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CULTIVATION OF TOPINAMBUR UNDER DIFFERENT RATES OF APPLICATION OF ORGANIC FERTILIZERS IN THE CONDITIONS OF THE SOUTHERN ARAL REGION

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ANNOTATION

The article discusses the features of the cultivation of Jerusalem artichoke at different rates of organic fertilizers in the conditions of the South Aral Sea. Jerusalem artichoke is becoming increasingly popular in the world, primarily as a raw material for obtaining inulin, feed and bio-fuel.

KEY WORDS: ***fertilizers, insulin, biofuel, feed, leaves, flowers, tubers.***

INTRODUCTION

Jerusalem artichoke (*Helianthus tuberosus)* belongs to the Asteraceae family. This perennial herbaceous plant in some years and under favorable conditions reaches a height of three meters. The stem dies off for the winter, and new shoots grow from the tubers in the spring. The leaves are simple and large, sometimes up to 20-25 cm long, the whole plant is pubescent. Inflorescences - baskets with a diameter of 4-8 cm with bright yellow reed flowers, fruits - achenes, like those of a sunflower. Flowering, depending on the place of cultivation, lasts from September to November.

Today, this crop is cultivated on almost all continents, but is not as important as potatoes, wheat or rice (Starovoitov V.I., Starovoitova O.A., Zvyagintsev P.S., Mandryka E.A., Lazunin Yu.T.., 2015). It is grown in production as an annual crop, which, in general, does not impose special requirements on conditions. Considering that this perennial plant forms a large biomass, the soil must also be sufficiently loose for the successful formation of tubers. It is best if these are well-fertilized light loams. The optimal pH values are in the range of 6.0-7.5. The site is preferably well lit or you can choose a place with a little shading.

Jerusalem artichoke is a functional food product (prebiotic). Tubers are rich in inulin, pectin, vitamins: ascorbic acid, B1, B2, beta-carotene, microelements, contain a complex of proteins and amino acids, incl. irreplaceable, which are nutrition for the human thymus, responsible for the immune system in the body (Zhevora S.V., Starovoy-tov V.I., 2015; Starovoitov V.I., Starovoitova O.A., 2015).

Purpose of the study – to formulate and substantiate the cultivation of Jerusalem artichoke with the introduction of various doses of organomineral fertilizers. Compliance with the features of the agricultural methods of growing Jerusalem artichoke can significantly increase the yield.

MATERIAL AND METHODS

The object of research is Jerusalem artichoke and the technology of its cultivation. To increase the yield of tubers and biomass, it is necessary to carefully select varieties, planting dates, effective methods of weed control, fertilization, watering and harvesting [1, 7, 8].

Experimental conditions: meadow-alluvial, medium loamy, medium saline soils, chloride-sulfate type of salinity. The content of humus in the plow horizon is 0.88 mg/kg, gross nitrogen 0.1, phosphorus 0.24, potassium 2.6 mg/kg. In the conditions of the South Prearalie on saline soils, sowing was carried out on a flat soil surface.

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RESULTS AND DISCUSSION

Scheme of experience. Studies have shown that the most popular varieties of Jerusalem artichoke grown in Uzbekistan are Fayz Baraka and Muzhiza.

These are universal varieties that can be used in production. Considering that Jerusalem artichoke is an unpretentious plant, an extremely effective agricultural crop, responds to additional fertilization, at the same time it significantly improves soil quality [12, 13], we studied the following fertilizer rates for two varieties of Jerusalem artichoke Fayz Baraka and Mujiza:

1. Without fertilizers.
2.Organic fertilizers are normally 20 t/ha.
3. Organic fertilizers are normally 30 t/ha.
4. Organic fertilizers at a rate of 40 t/ha.
5. Organic fertilizers at the rate of 50 t/ha.
6. Norm of mineral fertilizers N100 P60 K100

Pre-planting field processing is the same as for potatoes, and depends on the type of soil. The quality (shape) and yield of Jerusalem artichoke depend on the density of the soil, therefore, immediately before planting, the soil is loosened by plowing, milling or cultivation [12, 13].

The planting density of Jerusalem artichoke is 15…30% lower than that of potatoes, depending on the size of the tuber nest. When Jerusalem artichoke is grown as a perennial plant, the crop is reproduced in the second and subsequent years from the tubers left in the ground after harvesting [2, 5].

The date of planting of Jerusalem artichoke tubers is selected depending on a number of conditions; the planting of tubers in the soil in 2021 was carried out in early spring on March 4-5. Harvest, depending on the variety, is usually formed in 120-140 days. Jerusalem artichoke was planted with whole tubers, tubers weighing from 45 to 60 g were used. The optimal density is 30...60 thousand pieces/ha.

A planting density of 30…35 thousand tubers per 1 ha is considered reasonable with row spacing of 75 cm, i.e., 3 ... 4 tubers per 1 m^2. Distance –23…30 cm between seed tubers within a row; 75 cm - between rows. The planting depth is more than 10.0 cm, as the zone is considered to be a semi-arid zone.

In the early stages, the plant directs most of the nutrients to the growth of the stem, shoots and leaves and their successive development. After the beginning of flowering, in the second half of summer, the number of leaves in Jerusalem artichoke begins to noticeably decrease.

By autumn, an intensive outflow of nutrients into the tubers from the entire green mass of plants begins, as a result of which the tops of the plants die off and dry out. Sometimes the leaves of Jerusalem artichoke completely die off after several frosts, but in most cases remain on the trunks.

From the moment flowering begins, carbohydrates synthesized in the leaves begin to flow along the stem to the tubers. Most of the dry matter is deposited in tubers in the form of fructans (inulin, fructose) and storage proteins.

The initial stage of tuber formation occurs 12-14 weeks after planting, at the beginning of flowering. Stabilization of the number of tubers occurs on the 16th week. after landing. The time of tuber formation occurs relatively early, during the growing season in early July.

The process of tuberization occurs due to the rapid division of cells and their growth. At the same time, the initial structural framework necessary for storing reserve nutrients for subsequent assimilation is formed long before the start of the influx of carbonaceous compounds, during the period of tuber growth. The start of winter stockpiling is stimulated by photoperiodic plant responses, even in accessions for which neutral daylight is the optimal photoperiod for flowering.

Harvesting Jerusalem artichoke begins with the removal of green mass, since mechanized harvesting of tubers is possible only after harvesting green mass. The green mass in September is mowed and taken out of the field to be used for feed (or fuel pellets) or crushed and scattered across the field.

Crushing green mass and spreading it across the field have two goals: improving the conditions for mechanized harvesting of tubers and using green mass as organic fertilizers. Since in the trunk of Jerusalem artichoke, especially in its lower part, there are still quite a lot of carbohydrates going to the tubers, mowing of the green mass of Jerusalem artichoke is carried out at a stem cut height of 20 ... 40 cm. The green mass, since it is a valuable fodder, is harvested by forage harvesters for large-stemmed crops and taken out of the field or crushed and scattered on the field, like green manure, with a KIR-1.5 bottler or a similar machine [10,12].

The size of the Jerusalem artichoke tuber nest is 1.5 ... 2.0 times larger than that of potatoes, its destruction due to the powerful root system requires great effort. The

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mechanical connection of the tuber with the stolon in autumn is 2–3 times higher than in spring, so the load on the working bodies of harvesters is higher. Therefore, after mowing the stems, it is better to start harvesting after 10 days.

A pause between the harvesting of green mass and tubers is done for the accumulation of tuber mass due to the outflow of plastic substances from the trunk into the tubers. At this time, tubers are maturing and their mechanical connection with stolons is reduced. In conditions of large volumes of harvesting and the need to obtain raw materials for processing, the harvesting of tubers of most varieties can be started immediately after the removal of the stem mass. For harvesting, it is recommended to use potato harvesters, loader diggers or diggers [10].

Due to the complexity of harvesting and its short terms, limited weather conditions that allow the use of harvesting equipment to preserve good tubers, part of the harvesting can be postponed to spring. The seed material is often harvested in the spring for replanting. Studies have shown that by spring the tuber nest increases significantly, and this must be taken into account when harvesting.

Shoots in our conditions begin to appear 1-2 weeks after planting, mainly depending on the soil temperature. The germination of Jerusalem artichoke is high and amounted to 88…97% (Table 1). Growth and development of weeds is observed, measures for the destruction of weeds were carried out by 2-3 manual weeding of plantings of Jerusalem artichoke: one pre-emergence and two until the plants reached a height of 30 cm.

Studies in different geographical conditions have shown that early planting of tubers allows plants to optimize photosynthesis in response to long daylight hours, increasing light intensity and maximum temperatures during the growing season. Planting varieties of early ripening in February-March guarantees a high yield of tubers already in August.

According to the literature, the yield of tubers and their size in highly fertile areas is twice as high as in low-fertile areas. Typical requirement for fertilizers for Jerusalem artichoke: N (nitrogen) - from 70 to 100 kg/ha; P (phosphorus) - from 80 to 100 kg/ha; K (potassium) – from 150 to 250 kg/ha [9, 10]. According to our data (Table 1), with an increase in the rate of application of organic and mineral fertilizers, the yield of both green mass and tubers increases. When applying 20 t/ha of organic fertilizers, compared with the control without fertilizers, the yield of green mass increased by 7.0 t/ha for the Faiz baraka variety, by 8.4 t/ha for the Muzhiza variety; tubers productivity by 11.2 and 15 t/ha, respectively.

Table 1
Indicators of growth and development of Jerusalem artichoke varieties

	Norms of organic and mineral fertilizers / varieties	Germination of tubers, %		Green mass, in the flowering phase, t/ha		Tuber yield, t/ha	
		Faiz Baraka	Mujiza	Faiz Baraka	Mujiza	Faiz Baraka	Mujiza
1.	Without fertilizer	90	94	20	23,6	0,8	1,0
2	20 t/ha.	88	95	27	32	12	16
3	30 t/ha.	90	96	35	39	24	27
4	40 t/ha	91	93	47	50	41	45
5	50 t/ha.	93	95	48	52	43	48
6	N100 P60 K100	95	97	45	46	32	35

The most optimal option was the application of 40 t/ha, while the most optimal yield according to the experiment is noted, green mass for the Faiz baraka variety is 47 t/ha for the Muzhiza variety is 50 t/ha; the yield of tubers was 41 and 45 t/ha, respectively.

A further increase in the rate of application of organic fertilizers slightly increased the yield of both green mass and tubers of Jerusalem artichoke varieties. The effect of mineral fertilizers on the yield of green mass and tubers was equal to the application of 30-40 t/ha of organic mineral fertilizers. Given the aftereffect and natural origin, the high cost of mineral fertilizers, the preference for organic fertilizers should be noted.

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After harvesting, Jerusalem artichoke tubers are poorly stored in winter, quickly fade, and are affected by fungal diseases. Therefore, usually a small part of the tubers is harvested in the fall and used for animal feed or silage preparation, and the main part - in the spring, so as not to store a large number of tubers and prevent their natural decline. It is advisable to use piles and trenches for storing tubers of autumn harvest. For better storage, they are laid in layers of 10 cm, alternating with soil or sand.

CONCLUSIONS

1. According to the results of the cultivation of Jerusalem artichoke at various rates of organic fertilizers in the conditions of the South Aral Sea, it follows that the study of the technology of growing Jerusalem artichoke is an important component in growing in organic farming.
2. The productivity of both varieties of Jerusalem artichoke was optimal when applying 40 t/ha of manure. In comparison with the variant without fertilizers, the increase in tuber yield was 7 t/ha for the Fayz baraka variety and 8 t/ha for the Muzhiza variety. Given the aftereffect and safety of use, preference should be given to the application of organic fertilizers.
3. Jerusalem artichoke is a new crop for industrial cultivation on saline soils with different norms of organic fertilizers, therefore the technology of its cultivation should be studied and improved.

LITERATURE

1. *Zhevora S.V., Starovoitov V.I. Problems and prospects for the production of potatoes and Jerusalem artichoke for health-improving nutrition products: Sat. scientific tr. Michurinsk, 2015, pp. 100-105.*
2. *Kolomeichenko V.V. Crop production / Textbook. - Agrobusinesscenter, M.: 2007. — 600 s. ISBN 978-5-902792-11-6.*
3. *Starovoitov V.I., Starovoitova O.A., Zvyagintsev P.S., Lazunin Yu.T. Jerusalem artichoke is an innovative resource in the development of the Russian economy // Food Ingredients. Raw materials and additives. - 2013. No. 2. P. 30-33.*
4. *Starovoitov V.I., Starovoitova O.A., Zvyagintsev P.S., Mandryka E.A., Lazunin Yu.T. Jerusalem artichoke - culture of multi-purpose use // Food industry. 2013. No. 4. S. 2-5.*
5. *Starovoitov V.I., Starovoitova O.A., Zvyagintsev P.S., Mandryka E.A., Lazunin Yu.T. Jerusalem artichoke is a unique vegetable raw material // Food industry. 2015. No. 8. S. 16-20.*
6. *Crop production / P.P. Vavilov, V.V. Gritsenko, V.S. Kuznetsov and others; Ed. P.P. Vavilov. – 5th ed., revised. and additional – M.: Agropromizdat, 1986. – 512 p.: ill. - (Textbook and textbooks for higher educational institutions).*
7. *Reingart E.S., Kochnev N.K., Ponomarev A.G. Jerusalem artichoke: growing - harvesting - obtaining bioethanol // Rural mechanic. 2009. No. 1. S. 28-29.*
8. *Barloy J. Techniques of cultivation and production of the Jerusalem artichoke, in Topinambour (Jerusalem Artichoke), Report EUR11855, Grassi, G. and Gosse, G., Eds., Commission of the European Communities (CEC), Lux -embourg, 1988. Pp. 45-57.*
9. *Starovoitov V.I., Voronov N.V., Starovoitova O.A. The development of mass cultivation of Jerusalem artichoke - prerequisites for improving the environment: Proceedings of the Intern. agroecological forum. St. Petersburg: GNU SZNIIMESH, 2013. T. 2. S. 135-141.*
10. *Starovoitov V.I., Starovoitova O.A., Manokhina A.A. Peculiarities of technologies and machines for the cultivation of Jerusalem artichoke // Rural mechanic. 2015. No. 11. P. 4-5.*
11. *Starovoitov V.I., Starovoitova O.A. Innovative ridge technologies and technical means for the cultivation of potatoes and nambur marshes // Agriculture. 2015. No. 7. P. 40-42.*