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INFLUENCE NITROGEN FERTILIZER ON PRODUCTIVITY SYLPHIUM PERFOLIATUM FOR GROWING ON THE SOLID BIOFUELS

The results of two years of research on the effect of fertilizers on the productivity of the sylphium perfoliatum. It is established that the application of mineral fertilizers at the rate of $N_{120}P_{30}K_{60}$ provides higher yields from 8.3 t/ha to 28.0 t/ha of dry biomass sylphium perfoliatum.

***Keywords**: fertilizers, performance, Sylphium perfoliatum*

Introduction. Over the last century, oil and gas in the world has increased by almost 20 times, and continues to grow. It is estimated that within 40-50 years of hydrocarbon reserves are almost exhausted and before the global scientific community, the question arises: how to provide humanity with energy. Therefore, in many countries are increasingly creating so-called energy plantations. The basic idea of the latter is that due to photosynthesis plant accumulate solar energy in the vegetative organs of this energy can be further converted into a liquid, gaseous or solid fuel, and that it may come producing alternative fuels [5].

In Ukraine, the use of biomass energy that is still in its infancy, although the conditions for its development (particularly climate change, the potential of the agricultural sector, the availability of labor and land) is quite favorable.

Important criteria in the selection and cultivation of plants for bio-energy is the cultivation of these crops on non-agricultural land using traditional techniques [3].

The bulk of the plant - Energy is a perennial, so the technology is growing and include the use of a small number of operations, which will reduce the cost of cultivation, reduce the cost of raw materials received and reduce human pressure on the environment [4].

The plants, which are used in bio-energy, there are a number of requirements: simplicity to the soil - climatic conditions, availability of soil nutrients, as well as the ability to form a strong biomass in a short period of time and grow quickly after harvesting [2].

One of these perennial crops, which is able to generate high yields of biomass and can be used as a source of biosyrya is a sylphium perfoliatum. According productive longevity sylphium no equal among perennial crops. In the first year after planting sylphium perfoliatum is growing rapidly, forming only a rosette of leaves. In the second year and in the future it is able to form large and stable yields of biomass. Stem sylphium can reach three meters high, and yields more than 100 t/ha of green mass [1].

The materials and methods of research. The studies were conducted within the land of the Institute of Agriculture Western Polessye NAAS of Ukraine.

The experimental setup included the following options:

1. No fertilizer (control);
2. P_{30} K_{60} - background;
3. Background + N_{30};
4. Background + N_{60};
5. Background + N_{90};
6. Background + N_{120}.

The area of experimental land - 10 m^2 , repeatedly - six times .

The experiment was laid in the spring of 2011 on crops sylphium perfoliatum on the same background - $R_{30}K_{60}$. Accounting harvest was carried out by weighing a continuous manner with the accounting area of each plot. The content of oven-dry weight of the crop was determined thermostatically - gravimetric method.

Soil test area - a shallow black soil with a little humus agrochemical characteristics of the arable layer (0-20 cm): 1.4 mg.ekv hydrolytic acidity per 100 g soil; saline pH - 6.5; humus of Tyurin 1.4% imbibed bases for programming Kappen - 17.1 mg/100 g soil moving P_2O_5 and K_2O on Kirsanov respectively, 15.2 and 12.1 mg/100 g of soil nitrogen by easily hydrolyzed Kornfildom 12.0 mg/100 g of soil .

The results of research. Weather conditions in 2012 were more favorable for the cultivation of sylphium perfoliatum compared with the same period of growth in 2011, as 2011 was characterized by insufficient moisture with higher average daily temperatures, which negatively affected the yield of biomass crops.

The dynamics of accumulation of dry weight by date accounting investigated variants in 2012 was different, however, in all variants of the experiment was observed pattern - the most active accumulation of dry mass started at the end of July (Table 1). Thus, taking into account, in June the dry matter content in the biomass on the variant without fertilization (control) was 8.9 t/ha, and the end of July yield increased to 9.6 t/ha.

Table 1

The accumulation of dry mass of plants sylphium perfoliatum depending on the use of different doses of nitrogen fertilizer, t/ha (2012)

№	Variants of the experiment	Date of registration					
		31.05	29.06	31.07	30.08	28.09	31.10
1.	No fertilizer (control)	6,6	8,9	9,6	9,8	10,3	9,4
2.	P_{30} K_{60} – background	7,6	12,4	13,9	16,8	17,9	16,2
3.	Background + N_{30}	12,5	13,2	14,8	18,9	20,1	18,1
4.	Background + N_{60}	12,9	13,5	16,8	21,4	22,7	20,9
5.	Background + N_{90}	14,1	18,1	19,9	24,9	26,4	23,9
6.	Background + N_{120}	18,5	22,4	23,3	28,5	30,7	28,0

In August saw an increase in dry matter content of up to 9.8 t/ha. Over the next month, as a result of the suspension of fundamental growth processes , the yield increased slightly to 10.3 t/ha, and at the time of last census yields decreased to 9.4t/ha.

Found that the use of nitrogen fertilizer in the dose against $R_{30}K_{60}N_{120}$ kg/ha ai will provide the dry mass at the level of 22.4 t/ha in June. The next selection in the month of July showed a significant activity accumulation of dry matter - 23.3 t/ha with a consequent increase in August to 28.5 t/ha. In September, the figure rose to 30.7 t/ha and was the highest for the entire growing season. At the time of the last accounting harvest due to the termination of the growing season and outflow of nutrients in the roots for successful overwintering yields decreased to 28.0 t/ha of dry matter.

A similar pattern of activation on the main growth processes in July - August was observed in the other study options. This is due to the fact that in these months at a favorable temperature fell the maximum rainfall for all summer growing season. As a consequence, the embodiments where the fertilizers were added, took place activation nutrient uptake by plants and the intensification of the processes of growth, dry matter accumulation and consequently, the growth of crop dry weight.

Yield of vegetative mass , creating bioenergy plantations and cultivation of plants for biofuels is one of the crucial criteria , since the larger the yield, the higher the yield and thus more profit per unit area.

The results of studies show that an average of two years of research higher rate of biomass sylphium perfoliatum 28.0 t/ha to ensure payment of 120 kg/ha of ai Nitrogen against $R_{30}K_{60}$ (Table 2).

The growth of biomass was 19.7 t/ha compared with the case without fertilizer (control 8.3 t/ha).

Several smaller harvest (23.9 t/ha) and , respectively, and increase in dry biomass (15.6 t / ha) to a variant without fertilization (control) received for the introduction of 90 kg/ha of active ingredient of nitrogen fertilizer. Adding phosphate and potash fertilizers in the background provided a yield of dry mass of the sylphium

perfoliatum at 14.9 t/ha of dry matter and to gain control of 6.6 t/ha. Adding 30 kg/ha of active ingredient of nitrogen fertilizer contributed to the growth of dry matter yield up to 18.9 t/ha compared with the case without fertilizer (control) - 8.3 t/ha.

Table 2

Collection of dry biomass sylphium perfoliatum in the period of maximum accumulation, depending on the use of different doses of nitrogen fertilizer , t/ha

№	Variants of the experiment	2011	2012	The average for the 2011-2012	To increase control of t / ha the average for the 2011-2012	Is absolutely dry matter content in the biomass, %
1.	No fertilizer (control)	6,2	10,3	8,3	-	46,0
2.	P30 K60 – background	11,5	18,3	14,9	6,6	37,0
3.	Background + N30	17,7	20,1	18,9	10,6	38,0
4.	Background + N60	19,3	22,7	21,0	12,7	36,5
5.	Background + N90	21,0	26,7	23,9	15,6	35,9
6.	Background + N120	25,3	30,7	28,0	19,7	35,0
	HIP $_{0,5}$	0,71	1,56,			

Conclusions. Research has established that the yield of biomass sylphium perfoliatum significantly affected by increasing doses of nitrogen fertilizers. The highest yield of dry biomass - 28.0 t/ha - were at the option of the application of nitrogen fertilize.

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Анотація

Шевчук Р.В., Ровна Г.Ф., Кирьянчук К.І.

Вплив азотних добрив на врожайність сильфії пронизанолистої за вирощування на тверде біопаливо

Подано результати дворічних досліджень з впливу мінеральних добрив на продуктивність сильфії пронизанолистої. Встановлено, що внесення мінеральних добрив з розрахунку $N_{120}P_{30}K_{60}$ забезпечує зростання врожайності з 8,3 т/га до 28,0 т/га сухої біомаси сильфії пронизанолистої.

***Ключові слова**: мінеральні добрива, продуктивність, сильфія пронизанолиста*

Аннотация

Шевчук Р.В., Ровна Г.Ф., Кирьянчук К.И.

Влияние азотных удобрений на урожайность сильфия пронизанолистого при выращивании на твердое биотопливо

Представлены результаты двухлетних исследований по влиянию минеральных удобрений на продуктивность сильфия пронизанолистого.

Установлено, что внесение минеральных удобрений из расчета N_{120} P_{30} K_{60} *обеспечивает рост урожайности с 8,3 т / га до 28,0 т / га сухой биомассы сильфия пронизанолистого.*

***Ключевые слова**: минеральные удобрения, продуктивность, сильфий пронзеннолистный*