ABSTRACT

Perennial fodder grasses are an important food source for ruminants, representing a basic component for setting up temporary meadows, oversowing of degraded permanent meadows and covering with grass slopes, bands and entertainment sports, etc.

The natural factors in the agricultural area of our country are generally favourable for obtaining high seed yields for the main species of perennial fodder grasses. As for any other crop, the progress obtained in perennial fodder grasses for seed, during the recent decades, required further research and their placing in different climatic areas and, especially, microclimate areas, in order to obtain high and qualitative productions under these soil and climatic conditions. This study, which is found in this context, was conducted at the Teaching Station of USAMV, the Ezăreni Farm. Its aim was to establish for seed production perennial grasses, some technological links represented by two graduation-sowing distance (a1 = 25 cm between rows, a2 = 50 cm between rows) and species of three graduation-perennial grasses (b1 = *Festuca pratensis* Transilvan Variety, which was recorded in 1988, a semi-late variety with good wintering and disease resistance, and a seed potential production of 800-1000kg/ha), b2 = *Festuca arundinacea* - Brio Variety, achieved in 1992, having a good resistance to leaf diseases, drought and wintering and a seed potential production of 900 - 1000 kg / ha) and b3 = *Bromus inermis* Doina Variety, achieved in 1995, a variety with a very good resistance to diseases, wintering and drought). For obtaining good results, the trial was conducted for three years (2006-2008), the climatic conditions ranging from very favourable (2006) and favourable (2008) to the least favourable ones in 2007.

For the elaboration of this work and for interpreting the results, we have studied the literature concerning the approached theme. Our research studied the response of the three species under conditions of the above-mentioned technological factor, both for the main biometric measurements during vegetation, and for the qualitative analysis of produced seeds.

The observations made during the three years of experimentation pointed out the great influence of weather fluctuations and planting distance between rows on plant development.

During the growing season, the following observations and measurements were done: date of sowing – trial sowing time (20 August 2006), sunrise time - for each variant was considered the day when rows were distinctly visible (when 75% plants rouse, so *Festuca pratensis* and *Bromus inermis* species rose between 12 and 14 days since sowing, and *Festuca arundinacea* species, between 13 and 15 days, plant rise being evaluated with marks from 1 to 9. *Festuca pratensis* received 8, while *Festuca arundinacea* and *Bromus inermis* species, 9.

The other observations received marks from 1 to 9 for each species and planting distance (1 – the worst and 9 – the best).

Because the studied perennial fodder grasses produced seeds since the second vegetation year, we did not study the generation traits during the first year of experimentation.

The appearance date of first inflorescences in 2007 was different, depending on species. *Festuca pratensis* formed ears on May 20, ear formation lasting until May 25-26, *Festuca arundinacea* formed ears on May 22 and the appearance of first inflorescences in *Bromus inermis* species took place on May 12. In 2008, the appearance of first inflorescences was different, depending on species, *Festuca pratensis* formed ears on May 15-16, and the emergence of inflorescences took place on May 21-22, *Festuca arundinacea* formed ears on May 19 and the emergence of inflorescences in *Bromus inermis* was on May 18.

In 2007, at ear formation, shoots reached the height of 65-70 cm in *Festuca pratensis*, 75-85 cm in *Festuca arundinacea* and the shoots of *Bromus inermis* species reached the height of 75-95 cm, while in 2008, shoots reached the height of 110-114 cm in *Festuca pratensis*, 102-110 cm in *Festuca arundinacea* and 110-120 cm in *Bromus inermis*.

In 2007, at harvest, the perennial fodder grasses belonging to *Festuca pratensis* species, reached the height of 70-75 cm, *Festuca arundinacea*, the height of 87-95 cm and the related species *Bromus inermis,* 90-105 cm. In 2008, the plants belonging to *Festuca pratensis* species reached the height of 110-117 cm, *Bromus inermis* reached 114-125 cm and the plants belonging to *Festuca arundinacea* species reached 105-112 cm.

In 2008, compared with 2007, the highest tillering capacity, at the sowing distance of 25 cm between rows was found in *Festuca arundinacea* (1760 vegetative shoots / m²), followed by *Festuca pratensis* (1521 vegetative shoots/ m²) and *Bromus inermis* (470 vegetative shoots / m²). At the sowing distance of 50 cm between rows, the best tillering was found in *Festuca arundinacea* (1936 vegetative shoots / m²), *Festuca pratensis* had a number of 1314 / m² and *Bromus inermis,* 364 vegetative shoots / m².

During the long vegetation period, observations were made on plant tolerance to the attack of pests and diseases, which was marked from 1 to 9, all the three species receiving 8 in case of tolerance to diseases, because of the sporadic attacks on leaves (between 5 and 10%) in *Festuca pratensis* and *Bromus inermis*, produced by *Coronifera Puccini* Kleb. and

Leptosphaeria graminis (Fuck.) Sacc.; the attacks of *Claviceps purpurea* (Fr.) reported on panicle, were less than 5% in all three species.

This year, no harmful attack was reported, therefore all the three species were marked with 9. These notations were valid in both 2007 and 2008. Harvest was performed manually, the harvested area being of 16 m^2 with four replicates. In 2007, the two period harvest was not allowed. Harvesting of *Festuca pratensis* was done on June 16, of *Bromus inermis* on June 20 and of *Festuca arundinacea* on June 22. Year 2008, being a favourable year as climate, allowed two period harvest, the harvested area being of 4 m^2 with four replicates. The first harvesting period was when seeds had moisture of 45% -50%, and the second one, when moisture was 35% -40%. The first period harvest of *Festuca pratensis* was done on June 21, of *Festuca arundinacea* on June 30 and of *Bromus inermis* on July 2; the second period harvest was done after approximately 6-7 days, depending on species. After harvesting, production was determined in each species by weighing and reporting it at hectare, when seeds reached, by drying at sun, moisture of 14% and observations were made, both on seed sizes (length and width) and on the 1000-grain weight. After harvesting, both in 2007 and 2008, samples were taken from 25 plants of each variant and they followed length of inflorescences (cm), average number of ramifications / inflorescence and average number of seeds / inflorescence.

The surveys were conducted in accordance with all the norms of technical and experimental technology. *Bromus inermis* was used as control and was sown at the planting distance between rows of 25 cm.

Production data were processed statistically according to the model of bifactorial experiences, analyzing the influence of species, the sowing distance between rows and the interaction between the two studied factors, both on production and on seed quality.

The mean results of production, on two years of trials, when seed was obtained, from the point of view of the species influence, pointed out that, of the three studied species (*Festuca pratensis, Festuca arundinacea* and *Bromus inermis*), the most productive proved to be *Bromus inermis*, which was the control variant, because this species is best adapted to the conditions of the Moldavian forest steppe, obtaining a mean production of 1309 kg / ha. *Festuca pratensis* obtained a mean production of 900 kg / ha, with a significant negative distinctively difference of 409 kg / ha, compared to the control, and in case of *Festuca arundinacea*, a mean production of 935 kg / ha was obtained, with a difference of 355 kg / ha, compared to the production obtained by *Bromus inermis*.

Analysing the mean yields obtained in terms of the influence of planting distance between rows, they noticed that at the sowing distance of 50 cm between rows, because of higher area of nutrition, better tillering capacity and of the highest number of generative shoots, seed production was of 1169 kg/ ha, with a very significant difference of 231 kg / ha, compared to the

control variant, which represents an increase of 25% compared to the variant sown at 25 cm between rows, when a production of 939 kg / ha was achieved.

As concerns the interaction between species and the planting distance between rows, the obtained results pointed out the mean production achieved at the average planting distance of 50 cm between rows, which yields were higher in all three species, compared to the yields obtained at the distance of 25 cm between rows. From all the three studied species, the yields obtained by *Bromus inermis* species at both planting distances between rows, were the highest. *Bromus inermis*, which is the control, obtained a production of 1469 kg / ha at the distance between rows of 50 cm and a production of 1149 kg / ha was obtained at the sowing distance of 25 cm between rows.

In *Festuca pratensis,* a yield of 851 kg / ha was obtained at the sowing distance of 25 cm between rows, and a yield of 949 kg / ha was obtained at the planting distance of 50 cm between rows.

Distinctively significant yield differences were found in *Festuca arundinacea*, when at the planting distance between rows of 25 cm, a yield of 816 kg/ ha was obtained and at the planting distance of 50 cm, 1090 kg/ ha were obtained.

Seed samples were taken in laboratory where they determined as a first qualitative analysis, the physical purity of seeds. Following these determinations, they concluded that the physical purity of seeds was between 99.8% and 99.9% for the samples collected in 2007, and for samples of 2008, the remaining 0.1% -0.2% of seeds being considered inert materials. Then, determinations were done on the germination energy and hectolitre mass and the obtained results were submitted to the statistical calculation.

As concerns the influence of species germination on energy, they found that in 2007, because of poor weather conditions, it had a value of 60.7% for species *Bromus inermis* (control), followed by *Festuca pratensis*, which germinated at a rate of 46.4% and *Festuca arundinacea*, which had a germination energy of 18.1%. In 2008, at the first period, the germination energy was of 65.7% for *Bromus inermis*, followed by *Festuca pratensis*, which germinated at the rate of 56.20% and the species *Festuca arundinacea*, which had a germination energy of 41.3%. At the second period, *Bromus inermis* (control) had the highest germination energy value of 70.4%, *Festuca pratensis,* 56.2% and *Festuca arundinacea* , 41.7%.

According to the influence of species in 2007, seed germination had values of 86.5% in *Festuca pratensis; Bromus inermis* (control) had a value of 86.3% and *Festuca arundinacea,* 79.2%. In 2008, seeds harvested in the first germination period had values of 93.3% in species *Festuca pratensis*, while *Bromus inermis* (control) had a value of 89.6% and *Festuca arundinacea*, of 81.2%. Seeds harvested in the second germination period had values of 92.4%

in *Festuca pratensis* species, 95.3% in *Bromus inermis* (control) and 83,8% in *Festuca arundinacea* species.

Regarding the hectolitre mass in 2007, it had a value of 19.2 kg for *Festuca pratensis*; *Bromus inermis* species (control) had a value of 10.93 kg and in *Festuca arundinacea*, the hectolitre mass was of 9.72 kilograms. In 2008, the seeds harvested in the first period had hectolitre mass values of 27.31 kilograms in *Festuca pratensis*, 11.72 kilograms in *Bromus inermis* (control) and 21.17 kg in *Festuca arundinacea.* For seeds harvested in the second period, hectolitre mass had a value of 27.7 kg in *Festuca pratensis*; *Bromus inermis* species (control) had a value of 11.69 kg and *Festuca arundinacea* ,a value of 21.68 kg.

Analysing the results concerning the influence of planting distance, we found that the germination energy in 2007 was of 42.1% in variants sown at the distance of 50 cm between rows and of 41.3% at the distance of 25 cm between rows, while in 2008, in the first period, the germination energy had a value of 55.6% at the sowing distance of 50 cm and of 53.1% for seeds sown at the distance of 25 cm between rows, which were lower values than those obtained for samples collected in the second period, when for the first sowing distance, the germination energy had a value of 55.9% and of 56.3% for the variants sown at the distance of 50 cm between rows.

The germination value in 2007 was of 84.7% at the planting distance between rows of 50 cm and 83.3% at the sowing distance of 25 cm between rows (control). In 2008, seeds harvested in the first period had a germination of 87.5% at the planting distance of 50 cm and 88.5% at the planting distance of 25 cm, while those harvested in the second period, at the first sowing distance, had germination values of 90.7% and 90.3%, at the planting distance of 50 cm.

The value of hectolitre mass in the variants sown at the distance of 25 cm between rows in 2007 was of 13.28 kilograms and 13.19 kilograms in variants sown at the second distance of 50 cm between rows. For seeds harvested in 2008, in the first period, hectolitre mass had a value of 20.33 kg at the sowing distance of 25 cm between rows and of 19.81 kg for seeds sown at the second distance. For seeds harvested at the second distance, hectolitre mass was of 20.42 kg for the variants sown at the first sowing distance between rows and 20.33 kg for samples gathered from variants sown at the second sowing distance.

Depending on the data reported for the interaction between the studied factors, it was observed that the germination energy for *Bromus inermis* was of 62.8% at the distance of 50 cm between rows and of 58.5% for seed samples harvested from variants sown at the distance of 25 cm between rows. In *Festuca pratensis,* the energy germination at 25 cm distance between rows was of 47%, and at the distance of 50 cm between rows, it was of 45.8%. Distinctively significant differences in the obtained values for the germination energy were also obtained in *Festuca arundinacea*, at the variant sown at 25 cm distance between rows (18.3%), while at the

planting distance of 50 cm between rows, the value of energy germination was of 17.8%. In 2008, the value of germination energy in the harvested seeds at the first period for *Bromus inermis* was of 66.5% in the variant sown at the distance of 50 cm between rows and 64.8% at the distance of 25 cm between rows.

In *Festuca pratensis*, the germination energy at 25 cm distance between rows was of 55.3% and at the distance of 50 cm between rows, of 57.0%. Very distinctively significant differences of the obtained values for the germination energy were obtained in *Festuca arundinacea*, at the variant sown at 25 cm distance between rows (39.3%), while at the planting distance of 50 cm between rows, the germination energy was of 43.3%. As concerns the influence of interaction between the studied factors, for the harvested seeds in the second period, the energy germination at the sowing distance of 50 cm between rows for *Bromus inermis* was of 71.0%, and at the distance of 25 cm between rows (control), the percentage of germinated seeds was 69.8%. In *Festuca pratensis*, the germination energy at 25 cm distance between rows was of 53.3% and at the distance of 50 cm between rows, of 59.0%. Very distinctively significant differences of the value of germination energy were obtained in *Festuca arundinacea*, at the variant sown at 25 cm distance between rows (44.5%), while at the planting distance of 50 cm between rows, the value of germination energy was of 38.8%.

Considered from the point of view of the interaction between the studied factors in 2007, germination had the value of 87.0% at the distance between planting of 25 cm in *Festuca pratensis*, while at the distance of 50 cm, the percentage of germinated seeds was of 86.0%. Germination obtained in *Bromus inermis* species was of 84.0% in sown variants at the distance between rows of 25 cm (control), while at 50 cm distance between rows, it was of 88.5%. In *Festuca arundinacea*, seed germination at 25 cm distance between rows was of 78.8%, while at the distance of 50 cm between rows, of 79.5%.

The germination of the seeds harvested in 2008, in the first period, had the value of 95.3% at the distance between rows of 25 cm in *Festuca pratensis*, while at the distance of 50 cm between rows, the percentage of germinated seeds was of 91.3%. In *Bromus inermis*, the percentage of germinated seeds was of 89.8%, at the sowing distance between rows of 25 cm (control), while at 50 cm distance between rows, it was of 89.3%. In *Festuca arundinacea*, seed germination was of 80.3%. at 25 cm distance between rows.

For the seeds harvested in the second period, the germination of *Festuca pratensis* at 50 cm distance between rows was of 91.8%, while at the planting distance between rows of 25 cm, it had a value of 93.0%. In *Bromus inermis* species, germination was of 95.5% in variants sown at the distance between rows of 25 cm (control), while at 50 cm distance between rows, it was of 95.0%. In *Festuca arundinacea*, seed germination was of 83.5% at 25 cm distance between rows and 84.0% at the distance of 50 cm between rows.

The value of hectolitre mass obtained in *Festuca pratensis*, in 2007, at the planting distance of 25 cm between rows, was of 19.11 kilograms, while at the planting distance between rows of 50 cm, this value was of 18.93 kilograms. In *Festuca arundinacea,* hectolitre mass was of 9.72 kg at the sowing distance of 25 cm between rows, while at the sowing distance of 50 cm between rows, this value was of 9.74 kilograms. In *Bromus inermis*, the values of hectolitre mass were, at the sowing distance between rows of 25 cm, of 10.97 kilograms and of 10.89 kilograms, at the planting distance between rows of 50 cm.

The value of hectolitre mass in seeds harvested in 2008, at the first period, was of 28.29 kilograms in *Festuca pratensis*, at the sowing distance of 25 cm between rows, while at the planting distance between rows of 50 cm, hectolitre mass was of 26.34 kg. In *Festuca arundinacea*, hectolitre mass was of 21.42 kg at 25 cm sowing distance between rows, while at the sowing distance of 50 cm between rows, this value was of 20.92 kilograms. In *Bromus inermis*, the values of hectolitre mass were of 11.77 kilograms (control variant), at the planting distance between rows of 25 cm, while at the planting distance between rows of 50 cm, it was of 11.68 kilograms.

For samples gathered in the second period, hectolitre mass in *Festuca pratensis* was of 27.80 kilograms, at the sowing distance of 25 cm between rows, while at the planting distance between rows of 50 cm, hectolitre mass was of 27.74 kilograms. In *Bromus inermis*, hectolitre mass was of 11.68 kilograms, at the distance between planting rows of 25 cm, while at the distance between planting rows of 50 cm, it was of 11.69 kilograms. For seeds of *Festuca arundinacea* species, hectolitre mass was of 21.79 kg at the sowing distance of 25 cm between rows, while at the sowing distance of 50 cm between rows, this value was of 21 kg.

As regards the economic efficiency of setting up seed plots with perennial fodder grasses, especially *Festuca pratensis, Festuca arundinacea* and *Bromus inermis*, given the obtained results, we could assess that they lead to a significant profit and, therefore, this profitable work should encourage the organization of specialized farm production of fodder seeds, in order to provide the necessary seeds for our country, but also to create significant exportation quantities.