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CHARACTERISTICS OF THE STARTING MATERIAL OF STOCKOLUS BEZOS FOR LAWN USE

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A small number of species of perennial grasses are used to create lawns in Ukraine. Among the large species composition (the group of fodder grasses includes more than 600 species of plants), the greatest fodder value is the thornless cornflower, which is used for green fodder, silage, hay and grass flour. But increasingly, plants of this culture are used in garden compositions, planted in gardens, front gardens, along the edge of lawns, in flower gardens. Tall specimens can play the role of a hedge in the country. This is facilitated by a number of advantages: drought resistance, frost resistance, undemanding to growing conditions. The purpose of the research was to evaluate the samples of the seedless cornflower in order to identify the forms that belong to low-growing (ground) cereals and to select the breeding material based on a set of productivity and resistance to adverse environmental factors in combination with decorativeness. In the process of research, field and quantitative methods, the test beam method, weight, and statistical methods were used. According to the results of the study of the root forms of the thornless cornflower in the collection nursery, it is possible to recommend Aeneas, Universe, D07, K35591 as the starting material for creating lawn-type varieties. Samples of Aeneas have good winter hardiness, quickly restore vegetation in the spring, do not form clumps, have a rich dark green color of the leaf plate, high winter hardiness, resistance to shedding and falling out, and good decorativeness. The Universe sample has a high score of decorativeness, green color of the leaves, which have pubescence and are quite soft. The plants of the sample are well established, quickly regenerate vegetation and are resistant to shedding and falling. The sample is quite drought-resistant, resistant to diseases, especially brown rust. The sample is quite durable and does not lose its decorativeness for 4 years. Sample D07 has a good decorativeness score, a nice light green color of the leaf blade, soft leaves, pubescent. Plants of this form are resistant to seed shedding, grass loss, grow slowly after mowing and do not form clumps. Sample K35591 has good winter resistance and durability, a high score of decorativeness. Forms a good sod cover, rich green color of the leaves. Plants are resistant to diseases, quickly regenerate vegetation and are quite drought-resistant.

Keywords: *thornless cornflower, collector's item, productivity, winter hardiness.*

ХАРАКТЕРИСТИКА ВИХІДНОГО МАТЕРІАЛУ СТОКОЛОСУ БЕЗОСТОГО ДЛЯ ГАЗОННОГО ВИКОРИСТАННЯ

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Для створення газонів в Україні використовують невелику кількість видів багаторічних злакових трав. Серед великого видового складу (у групу кормових злакових трав входить понад 600 видів рослин) найбільшу кормову цінність має стоколос безостий, який використовують на зелений корм, силос, сінаж та трав'яне борошно. Але все частіше рослини цієї культури застосовують у садово-паркових композиціях, висаджують у садах, палісадниках, по краю газонів, у квітниках. Високорослі екземпляри можуть відігравати роль живої огорожі на дачі. Цьому сприяє низка переваг: посухостійкість, морозостійкість, невибагливість до умов вирощування. Мета досліджень полягала в оцінці зразків

стоколосу безостого для виявлення форм, які відносяться до низькорослих (низових) злаків, та виокремлення селекційного матеріалу за комплексом ознак продуктивності та стійкості до несприятливих чинників середовища у поєднанні з декоративністю. Під час досліджень використано польовий та кількісний методи, метод пробного снопа, ваговий, статистичний. За результатами вивчення низових форм стоколосу безостого у колекційному розсаднику можна рекомендувати як вихідний матеріал для створення сортів газонного типу зразки Еней, Всесвіт, Д07, К35591. Зразок Еней має гарну зимостійкість, швидко відновлює вегетацію навесні, не утворює купин, має насичений темно-зелений колір листової пластини, високу зимостійкість, стійкість до осипання та випадання і гарну декоративність. Зразок Всесвіт має високий бал декоративності, зелений колір листків, які мають опушення та досить м'які. Рослини зразка гарно кущаться, швидко відновлюють вегетацію та стійкі до осипання і випадання. Зразок є досить посухостійким, стійким проти хвороб, особливо бурої іржі. Зразок досить довговічний і не втрачає своєї декоративності протягом 4-х років. Зразок Д07 має гарний бал декоративності, гарний світло-зелений колір листової пластини, м'яке листя, опушене. Рослини такої форми стійкі до осипання насіння, випадання травостою, повільно відростають після скошування та не утворюють купини. Зразок К35591 має гарну зимостійкість та довговічність, високий бал декоративності, формує гарне покриття дерниною, насичений зелений колір листків. Рослини стійкі до хвороб, швидко відновлюють вегетацію та є досить посухостійкими.

Ключові слова: *стоколос безостий, колекційний зразок, урожайність, зимостійкість.*

Introduction

Gazon is a french word that means an area in a garden, park or boulevard sown with grass for decorative purposes, usually even and short-trimmed [1]. But nowadays the term "lawn" is used in a broader sense. A cultivated lawn is an area with an artificially created sod cover, which was formed by sowing and growing certain types of grasses (mainly perennial cereals) and is an important element of garden and park compositions [2]. The grasses used to create artificial lawns should be perennial, providing a dense, uniformly closed grass stand with a uniform color throughout the growing season [3, 4]. From year to year, the demand for lawn grasses grows, because they are a beautiful background for flowers, bushes, and trees, diversifying and intensifying their tonality. But the role of lawns does not end there, because they not only improve the decorativeness of green spaces, but also perform a certain sanitary and hygienic role. Their dense turf prevents soil erosion, traps dust and increases air humidity [5–8].

Recently, lawn grasses are used not only for decorative design, but also as a factor that improves the environment. Lawn coverings release phytoncides during mowing, thus improving the air [9–10]. Such properties of lawns are an important factor in the modern urban environment, when the area of cities, the number of people, buildings, industrial facilities, and roads is constantly increasing [11–13].

A small number of species of perennial grasses are used to create lawns in Ukraine. A necessary condition for the creation of highly productive grass stands is to attract new types of perennial grasses, as well as to increase their productivity and decorative indicators with the help of selection measures. But it should be remembered that lawn grasses must meet a set of requirements: be perennial, reproduce vegetatively and by seeds, form a dense grass stand and have high rates of seed productivity and decorativeness [14–16].

Cereal grasses are mainly used as fodder crops, but recently they are increasingly used in garden and park compositions. In combination with decorativeness, they have ecological significance in protecting the environment. The creation of lawn grass varieties of domestic selection is a rather urgent task, since today most of the varieties used in Ukraine are varieties of foreign selection: the number of varieties of Western European selection (73 %), domestic (27 %) [7].

Among the large species composition (the group of fodder grasses includes more than 600 species of plants), the greatest fodder value is thornless cornflower, which is used for green fodder, silage, hay and grass flour [17]. But increasingly, plants of this culture are used in garden compositions, planted in gardens, front gardens, along the edge of lawns, in flower gardens. Tall specimens can play the role of a hedge in the country. This is facilitated by a number of advantages: drought resistance, frost resistance, undemanding to growing conditions.

Stokolos bezostosty belongs to the group of upland cereals, but 15 % of the collection samples belong to low-growing (ground) cereals with a large number of shortened vegetative shoots located in the root zone, which grow well after frequent mowing and are resistant to trampling.

The *purpose* of the research: to evaluate the samples of spikeless cornflower with the aim of identifying the forms that belong to low-growing (ground) cereals and to select breeding material based on a set of characteristics of productivity and resistance to adverse environmental factors in combination with decorativeness.

Materials and methods of research

The research was conducted at the experimental field of the Poltava State Agricultural Research Station named after E. Vavilova IS and APV of the National Academy of Sciences of Ukraine in 2017–2021. This is the central part of the Eastern Forest-Steppe of Ukraine, almost on the conventional border with the Northern Steppe and the Southern Forest-Steppe - a zone of insufficient moisture. The soil is dark gray, gilded, and characterized by the following agrochemical parameters of the arable layer at a depth of 0–30 cm: hydrolytic acidity 1.9–3.3 mg equiv. per 100 g of soil; humus content – 2.44–3.46 %; The pH of the salt extract is 5.8–5.9; mobile forms of phosphorus – 13–21 mg per 100 g of soil; easily hydrolyzed nitrogen 4.42–7.94 mg per 100 g of soil; exchangeable potassium – 16–20 mg per 100 g of soil; the amount of absorbed bases is 21–30 mg per 100 g of soil.

According to data from the Poltava weather station, the air temperature during the growing season increased by +0.7 °C compared to the average multi-year data for more than 50 years, while the amount of precipitation decreased, respectively, by 14.3 mm.

Agricultural techniques for growing perennial grasses are generally accepted for the zone.

In the collection nursery, seeds were sown by hand on plots with an area of 5 m^2, repetition twice. The method of sowing is single-species, continuous row (10 cm) with a reduced seeding rate, to prevent thickening in the rows. In the collection nursery, the evaluation of the samples of thornless sedge was carried out according to the following characteristics: decorativeness, resistance to shedding and shedding, color of the leaf plate according to the Methodological recommendations for the selection of perennial grasses [18].

During the growing season, the morphological characteristics of samples of perennial grasses were studied according to the "Methodology of examination of technical and fodder plant varieties for suitability for distribution in Ukraine" [18]. Accounting for the structure of the harvest was carried out by analyzing test sheaves. Statistical processing was carried out according to the method of B. A. Dospekhov [19].

The material for the research was a collection of 120 specimens of the thornless spikelet of various ecological and geographical origins from the collection funds of the National Center of Plant Genetic Resources of Ukraine and the Poltava State Agricultural Research Station named after M. I. Vavilov of the Institute of Pig Breeding and APV of the National Academy of Sciences.

Research results and their discussion

The analysis of domestic and world experience indicates that mainly thornless corn is used as a fodder crop. And that is why selection work is directed mainly to the creation of fodder crop varieties. Forage varieties should have fast growth, provide the maximum yield of high-quality green mass [20]. Varieties for lawns should germinate quickly, restore vegetation early, have a high competitive ability with weeds, reproduce vegetatively, have good bushing, quick turfing of the area, slow regrowth after mowing, beautiful green cover after mowing, high resistance to diseases, drought - and frost resistance [15].

For breeders who are working on the creation of varieties of lawn grasses, samples that can withstand late sowing periods are of greatest interest. But it is quite important that the seeds of the starting material germinate quickly and take root well after sowing, the plants compete well with weeds, reproduce vegetatively, bush well, be resistant to diseases and pests, and require minimal maintenance costs. Such characteristics are required for the creation of new varieties of perennial grass grasses for lawn purposes [21]. In Ukraine, using the genetic potential of introduced and local flora of lawn grasses, it is possible to create varieties of lawn crops adapted to growing conditions.

Collection nursery of thornless scotch of the Poltava State Agricultural Research Station named after M. I. Vavilova is represented by samples from breeding institutions of Ukraine, USA, Germany, Canada, Poland, Norway, Hungary, Georgia, Bashkiria. Samples of lower forms have the following provenance: Enei, UKR093:00133, Ukraine; 238461, UJ2000040, Norway; Universe, UKR093:00132, Ukraine; D07, UKR093:00134, Ukraine; K29225, UJ2000122, Russian Federation; K42360, UJ2000096, Russian Federation, K28190, UJ2000036, Bashkiria; K35591, UJ2000044, Georgia.

Breeding work with thornless sedge to create varieties for lawn use should be aimed at creating grassroots forms that form low-growing bushes that bush well. It is possible to achieve the desired bushiness by selecting low-growing plants of the culture, which form a uniform dense grass and do not form clumps [11, 15].

The bushiness of collection samples was studied over a period of 5 years. Over the years of research, the bushiness of Enei samples, UKR093:00133, Ukraine; 238461, UJ2000040, Norway; Universe,

UKR093:00132, Ukraine; K35591, UJ2000044, Georgia, was 9 points. Samples D07, UKR093:00134, Ukraine; K42360, UJ2000096, RF, K28190, UJ2000036, Bashkiria had bushiness of 7 points. The sample from the Russian Federation K29225, UJ2000122 had bushiness of 5 points during the years of study.

In terms of the speed of vegetation recovery, the samples of Enea, UKR093:00133, Ukraine, were the best; 238461, UJ2000040, Norway aegis; Universe, UKR093:00132, Ukraine. Vegetation recovery in samples D07, UKR093:00134, Ukraine and K35591, UJ2000044, Georgia occurred 4 days later than the above samples. Samples K29225, UJ2000122, RF recovered vegetation the latest; K42360, UJ2000096, Russian Federation and K28190, UJ2000036, Bashkiria.

The best among the studied samples is the Aeneas sample, which had dark green leaves, the highest decorativeness score, resistance to falling of 7 points and resistance to shedding of 7 points. Specimen 238461 had green leaf color, a high decorativeness score, a drop resistance score of 5 and a shedding resistance score of 7. The Universe sample had green leaf color, decorativeness of 5 points, resistance to shedding and shedding of 7 points. Sample D07 had a light green color of the leaf plate, decorativeness score was 4 points, resistance to shedding and falling out was 7 points. Specimen K29225 had green leaves, decorativeness score was quite low, 3 points, the specimen was prone to shedding, and scored only 3 out of 7 for this trait. Resistance to shedding is quite high and is 7 points. Sample K28190 had rather low indicators of decorativeness and resistance to falling, resistance to shedding was 7 points, the color of the leaves of the plants of the sample was light green. Sample K35591 had high resistance to shedding, 9 points, green color of the leaf plate, and 5 points each for decorativeness and resistance to shedding (tab. 1).

1. Characteristics of the source material of the seedless spikelet in terms of leaf blade color, decorativeness, resistance to shedding and shedding, average for 2017–2021

Collection sample	Color of leaves	Decorativeness, score	Durability, score	
			before falling out	before shedding
Eney	dark green	5	7	9
238461	green	5	5	7
Vsesvit	green	5	7	7
D07	the light gree	4	7	7
K29225	green	3	5	9
K42360	green	4	3	7
K28190	the light green	3	3	7
K35591	green	5	5	9

Modern varieties of cereal grasses have a high genetically determined potential of seed productivity. But the ability to shed and uneven ripening causes significant losses and complicates the process of harvesting seed grass stands [22]. The study of the biological features of the thornless spikelet, its growth and development, resistance to adverse abiotic conditions, shedding and shedding is of great scientific and practical importance for the purpose of its use in the creation of varieties [2]. There fore, the vegetation period significantly affects the uniformity of seed ripening of perennial grasses, and, accordingly, the yield, since the simultaneous ripening of seeds prevents loss during harvesting.

One of the main criteria for the value of breeding material at the final stages of selection is high adaptability and stable seed yield over the years.

Sample D07 had the highest yield of green mass, the seed yield was 20 g per bush, the vegetation period was 112 days, winter hardiness was at the level of 7 points. The plants of the sample recovered their vegetation quite early and had good decorativeness. The yield of green mass from a bush in the Enea specimen was 342.6 g from a bush, seeds – 17 g from a bush, the vegetation period was quite long and amounted to 112 days. The specimen had a high winter hardiness score and grew quickly in the spring. Samples 238461 and Universe had a vegetation period of 109 days, an average yield of green mass per bush and a high winter hardiness score. The seed yield of sample 238461 was 15 grams per bush, and the sample Universe – 19 g per bush. Sample K42360 had the lowest winter hardiness score, only 5 points, the vegetation period was 114 days, the yield of green mass in the sample was 236.9 g per bush, the seed yield was 14 grams per bush. Sample K29225 had the lowest yield of green mass, only 211.7 g per bush, the seed yield was 12 g per bush, the vegetation period was 111 days, winter hardiness was at the level of 7 points (tab. 2).

2. Yield, vegetation period, winter hardiness of collection samples of the thornless cornflower, average for 2017–2021

Collection sample	Crop capacity, g/bush	Vegetation period, days	Winter hardiness
Enei	17	112	9
238461	15	109	9
Vsesvit	19	109	9
D07	20	112	7
K29225	12	111	7
K42360	14	114	5
K28190	11	100	7
K35591	19	105	9

Sample K28190 had the shortest vegetation period, 100 days, the yield of green mass was quite high – 321.6 g/bush, seeds – 11 grams per bush, winter hardiness was quite high and amounted to 7 points. Sample 35591 had a rather short vegetation period, only 105 days, an average yield of green mass and a high yield of seeds – 19 grams per bush and a high winter hardiness score.

According to the results of the study of the root forms of the thornless cornflower in the collection nursery, it is possible to recommend Aeneas, Universe, D07, K35591 as the starting material for creating lawn-type varieties.

The Enea sample is characterized by low productivity in the first three years of use (20–26 t/ha) and slowly reduces the yield level of green mass (35–45 %) by the 5th year of use. It has good winter hardiness, quickly restores vegetation in the spring, does not form clumps, has a rich dark green color of the leaf plate, high winter hardiness, resistance to shedding and shedding, and good decorativeness.

The Universe sample has a high score of decorativeness, green color of the leaves, which have pubescence and are quite soft. The plants of the sample are well established, quickly regenerate vegetation and are resistant to shedding and falling. The sample is quite drought-resistant, resistant to diseases, especially brown rust. The sample is quite durable and does not lose its decorativeness for 4 years.

Sample D07 has a good decorativeness score, a nice light green color of the leaf plate, soft leaves are a little downy. Plants of this form are resistant to seed shedding, grass loss, grow slowly after mowing and do not form clumps.

Sample K35591 has good winter resistance and durability, a high score of decorativeness. Forms a good sod cover, rich green color of the leaves. Plants are resistant to diseases, quickly regenerate vegetation and are quite drought-resistant.

Conclusions

According to the results of the study of the root forms of the thornless cornflower in the collection nursery, it is possible to recommend Aeneas, Universe, D07, K35591 as the starting material for creating lawn-type varieties.

The Aeneas sample has good winter hardiness, quickly restores vegetation in the spring, does not form clumps, has a rich dark green color of the leaf plate, high winter hardiness, resistance to shedding and falling out, and good decorativeness. and quite soft. The plants of the sample are well established, quickly regenerate vegetation and are resistant to shedding and falling. The sample is quite drought-resistant, resistant to diseases, especially brown rust. The sample is quite durable and does not lose its decorativeness for 4 years. Sample D07 has a good decorativeness score, a nice light green color of the leaf plate, soft leaves are a little downy. Plants of this form are resistant to seed shedding, grass loss, grow slowly after mowing and do not form clumps. Sample K35591 has good winter resistance and durability, a high score of decorativeness. Forms a good sod cover, rich green color of the leaves. Plants are resistant to diseases, quickly regenerate vegetation and are quite drought-resistant.

Prospects for further research. Carry out selection work with selected samples and select combinations to create varieties of thornless lawn type sedge.

References

1. Bednarska, I. O. (2003). Vydy zbirnoi hrupy *Festuca glauca agg* u flori Ukrainy. *Visnyk Lvivskoho Universytetu. Seriia Biolohichna*, 33, 27–41. [In Ukrainian].

2. Laptev, A. A. (1983). *Gazony*. Kiev: Naukova dumka [In Russian].

3. Hlazachev, B. O. (1996). *Posibnyk maistra zelenoho hospodarstva*. Kyiv: Tekhnika [In Ukrainian].

4. Horbenko, N. Ye., & Hrynyk, O. M. (2013). Formuvannia hazoniv na terytorii botanichnoho sadu NLTU Ukrainy. *Naukovyi Zbirnyk Natsionalnyi Lisotekhnichnyi Universytet Ukrainy*, 23 (2), 52–60. [In Ukrainian].

5. Mashchak, Ia. I. (2005). *Lukivnytstvo v teorii i praktytsi*. Lviv [In Ukrainian].

6. Riabchun, V. K. (2016). Geneticheskie resursy rastenij dlya obespecheniya selskohozyajstvennogo proizvodstva. *Henetychne ta sortove riznomanittia roslyn dlia pokrashchennia yakosti zhyttia liudei:* tezy Mizhnarodnoi naukovoi konferentsii, prysviachenoi 25-richchiu Natsionalnoho henbanku roslyn Ukrainy, Vinnytsia. [In Ukrainian, In Russian].

7. Riabchun, V. K., Suchkova, V. M., & Morhun, O. V. (2016). Systema henetychnykh resursiv roslyn Ukrainy: zavdannia, problemy ta perspektyvy. *Henetychne ta sortove riznomanittia roslyn dlia pokrashchennia yakosti zhyttia liudei: tezy* Mizhnarodnoi naukovoi konferentsii, prysviachenoi 25-richchiu Natsionalnoho henbanku roslyn Ukrainy. Vinnytsia [In Ukrainian].

8. Shkura, O. V. (2011). Analiz henofondu hazonnykh trav ta vidbir perspektyvnykh vydiv za pokaznykamy produktyvnosti i dekoratyvnosti. *Introduktsiia Roslyn*, 2, 79–85. [In Ukrainian].

9. Angelov, G., & Bednarska, I. (2016). Systematic relationships among eight taxa of genus Festuca from the Ukraine, as revealed by seed proteins electrophoresis. *Phytologia Balcanica*, 22 (1), 3–68.

10. Barylko, M. H., & Marinich, L. H. (2017). Formuvannia oznakovoi kolektsii kostretsiu bezostoho v umovakh Poltavshchyny. *Henetychni Resursy Roslyn*, 20, 99–107. [In Ukrainian].

11. Makoznak, N. A.(2010). *Osnovy dekorativnogo sadovodstva: ucheb. posobie. Stroitelstvo i ekspluataciya obektov ozeleneniya*. Minsk: Visha shkola [In Russian].

12. Shpahin, V. F. (2013). *Modeliuvannia seredovyshcha. AutoCAD+SketchUp*. Kyiv: *Naukovo-metodychnyi tsentr informatsiino-reklamnoi ta proforiientatsiinoi diialnosti Kyivskoho universytetu im. B. Hrinchenka* [In Ukrainian].

13. Kryzhanovska, N. Ya. (2009). *Osnovy landshaftnoho dyzainu*. Kyiv [In Ukrainian].

14. Kucheriavyi, V. P. (2008). *Ozelenennia naselenykh mists: pidruchnyk*. 2-he vydannia Lviv: Svit [In Ukrainian].

15. Zhyrnov, A. D., & Melnychuk, Ya. V. (2011). *Budivnytstvo i ekspluatatsiia sadovo-parkovykh obiektiv.* Navchalnyi posibnyk. Lviv [In Ukrainian].

16. Marinich, L. H., & Antonets, O. A. (2021). Vplyv strokiv posivu na produktyvnist stokolosu bezostoho v umovakh Lisostepu Ukrainy. *Visnyk Poltavska derzhavna ahrarna akademiia*, 3, 45–51 doi: 10.31210/visnyk2021.03.051 [In Ukrainian].

17. Tkachyk, S. O., Leshchuk, N. V., & Prysiazhniuk, O. I. (2016). *Metodyka provedennia kvalifikatsiinoi ekspertyzy sortiv roslyn na prydatnist do poshyrennia v Ukraini. Zahalna chastyna*. Vinnytsia: Ukrainskyi instytut ekspertyzy sortiv roslyn [In Ukrainian].

18. Dospehov, B. A. (1985). *Metodika polevogo opyta (s osnovami statisticheskoj obrabotki rezultatov issledovaniya)*. Moskva [In Russian].

19. Marinich, L. H. (2019). Otsinka zahalnoi kombinatsiinoi zdatnosti ta henetychnyi analiz zrazkiv stokolosu bezostoho metodom dialelnykh skhreshchuvan. *Visnyk Kharkivskoho Natsionalnoho Ahrarnoho Universytetu*, 1, 118–125. [In Ukrainian].

20. Serdiuk, M. A., Serdiuk, O. M., & Shkura, O. V. (2008). Novi sorty nyzovykh zlakovykh trav dlia ozelenennia. *Zbirnyk Naukovykh Prats Nnts «Instytut Zemlerobstva UAAN»*, 2, 110–120. [In Ukrainian].

21. Shatskij, I. M., Zolotaryov, V. N., & Ponomarenko, A. V. (2016). Biologicheskie osobennosti pobegoobrazovaniya i formirovaniya urozhaya semyan kostreca bezostogo *Bromopsis inermis* (Leys.) Holub v zavisimosti ot srokov podkashivaniya travostoya. *Kormoproizvodstvo*, 6, 41–45. [In Russian].

22. Kurhak, V. H., & Tsymbal, Ya. S. (2015). Osoblyvosti vedennia kormovyrobnytstva za orhanichnoho zemlerobstva. *Zbirnyk Naukovykh Prats NNTs «Instytut Zemlerobstva NAAN»*, 3, 77–86. [In Ukrainian].

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