

UDC: 633.631.527

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**DISPLEY OF BIOLOGICAL AND ECONOMIC FEATURES OF  
SWITCHGRASS (*PANICUM VIRGATUM*) AND DEVELOPING NEW  
VARIETIES WITH HIGH ENERGY VALUE IN THE FOREST-STEPPE  
ZONE OF UKRAINE**

*Switchgrass (*Panicum virgatum*) is an important source material for development of domestic hybrids and varieties. Selected were its breeding patterns 737 -10 (P. v.L.) Cave-in-Rock , 377 -10 (P. v. L.) Alamo, 398-10 (P. v. L.) Sunburst, 737-10 (P. v.L.) Cave -in-Rock, 1025-10 (P. v. L.) Forestburg , and 737-10 (P. v.L.) Cave-in-Rock with high content of solids, ash, and dry solid matter yield.*

**Keywords:** *switchgrass, selection, hybridization, biometric, biochemical, and economic characters.*

**Introduction.** Biofuel production in Ukraine can promote its energy independence and reduction of harmful emissions.

Success of bioenergy crops breeding depends on the availability and quality of source material, which possesses the property to transmit valuable features. It is impossible to realize any breeding program without reliable source material [1, 2]. The goal is to create a new source material of bioenergy crops through genetic recombination of best features as well as develop high-productive varieties with low content of harmful substances in the biomass and high energy value resistant to biotic and abiotic factors.

**Material and methods of research.** Used were samples of *Panicum virgatum*. Applied breeding methods: individual selection, closely related crossing, hybridization to improve plants for biometric, biochemical, and economic characters [3, 4].

Evaluation of biometric characters of economic and biological characteristics was conducted according to variety test methods common to the Institute of Bioenergy Crops and Sugar Beet, Bilotserkivska, Veselopodilska , Yaltushkivska research breeding stations.

The soils of Bilotserkivska breeding station are typical chernozem, deep, slightly humus, coarse grain – medium loamy with humus content of 3,85 %; Veselopodilska breeding station: typical chernozem, deep, coarse grain – medium loamy with humus content of 3,97 %; Yaltushkivska breeding station: light gray, gray, dark-gray podzol, medium loamy, slightly washed with a humus content of 2,75%. The climatic conditions of the growing season 2010-2012yrs were as follows: insufficient rainfall, high temperatures and low relative humidity that slowed down growth, development, and seed production of bioenergy crops.

Reproduction of *Panicum virgatum*, the samples evaluation, comprehensive study, crossing and reproduction were carried out on separate plots designed to comply with spacial isolation. Predecessor was meadow grass, farming methods - commonly adopted for cultivation in the steppe zone of Ukraine. Sowing was carried out at the optimum time on the plot of 5 m<sup>2</sup>. Standard Sunburst was placed between two numbers.

To study the biological features and selection of breeding-significant ones the sowing of switchgrass was carried out on 26-27 April 2010. Monitored were the most valuable features of switchgrass such as resistance to cold and drought, early ripeness, main stem height, the number of aboveground knots, tilling capacity, panicle length, leaf length, leaf width, weight of 1000 grains, carbohydrates, yield, resistance to diseases and pests, dry solid and ash content.

Hybridization was conducted for 10-12 most typical biometric and biochemical characters of plants.

During the harvesting selected were two or three the most productive plants of each number.

Productive properties plants were evaluated in comparison with the standard.

Experiment 1. Nursery garden. Samples of *Panicum virgatum*

The scheme of sowing (x- plot)

Sample №1	Path	Sample №2	Path	Sample №3	Path	Sample №n
x x x x x x	1,2m	x x x x x x	1,2m	x x x x x x	1,2m	x x x x x x
x x x x x x		x x x x x x x		x x x x x x		x x x x x x

Experiment 2. Comprehensive study, hybridization, creating of linear

materials: *Panicum virgatum*

♀ Cave-in-Rock x	♀ Alamo x	♀ Sunburst x
♂ Alamo	♂ Sunburst	♂ Cave-in-Rock
♂♀♀♂♀♀♂♀♀♂	♂♀♀♂♀♀♂	♂♀♀♂♀♀♂♀♀♂

Determination of germination and germination power was conducted on filter paper according to typical method. The weight of 1000 seeds was determined by weighing and counting to average with triple repetition [5].

Statistical analysis of the experimental results has been performed by methods of variance and factor analysis [6].

**Results of research.** For the purpose of breeding research introduced were following switchgrass samples: [(*Panicum virgatum* L.) Kanlow, (*Panicum virgatum* L.) Dacotach, (*Panicum virgatum* L.) Alamo, (*Panicum virgatum* L.) Forestburg, (*Panicum virgatum* L.) Shelter, (*Panicum virgatum* L.) Carthage, (*Panicum virgatum* L.) Cave-in-Rock, (*Panicum virgatum* L.) Sunburst]. Determined were their biometric characters and quality attributes.

Monitoring of the biomass accumulation dynamics was carried out. Selected were samples of *Panicum virgatum* for anatomical ( height of the main stem, number of aboveground knots, number of stems (tilling capacity), panicle length, leaf length, leaf width, weight of 1000 seeds, growing season), and physiological ( ash content , dry solids, resistance to leaf diseases (Fusarium, brown rust, powdery mildew, Table. 1). According to the observations selected were the best genotypes of Switchgrass 1025-10 (P. v. L.) Forestburg, 737-10 (P. v.L.) Cave-in-Rock with biomass yield of 14,7 ton/ha, dry solids 14,1 % , the energy value 232,5 GJ/ha and numbers 737 -10

737 -10 (P. v.L) Cave-in-Rock, 377 -10 (P. v. L.) Alamo with 14,9 ton/ ha, 16,8 %, 238,4 GJ/ ha, respectively (Table. 2.)

Applied to the Institute of plant varieties examination was variety "Morozko" with following characters: yield of solids 14,9 ton/ha, energy value 238,4 GJ/ha.

**Conclusion.** For biometric characters selected were three samples: - 737 -10 (P. v.L) Cave-in-Rock , 377 -10 (P. v. L.) Alamo, 398-10 (P. v. L.) Sunburst, 737-10 / (P . v.L.) Cave-in-Rock, 1025-10 (P. v. L.) Forestburg , 737-10 (P v.L.) Cave-in-Rock.

Selected was sample 737 -10 (P. v.L.) Cave-in-Rock, 377 -10 (P. v. L.) Alamo with a high content of solids, ash, solids yield.

Estimated by the complex of biological characters switchgrass plants are valuable source for the development of domestic varieties.

Provided with the source material of *Panicum virgatum* were breeding establishment for scientific researches.

### References

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## **Анотація**

**Орлов С. Д.**

**Особенности прояву біологічних, господарських ознак рослин *Panicum virgatum* (світчграс) з метою створення сортів з високою енергетичною цінністю в Лісостеповій зоні України**

Використання зразків *Panicum virgatum* (світчграс), оцінених за комплексом біологічних господарських ознак є цінним вихідним матеріалом для створення вітчизняних гібридів, сортів. Виділено селекційні зразки світчграсу 737 -10 (P. v.L.) Cave-in-Rock / 377 -10 (P v L.) Alamo, 398-10 (P v L.) Sunburst / 737-10 / (P. v.L.) Cave-in-Rock, 1025-10 (P v L.) Forestburg / 737-10(P v.L.) Cave-in-Rock з підвищеним вмістом сухої речовини, золи, урожайності сухої маси.

**Ключові слова:** світчграс, добір, гібридизація біометричні, біохімічними показники, господарські ознаки

## **Аннотация**

**Орлов С. Д.**

**Особенности проявления биологических, хозяйственных признаков растений *Panicum virgatum* (свитчграс) с целью создания сортов с высокой биоэнергетической ценностью в Лесостепной зоне Украины**

Использование образцов *Panicum virgatum* (свитчграс), оцененных по комплексу биологических, хозяйственных признаков, которые есть ценным исходным материалом для создания отечественных гибридов, сортов. Выделено селекционные образцы свитчграса 737 -10 (P. v. L.) Cave-in-Rock / 377 -10 (P. v. L.)Alamo, 398-10 (P v L.)Sunburst / 737-10 / (P. v. L.)Cave-in-Rock, 1025-10 (P v L.)Forestburg / 737-10(P v.L.)Cave-in-Rock с повышенным содержанием сухого вещества, зольных элементов, урожайности сухой массы.

**Ключевые слова:** свитчграс, отбор, гибридизация биометрические, биохимические показатели, хозяйственные признаки.