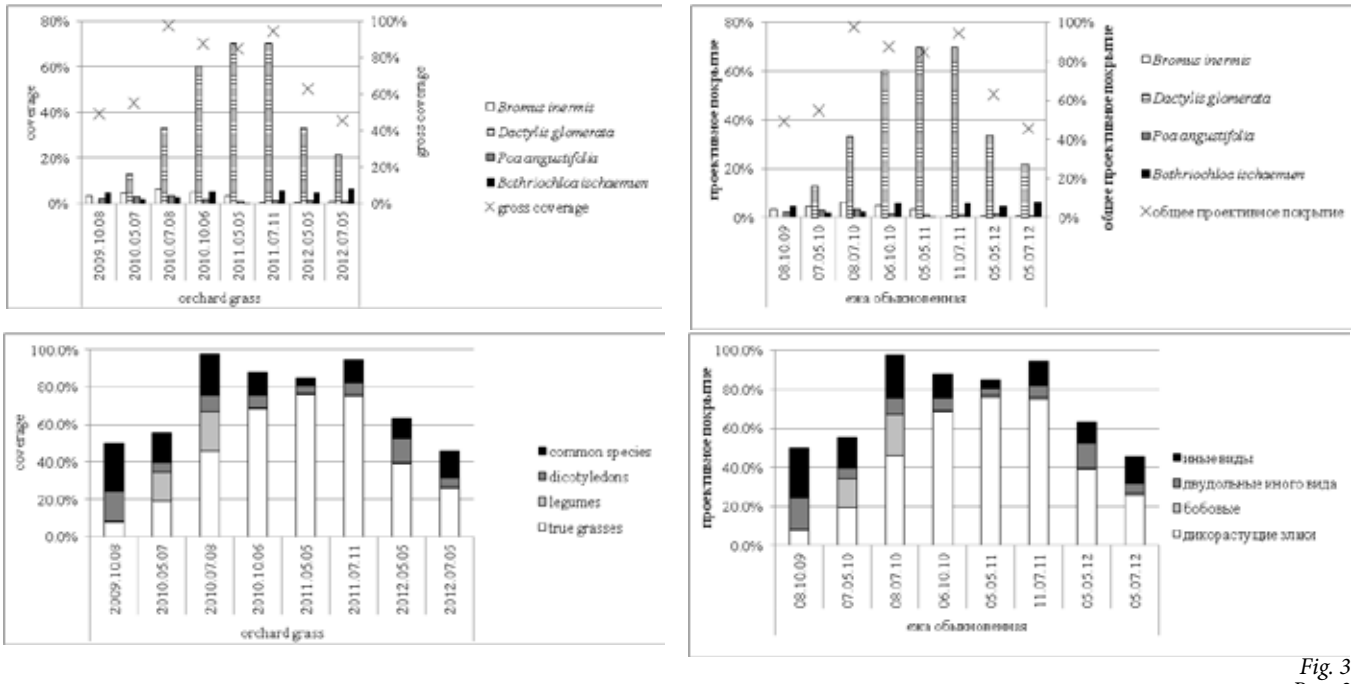

Fig. 3
Рис. 3

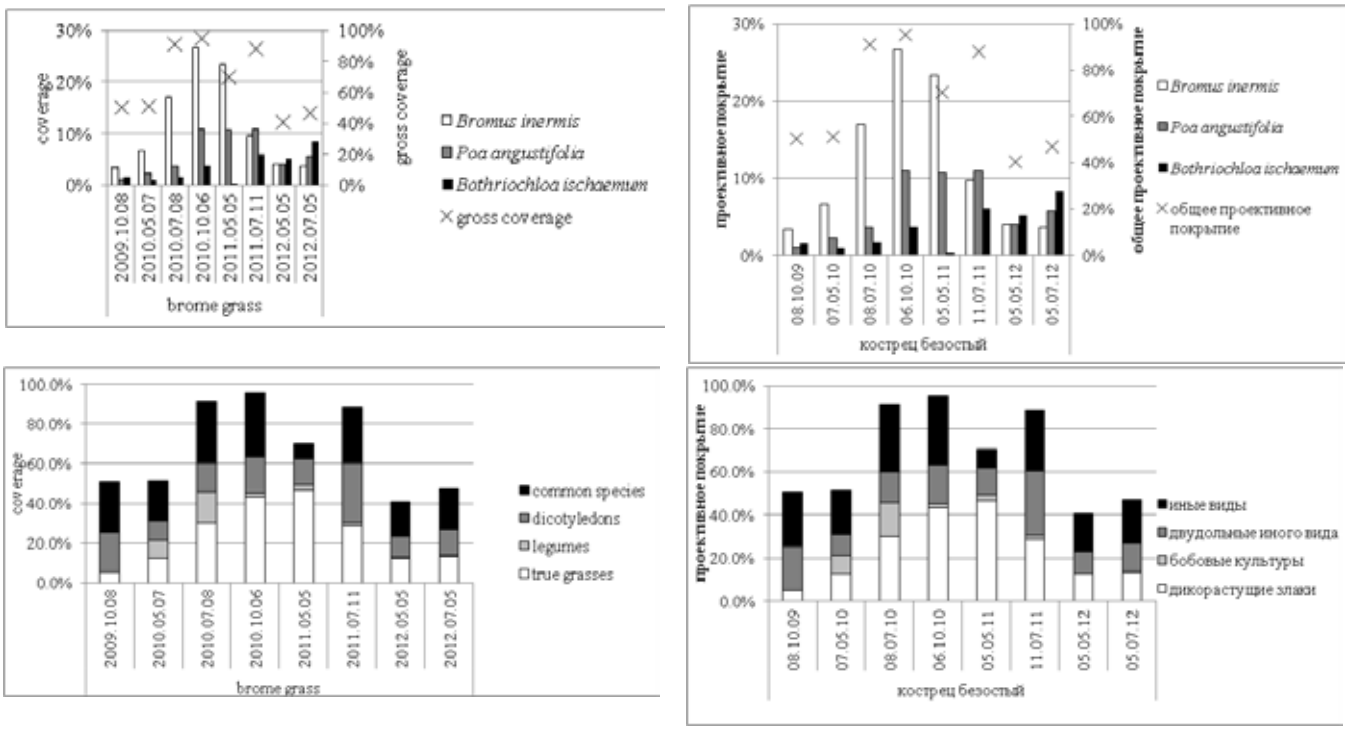

Fig. 4
Рис. 4

as a result of overseeding. This year had rainy spring and summer therefore legumes came up (*Trifolium campestre, Medicago minima*). The dicotyledons' coverage in July 2011 was the largest. The diversity in grasslands is important as associations respond more effectively to extreme stressors (e.g.: weather) and also handy in feeding and nature conservation. Other species also grown the best in this period. The changes in grass-canopy reduced to the initial level, effected by stolon type (long lifetime) species overseeding in 2012. This method has performed less efficient than overseeding with short lifetime species. This perfectly represents the primary effect of drought on grass composition.

Dactilys glomerata coverage was continuously increased in 2010. The highest coverage (70 %) was in the spring of 2011 (fig. 3). In July 2012 coverage has remained over 20 %. The plains blue-stem's coverage was about 2–8 %. The higher values were in dry periods. The overseeded *Dactilys* would not let the *plains blue-stem* spreading, but also suppressed other species.

Bromus inermis plots has reached maximum coverage at 27 % in autumn 2010 (fig. 4). *P. angustifolia* coverage was similar, however coverage was only 10 %. The plains blue-stem and other species were spreaded well. The coverage of other dicotyledon species were also relatively high.

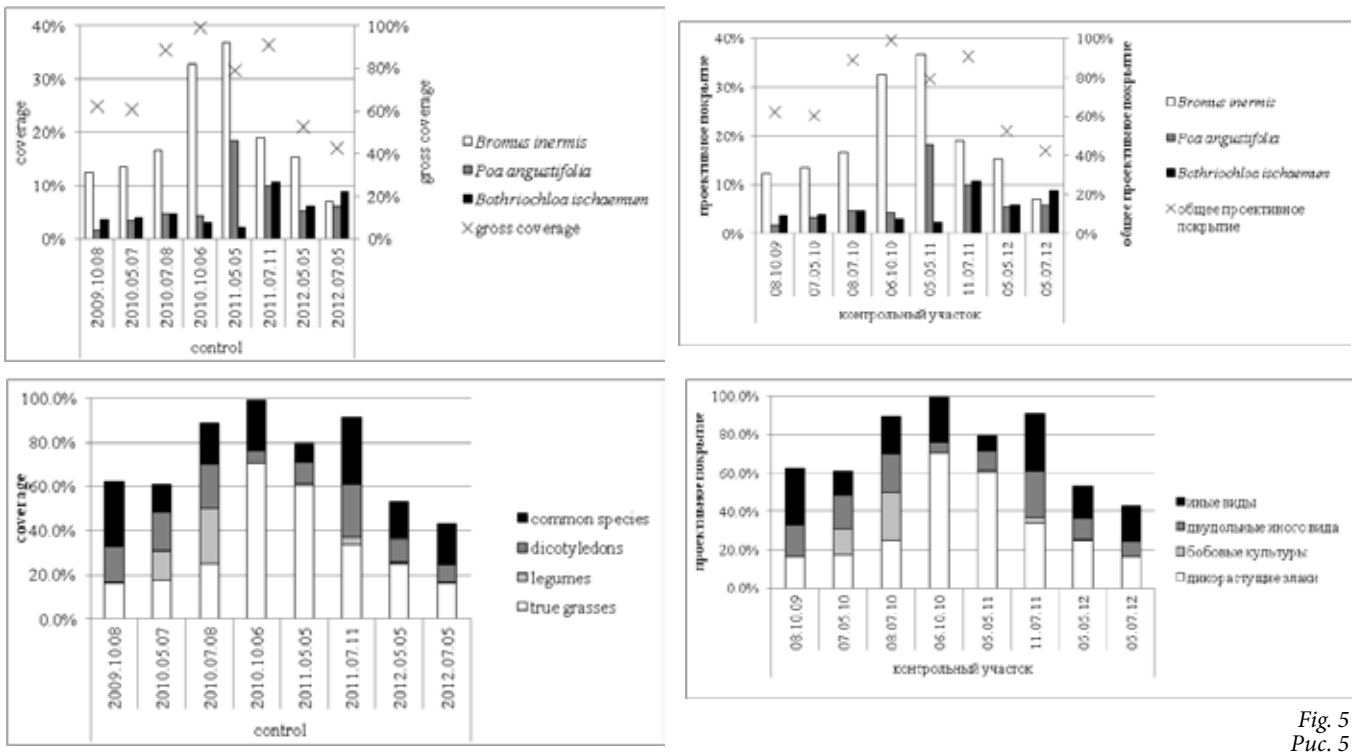

Fig. 5
Рис. 5

Plains blue-stem has grown the best in control plots (fig. 5). It's reached 9–10 % of coverage. The common true grasses has reached their maximum coverage in May 2011. However the gross coverage in autumn of 2010 was the highest. *Bromus inermis* was the dominant species.

In 2010 good weather conditions (plenty and continuous rainfall) made very effective the overseeding. Compare to 2009, the total grass coverage has increased significantly. In 2011, only one-third of last year's precipitation fell. Even in the first half of the year, very few (212,9 mm) from the end of July till December, a total of 6.6 mm rain fall. The plots' species composition changed and the total coverage reduced in every parcel. 2012 was also the year of drought, which further strengthened this process.

The smallest yield was in the *Lolium perenne* parcel. At the end of summer in 2011, due to the drought completely disappeared from the sward, but a year earlier there was over 40 % coverage. The disappearance effected on it's plains blue-stem controlling effect as well.

The *P. angustifolia* was the most effective species to control plains blue-stem but couldn't roll back completely, still did not effect on other grasses too.

D. glomerata has grown the best for forage production. It tolerates drought and has high productivity (Ecker, 1972; Gruber, 1942). It is important to note, that the coverage of *P. angustifolia* and *B. inermis* decreased in these plots. The plains blue-stem's coverage was constant, but the true grasses' gross-coverage was the highest also. The other grass components' cover declined the most and was the smallest too in these parcels.

The *B. inermis'* overseeding was successful, however by the spring of 2011 the coverage rapidly decreased and a year later the amount was the same as the beginning. This is probably caused by the longterm drought in this period. In these plots *P. angustifolia* and plains blue stem's growth increased too. There was also significant coverage of other species.

The coverage of useful true grasses in the control plot also showed fluctuations, demonstrated the dominant roll of weather. The cover of legumes also increased in 2010 similarly than in the treated plots. The other dicotyledon and coverage of other species are also well followed rainfall distribution.

Conclusions. At the extremely dry habitat we could not significantly reduce the plains blue-stem neither of treatments during the experiment. The overseedings had positive effect on species composition. Because of the aggressive initial growth of *L. perenne* it may be useful components of swards in wet years to roll back plains blue-stem. The pure seeding however is very risky at plains blue-stem's typicall dry and nutrient deficient habitats. *D. glomerata* in pure seeding, utilized in plains blue-stem control, primarily recommended for forage production because of it's high productivity, accumulation and it's efficient species reductive effect. Therefore could be very effective in mixture to serve nature conservation purposes. *P. angustifolia* did not let overgrown the plains blue-stem and had positive effect on species composition as well. It suits both for pure or mixed seeding. *B. inermis* did not get on under extreme conditions.

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