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Article

Bioenergetic Efficiency and Planting Timings in Soy Cultivation (Glycine max L.)

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Abstract: This study investigates the bioenergetic efficiency of soy cultivation (Glycine max L.) under varying planting timings and the application of bacterial fertilizer, Nitragin, in the Fergana region of Uzbekistan. Despite extensive research on soy cultivation, there is a knowledge gap in optimizing planting periods and bioenergetic outcomes under specific soil conditions. The study employed field experiments conducted between 2018-2020, analyzing four different planting periods and two soy varieties treated with Nitragin. Findings revealed that planting in mid-June resulted in the highest bioenergetic efficiency, with significant increases in both photosynthetic activity and crop yield. The results suggest that adjusting planting schedules and utilizing bacterial fertilizers can substantially enhance the bioenergetic productivity of soy, contributing to more sustainable agricultural practices in similar agro-ecological zones.

Keywords: sorta soi; biomass; urojay Zerno; prixod Far; calorynost; KPDFAR; raskhod energii; poluchennaya energy; chistiy Energeticheskiy pribil; coefficient energoeffektivnosti; bioenergeticheskiy coefficient; energozatrati

1. Introduction

In the world, the gross yield from soybeans is 362.2 million. an increase in production volumes in the Northern Hemisphere is expected in all major producing countries in 2020-2021, reaching tons [16]. In 2019, the world's shadow crop area was 122 million. of which more than 85% (106 million. hectares) to five leading countries, in particular Brazil - 37 million. ga, US-31 million. ga, Argentina-18 million. ga, India - 11 million. ga, China-9 million. corresponds to. In 2019, Brazil (3.3 t/ha), USA (3.2 t/ha), Argentina (3 t/ha), European Union (2.9 t/ha) and Paraguay (2.8 t/ha) were the leaders in productivity. Brazil ($84 million) as shadow exporters in 2019-2020. t), USA (45.6 million. t), Argentina (8 million. t), Paraguay (5.9 million. t), and Canada (4,25 million. t) while leading, the main importers line is China (92 million. t), European Union (15.1 million. t), Mexico (6 million. t), Argentina (3.8 million. t) and Egypt (3.7 million. t) occupied by countries such as [17].

Today, targeted research is underway in the world to realize the potential of the crop in terms of increasing the volume of soy production, to grow it in small- to-small areas, to eliminate the problem of vegetable protein, to enrich the soil with biological nitrogen and high-quality organic compounds, and to minimize the use of fertilizer, water and energy. As a result of research on the scientific justification of the timing of its planting in the main and repeated crop in increasing the volume of soy cultivation, as well as the use of bacterial fertilizers in increasing the proportion of biological nitrogen, reducing the application of mineral fertilizers, modern technologies are widely introduced in the production of soybeans.

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In Plant Science, symbiosis azotfixation is important in the conditions of energetic technology – in saving energy spent per unit of product and reducing its cost. When obtaining vegetable protein at the expense of symbiosis azotfixasia, legumes are energetically favorable: for example, to obtain 1 kcal of protein from cereals, 4 kcal of energy is spent, while only 1 kcal is spent on alfalfa protein [4, s. 43]. Due to the regular change in prices for materials and services, it is difficult to objectively assess the economic efficiency of soy cultivation using typical calculations. For an objective assessment, it will be necessary to determine the energy efficiency of cultivation. To do this, it is necessary to take into account all the energy consumption and the energy content of the crop for growing a crop, to determine the degree of compensation of energy consumption by the energy content of the crop [12, p. 22].

2. Materials and Methods

Mother polojila opit koreyshitov I uzkoyazichnogo obtsheprinyatogo kilingana Stillara [11, p. 197] V osnovu amalgi was increased.

The experiment was performed on 3 iterators, a systematic wound. One-eto experimentalny option plotshadyu 48 m2 (Annie 2.4 m, length 20 m). While Opit Raboti V kachestve taught rayona, zatshita together with atrophii collars 2500 m^2.

Experiment bil razveyan Amalgoy carried ekishem. Ekinsky razmakh choir sostavlyaet 60 cm, pushka choir - 3.5-4 cm, normoy etsisha s hectare v 70 kg schitaetsya was marked. Perejivanie tolko chto rodivshegosya jelania I krasoti: June 10-15, June 20-25, July 01-05, July 10-15. Planting work was carried Tatt uje davno sledit za amalgoy established.

Experiment Ekinsorg fotosinteticheskaya activation radiasii (FAR) base dannix na osnove hydrometeorologii Keltskogo regiona, energy boost of Kontrolny buriltshik dlya produktov unit (Q), koeffisient usisha Vilki (Kfar) formula rascheta while osnovana na tochnom

here,

Kpdfar-Far use coefficient,%; Ubiol-biomass, ts / ga;

q-energy value of product unit, kDj / kg; 104-constant number;

*∑Q is the arrival of photosynthetic active radiation (Far), kdj/cm².*Соя account when determining the bioenergetic efficiency of soy cultivation. Net energy income was defined as the difference between the energy content of a crop and the energy spent on growing a crop. The energy efficiency coefficient was determined by the ratio of net energy profit to spent energy. The bioenergetic coefficient (efficiency) was determined according to the ratio of the energy obtained to the energy expended, and the energy cost of the product was determined as the energy expended per unit of yield.

3. Results and Discussion

Energy consumption for agricultural production consists of: energy consumption for seeds, fertilizers, pesticides, fuels and lubricants (YOMM), depreciation deductions for tractors, agricultural machinery and equipment, transportation, capital and current repairs, electricity and labour costs [3, s. 35].

To determine energy costs, a technological map was compiled for planning processes in soy cultivation. All kinds of work to determine the energy efficiency of individual agrotechnological methods.

Table 1. Energy efficiency of individual agrotechnological methods

Sowing period (A)	Varieties (B)	Bacterial fertilizer (S)	Bio-mass, c/ha	Far arrival кДж/см²	q, кДж/кг	Kfar, %
10-15.VI (con-trol)	Dream (control)	Without nitragine	61,5	117,48	20096,64	1,05
		Nitragin	91,9	129,00	20096,64	1,43
	Ayjamal	Without nitragine	73,3	113,00	20096,64	1,30
		Nitragin	109,0	115,01	20096,64	1,90
20-25.VI	Dream (control	Without nitragine	67,9	109,61	20096,64	1,24
		Nitragin	99,4	116,27	20096,64	1,72
	Ayjamal	Without nitragine	79,1	101,95	20096,64	1,56
		Nitragin	112,0	110,53	20096,64	2,04
01-05.VII	Dream (control)	Without nitragine	61,9	85,66	20096,64	1,45
		Нитрагин	92,5	85,41	20096,64	2,18
	Ayjamal	Without nitragine	66,4	77,33	20096,64	1,73
		Nitragin	96,8	85,66	20096,64	2,27
10-15.VII	Dream (control)	Without nitragine	53,6	98,93	20096,64	1,09
		Nitragin	80,6	92,53	20096,64	1,75
	Ayjamal	Without nitragine	57,5	95,17	20096,64	1,21
		Nitragin	85,5	99,86	20096,64	1,72

Thus, the irrigated meadow of the Fergana region ensures that when growing soybeans in conditions of saz-alluvial soils, the seeds are treated with Nitragin and planted in the second decade of June, leaf formation in favorable sizes in plants, the photosynthetic potential of the crop is optimized, and the productivity of the plant is high, in exchange for the effective use of photosynthetic.

The value of the shade is determined by its chemical composition. The high content of fat (18-24 %) and protein (38-45 %) in seeds makes soybeans a very valuable crop (2, s. 36).

Soy is a very nutritious legume-cereal crop, whose grains contain about 35% protein. It contains all the essential amino acids, except methionine (1, C. 1298). Soy bean (grain) is widely used as a protein component in animal feed. In recent years, the production of soybeans in the world amounted to 250 million. more than a ton, this figure is mainly between the United States, Brazil, Argentina, China, India, Paraguay and Canada.

Table 2. The production of soybeans in the world

May		**Protein**		**Carbohydrates**	
%	**кг/га**	**%**	**кг/га**	**%**	**кг/га**
19,9	407,2	39,5	810,3	20,8	426,1
20,2	619,7	40,1	1229,4	21,2	648,2
20,1	491,0	39,6	967,5	21,0	512,8
21,4	778,7	40,2	1461,8	22,4	812,5
20,0	453,3	41,0	928,6	20,9	472,9
21,3	706,8	41,7	1382,7	22,3	737,6
21,5	567,7	40,9	1079,2	22,4	590,4
22,5	841,2	41,6	1554,3	23,5	875,9
19,7	450,9	40,2	922,6	20,6	472,4
20,0	686,4	40,6	1392,3	21,0	718,3
21,0	515,7	40,3	991,4	21,8	536,2
22,2	796,6	40,9	1466,7	23,2	830,0
19,1	409,3	39,7	850,2	19,9	426,5
19,8	639,2	40,0	1290,4	20,8	669,2
19,5	449,3	39,8	915,4	20,4	469,1
21,7	743,2	40,1	1372,5	22,7	775,0

It was taken into account that with a delay in the sowing period, the energy net profit was also reduced in exchange for a decrease in the yield and the energy accumulated in the crop.

The above trends have also been observed in terms of energy efficiency coefficient, bioenergetic coefficient and energy cost, and the highest results for these indicators are in the Oyjamole Variety, the seeds are inoculated with Nitragin, 20-25.VI it is worth noting that it is observed when planted at.

4. Conclusion

From the point of view of the assessment of the agronomic efficiency of the applied agrotechnological measure by the amount of yield, the economic efficiency by the net profit obtained, and the bioenergetic efficiency by the energy coefficients obtained in relation to the energy expended, the best results for these indicators are when the seeds are treated with Nitragin, 20-25.VI it was recorded in the Ayjamal variety, which was planted at. Despite the fact that the energy costs spent in the deviation of the sowing period from this period are in the same amount, there is a decrease in the energy efficiency coefficient, bioenergetic coefficient and an increase in energy cost due to the amount of energy accumulated in the resulting crop.

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