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## **EFFICIENCY OF METHODS OF PROTECTION FROM WEEDS ON THE GROWTH AND DEVELOPMENT OF MISCANTHUS PLANTS IN THE CONDITIONS OF WESTERN PART OF FOREST-STEPPE OF UKRAINE**

*The results of studies of the efficiency of influence methods of protection from weeds on the growth and development of miscanthus plants during the growing season are rendered in the work.*

**Keywords:** *bioenergy, biomass, Miscanthus, herbicides, chemical and mechanized tillage.*

**Introduction.** One of the main objectives of bioenergy is to create biomass energy plantations of high-energy crops used for the production of solid fuels with high biomass yield and a high content of cellulose. A particularly important issue is to attract industry to the process of growing unproductive and degraded lands. Among the wide range of high-performance cereals promising energy crop for the production of fuel pellets is miscanthus. Since this is a new culture for agriculture of Ukraine, scientists and manufacturers tasked detailed research and development of elements technology for growing miscanthus in different soil-climatic zones of Ukraine.

Among the methods of cultivation of miscanthus, a significant place is given to the care of plants, especially in the first year of vegetation. An important requirement for growing miscanthus biomass is weed control at planting, during the

germination and growing season. Necessary to determine the most effective way to protect from miscanthus weed.

By the middle of the XIX century, inefficient manual processing of the soil was the only means of controlling weeds in crops. With the development of vehicles and agricultural machinery began to use mechanical cultivation of the soil. Only in the twentieth century, the discovery of selective herbicides in many countries allowed to refuse machining and thus significantly improve the yield and quality of the final product. Modern herbicides can kill all types of weeds, but their use is very expensive and often not sufficiently accepted way of farming. Optimal results can be achieved by rational combination of different methods of protection, while weeds are most susceptible to herbicides, it will reduce the growth or destroy them completely [2, 3]. Not enough data in the literature about ways of protection of miscanthus plants from weeds are most effective. Optimization technology elements care for crops, which should ensure a high annual harvest of miscanthus biomass in soil and climatic conditions of the western Forest-Steppe of Ukraine remains questionable scientific basis.

The purpose of the experimental studies was to investigate the effect of different methods of protection from weeds on the growth and development of plants miscanthus in the west forest- steppes of Ukraine.

**Materials and methods of research.** Researchers conducted during the years 2012-2013 on the field of Borshchiv Agro technic College, Borshchiv town, Ternopil region. The soil is light gray forest, the content of mobile phosphorus (by the Kirsanov's method) in the 0-30 cm soil layer is 9.5 mg per 100 g of soil exchangeable potassium content (by Kirsanovs) - 6 mg per 100 g of soil nitrogen (by Kornfildom) - 28 mg per 100 g of soil, soil acidity (pH) - 6.0. During the study had high rainfall (June 2012 - 105.5 mm and 141.5 mm in 2013), which had a positive effect on plant growth and development. During the period of study average temperature was higher by 2 ... 4 ° C of average long-term values that in general weather conditions were favorable for growing miscanthus.

Experimental: Factor A - tillage before planting 1) cultivation, 2) without cultivation before planting, factor B - protect plants from weeds 1) inter-row tillage (MTZ-82 + KRNV-5, 6), 2) chemical method (spraying herbicides Prima SE 911 E. normally ranges from 0.5 l / ha), 3) manual weeding (control). The area of the landing - 196 m<sup>2</sup>, accounting - 94.1 m<sup>2</sup>, totals - 3300 m<sup>2</sup>, repetition - three times. The experiment was laid by the method of cleavage sites, placing reps - two tiers.

Accounting weeds were held on stationary area on the frame of 0.25 m<sup>2</sup> = 1.25 x 0.20 (m), which are superimposed on the diagonal in four places. The first check was performed before the cultivation, the second - after 20 days. Weed species were determined by the Catalogue [4].

**Results of studies.** Biological feature of the miscanthus plant is a long time of planting, emergence (20-35 days) and slow growth and development in the first half of the growing season. This is due to the temperature of the soil which at the time of planting is lower than the temperature during the germination of *Miscanthus* rhizomes. At the same time the weeds germination at relatively low temperature and before plants miscanthus, and more heat-loving - together with him, and greatly inhibit the early phases of its growth and development.

As the results of research show before the dominant cultivation in plantations miscanthus were these types of weeds as annual crops (Cock millet (*Echinochloa crus-galli* (L.) Pal. Beauv. Foxtail dove (*Setaria glauca* (L.) Pal. Beauv. )) - 26,4-29,5 pieces/m<sup>2</sup>, perennial grasses - couch grass (*Elymus repens* (L.) Gould.) - 12,5-12,6 pieces/m<sup>2</sup> (Table 1). In the variety of dicotyledonous species of flora segetal miscanthus plantations dominated: Common amaranth (*Amaranthus retroflexus* L.) - 8,4-8,8 per m<sup>2</sup>, lambsquarters (*Chenopodium album* L.) - 2,3-4,9 units. / m<sup>2</sup>, sow thistle yellow (*Sonchus arvensis* L.) - 3,8-5,4 per m<sup>2</sup>.

Table 1

**The effectiveness of methods of protection against weeds plants of  
miscanthus (average for 2012-2013)**

Types of weed	Method of protection								
	Mechanized cultivation			Spraying of herbicides			Manual weeding (control)		
	To cultivation pieces/m <sup>2</sup>	After cultivation, pieces/m <sup>2</sup>	Loss of, %	To cultivation pieces/m <sup>2</sup>	After cultivation, pieces/m <sup>2</sup>	Loss of, %	To cultivation pieces/m <sup>2</sup>	After cultivation, pieces/m <sup>2</sup>	Loss of, %
Common amaranth	8,4	0,3	96,5	8,7	3,3	62,1	8,8	0	100,0
Lambsquarters	4,9	0	100,0	2,3	0,8	65,2	4,8	0	100,0
Sow thistle yellow	3,8	0,7	82,6	5,4	0,6	88,8	4,2	0	100,0
Couch grass	12,6	1,1	91,7	12,5	2,9	76,8	12,6	1,7	86,5
Annual crops	26,4	3,3	87,5	29,5	5,1	82,7	28,1	0,4	98,6
Other	2,5	0	100	3,2	1,1	65,6	3,0	0	100,0
In all	58,6	5,4	90,8	61,6	13,8	77,5	61,5	2,1	96,5

To ensure the required level of cleanliness plants from weeds it's necessary to use rational system of protection of agricultural and chemical methods. It's difficult, costly and often impossible to do this in one effective method of weeding of *Miscanthus* plantations [5].

There are no secondary operations in the technology of growing *miscanthus*. Each is necessary and important in its own way. Thus, in areas where cultivation was carried out before planting observed less weeds than in those areas where it was not performed.

The research found (see Table 1.) that the use of herbicide in *miscanthus* plantations contributed to the overall plot clearing of weeds on 77.5%. In the embodiment of mechanized cultivation of the soil, the figure was 90.8%, but remains

a small amount of weed in the area of the line. Control option with manual weeding was 96.5%, but this operation requires more manual labor and time.

In contrast to the inter-row cultivation of soil in areas where herbicide spraying was conducted, were observed weeds (common amaranth, lambsquarters) survived after the herbicide. They were for a time in a depressed state, but subsequently recovered processes of life and even shaped seeds. However, the effects of herbicides adversely affect on the development of plants miscanthus. Certain time they were stressed, were deformed, had yellow leaves and twigs as well as disruption of growth was observed compared with the control variant (Table 2).

*Table 2*

**Influence of ways of protection against weeds on the growth and development of miscanthus plants (average for 2012-2013)**

Month	Method of protection								
	Mechanized cultivation			Spraying of herbicides			Manual weeding (control)		
	Height of main stem, cm.	Number of shoots pc.	Number of leaves, pc.	Height of main stem, cm.	Number of shoots pc.	Number of leaves, pc.	Height of main stem, cm.	Number of shoots pc.	Number of leaves, pc.
June	26,3	1,6	3,6	28,6	1,4	3,7	27,1	1,6	3,8
July	98,3	3,1	8,0	58,2	1,8	5,8	97,2	2,9	8,2
August	150,4	5,2	11,8	106,2	3,2	8,7	148,9	5,0	11,1
September	169,0	8,9	16,4	129,4	5,4	13,5	168,7	8,3	16,2

As can be seen from this table in early June in all areas of biometrics indicators of growth and development of miscanthus plants were almost identical. The height of the main shoot of plants ranged from 26.3 cm to 28.6 cm. When processing the biometric parameters were changed cardinally. In July, the height of the main shoot at the test version and the version of mechanized tillage was 97.2 cm and 98.3 cm, whereas in the areas where herbicide spraying was conducted, it was 58.2 cm. On

September the height of the main shoot in areas where mechanized tillage and control variant was 169.0 cm and 168.7 cm, a variant of chemical cultivation - 129.4 cm.

**Conclusions.** Modern technology of growing miscanthus plants requires effective protection from weeds in the first year of vegetation. The most effective measure is the inter-row tillage in the phase of tillering plants, which lets you control the number of weeds in the row middles.

Chemical soil to kill weeds should be carried out in the area of miscanthus strings using string (band) application of herbicides.

For industrial plantations growing miscanthus is necessary to mix the chemical and mechanical processing, which increases the efficiency of miscanthus plant protection from weeds in the first year of vegetation. from

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### ***Анотація***

***Гуменник М.Я., Хіврич О.Б., Квак В.М., Замойський О. І.***

***Ефективність впливу способів захисту від бур'янів на ріст і розвиток рослин міскантусу в умовах західної частини Лісостепу України***

*Наведені результати досліджень ефективності впливу способів захисту міскантусу від засміченості на ріст і розвиток рослин у процесі вегетації.*

***Ключові слова:*** біоенергетика, біомаса, міскантус, гербіциди, механізований і хімічний обробки ґрунту.

### ***Аннотация***

***Гуменник М.Я., Хиврич А.Б., Квак В.М., Замойский А. И.***

***Эффективность влияния способов защиты от сорняков на рост и развитие растений мискантуса в условиях западной части Лесостепи Украины***

*Приведены результаты исследований эффективности влияния способов защиты мискантуса от засоренности на рост и развитие растений в процессе вегетации.*

***Ключевые слова:*** биоэнергетика, биомасса, мискантус, гербициды, механизированный и химический обработки почвы.