даврига нисбатан камайиши қайд қилинди. Худди шундай ҳолат қолган вариантларда ҳам шоналашдан кейинги босқичда камайиб бориши кузатилди (3-жадвал).

Хулоса ўрнида шуни айтиш мумкинки, қишлоқ хўжалигида, хусусан пахтачиликда ҳам минерал ўғитлар ғўза ҳосилдорлигини оширишнинг энг муҳим ва асосий омилларидан бири ҳисобланади. Аммо, уларни тўғри қўллаш муаммоси ҳали ҳам етарлича ечилгани йўқ. Чунки, берилган озиқ элементлар, тупроқ-иқлим ва ҳоказолар билан ўсимлик ўртасидаги ўзаро таъсир ҳамда глобал иқлим ўзгаришига мос ечимлар ҳали етарли даражада ўрганилмади. Қишлоқ хўжалиги экинларига, хусусан ғўзага ҳам азотли, фосфорли, калийли ва бошқа озиқ элементларни кўп омилли таъсирларини ҳар томонлама билиш биосферани муҳофаза қилиш ва ўғитлардан фойдаланиш коэффициентини ошириш муаммолари билан қўшилиб, янада муҳим аҳамият касб этади. Чунки, қишлоқ хўжалиги экинлари ўғитлардан фойдаланиш коэффициенти анча паст, унинг тебраниш даражалари эса хилма-хил бўлиб, қўлланиладиган минерал ўғитлар миқдор (норма)ларининг ортиб бориши экинлар ҳосилдорлигини ортиб боришига ҳизмат қилмайди. Экинларнинг озиқа элементларига бўлган, яъни потенциал имкониятидан юқори бўлиши, уларнинг ҳосил салмоғига ва сифатига салбий таъсир кўрсата бошлайди. Шунингдек, илмий асосланган ўғитлаш тизимига қатъий риоя этилмаслиги оқибатида табиатнинг ҳамда тупроқларнинг ўғит қолдиқлари билан ифлосланишига олиб келади.

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EFFECT OF AMARANTH PLANTING TIMES AND PLANT THICKNESS ON THE VOLUME WEIGHT OF SOIL

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Annotasiya. Amarant o'simligi har qanday ekin uchun yaxshi o'tmishdosh ekin bo'la oladi. Uning hosili yig'ishtirib olinganidan keyin tuproqqa qoldiradigan ildiz va ang'izi tuproqning hajm massasini oldingisidan kamayishini ta'minlaydi. Ayniqsa, amarantni Namangan viloyatining och tusli bo'z tuproqlar sharoitida o'stirish uchun 15 martda 60X25-1 tizimda nazariy ko'chatlar sonini 66,6 ming dona bo'lishi yaxshi samara beradi.

Kalit so'zlar: amarant, o'simlik, ekin, vegetatsiya, tuproq, qatlam, hajm massa, dorivor, tajriba, ekish sxemasi, ekish muddati.

ISSN 2181-0626 1/2023y.

Аннотация. Растение амарант может быть хорошим предшественником для любой сельскохозяйственной культуры. После его сбора оставшиеся в почве корни и побеги обеспечивают уменьшение объемной массы почвы по сравнению с предыдушей. Специально для выращивания амаранта на светло-серых почвах Наманганской области теоретическое количество всходов в системе 60X25-1 на 15 марта составит 66600 шт.

Ключевые слова: амарант, растение, урожай, вегетация, почва, слой, масса, объем, лекарственный, опыт, схема посадки, период посадки.

Annotation. The amaranth plant can be a good predecessor crop for any crop. After its harvest, the roots and shoots left in the soil ensure that the volume mass of the soil is reduced from the previous one. Especially for growing amaranth in the light grey soils of the Namangan region, the theoretical number of seedlings in the 60X25-1 system on March 15 will be 66,600 units.

Key words: amaranth, plant, crop, vegetation, soil, layer, mass volume, medicinal, experiment, planting scheme, planting period.

In order to improve and strengthen the health of the population of our republic, the task is to provide them with the necessary medicines in sufficient quantity. Cultivation and processing of medicinal plants in order to create a single base of scientific research on the cultivation and processing of medicinal plants in the territories of the republic, to study the advanced scientific developments of foreign countries, to establish cooperation with leading scientific institutions, to introduce modern technologies and scientific developments to the republic, and to strengthen the effective use of existing opportunities. A research and production centre was established. The mission of the centre is to grow and process medicinal plants on a scientific basis, to study the areas of medicinal plants growing wild in the territory of the republic and to determine their reserves, to preserve the gene pool of existing bioresources, to organise mother plantations, to grow and prepare seed materials, and to breed medicinal plants, taking into account specific soil and climate conditions. is to establish cultural cultivation. One of such plants is amaranth, and it is planned to carry out work aimed at increasing its productivity while preserving its medicinal properties.

It is also important to study the impact of agricultural crops on the soil, in addition to increasing the productivity of agricultural crops and meeting the needs of the population. It is also relevant to study the effect of the amaranth plant on the volume and mass of the soil. Because the change in volume and mass has a dramatic effect on the yield and quality of the next crop. A lot of scientific research is being done in this regard.

F.M. Khasanova and I.T. Karabaevlar [11; 248–250-b], based on their experimental data, came to the following conclusion: regardless of the method of tillage and sowing, after winter wheat, the volume mass of the soil did not increase (it was not compacted).

The studies found that manure, clay, and trace elements used separately and together increased the yield of winter wheat on medium-eroded soil by 16.6–64.2% in all years and on average, over three years, by 20.6–58.8%. It is characteristic that the «clay + manure» option was quite effective in all the years of the experiments because it provided a more balanced plant nutrition than pure manure. The increase in the yield of winter wheat on average over 3 years in this option was 57.4%. Also had a positive effect on the bulk density from the physical properties of the soil. Similar studies were carried out in Bulgaria [12, pp. 65–69, 13; pp. 20–27, 14; pp. 186–192].

J. Egorov and E. Gorelov [4; p. 20–21] write that the main task of the farming system is to obtain a high yield from each hectare of irrigated land and enrich the soil with minerals and organic substances. In this case, as the soil structure improves and the amount of humus in its content increases, the soil's ability to absorb moisture increases. The cotton yield was 2–3 percent higher in the intercropped fields compared to the control.

Researchers M.P. Balev and R.S. Koratayanova [1; p. 80–88] found in experimental results (CO_2) that the concentration of carbon dioxide gas depends on soil density, humidity, and temperature. According to the author's conclusion, the different ploughing depths in the main soil tillage technology created different structures in the ploughed layer, led to different

distributions of organic residues in the soil layers, and, as a result, created different air patterns. Also, during the entire growth period, carbon dioxide gas release and an increase in the soil environment (CO_2) occurred in the variants ploughed in a double-layered plough at a depth of 30–40 cm and in the variants that received powder and agate.

The significance of fertilizers is much broader, and their action is much more complicated, since they have a large and multifaceted effect on many properties of the soil (chemical, physico-chemical, biochemical) and microbiological processes occurring in it. Fertilizers change the reaction of the soil environment, the availability of soil food elements for plants, the activity of beneficial microflora, thereby affecting the conditions for the growth and development of plants and, ultimately, the yield and its quality [10; 143-p, 15; 50-52-pp].

According to I. Zh. Sulaimanov et al. [6; 25-27 б.] after the winter wheat repeated sowing of beet crops will have a positive effect on the size of the soil and serve to increase its productivity. Although this crop, which has been studied in practice, yields relatively good results, it is important to select the optimal sowing standards for all repeated crops.

In order to increase the efficiency of irrigated land use as a second crop of succeeded suctions, it is best to plant 50-75% of its seeds with seeds (respectively, 84% and 89%), so as to obtain full seedlings of seeds [7; 122-126 б.].

Omonilloevich F. Kh. and others [9; pp. 321-325] stated that calcium and micro- and macroelements in chicken egg shells are used as various fertilisers and bioactive compounds to find high-performance fertilisers for the cultivation of amaranth medicinal plants, in medicine, and that it is a unique raw material in agricultural fields. It is especially useful for the amaranth plant.

A.O. Khabibullaev [8; p. 741-746] stated that in order to increase the organic matter in the soil in order to obtain a high and quality product from the amaranth plant, it is advisable to plant rye and rapeseed as a siderate crop after harvesting cotton, which is the main crop. In early spring, 380–400 t/ha of blue mass is ploughed into the ground, which increased the humus content of the soil by 0.001% when it was determined after the amaranth harvest, which led to a decrease in volume mass.

For this purpose, we aimed to study the impact of the amaranth plant and the agrotechnical factors applied to it, its planting period, and the number of seedlings on the volume and weight of the soil.

The experimental system is presented in Table 1, where 12 options are arranged in 4 rows in one tier, the total area of each plot is 240 m^2, and the area of consideration is 100 m^2. The total area of the experiment is 1,115 hectares. In the experiment, three different amaranth planting dates were set (15.03; 25.03; and 05.04). The planting patterns were 60X20-1, 60X25-1, 60X25-1, and 60X30-1, and the number of theoretical seedlings was different for the different planting patterns.

In the experiment, 100% of the planned phosphorus and potassium fertilisers were applied before ploughing the field, since the mineral fertilisers were applied at the same rate. Nitrogen fertilisers were given 40% of the total nitrogen rate before planting (20%), another 35% when 2–3 true leaves are produced (after the single one), and the remaining 40% during fertilisation.

In the experiment, monitoring of plant growth and development and calculations were carried out based on the tasks defined on the basis of the plan. Also, in order to determine changes in the amount of nutrients in the soil before the experiment and at the end of the experiment, soil samples were taken from the ploughed (0–30 cm) and under-tilled (30–70 cm) layers, and agrochemical analyses were carried out, in which humus and nitrogen, phosphorus, and total amounts of potassium, as well as mobile amounts of nutrients, were determined. For the analysis of soil samples, nitrates were analysed by the Grandwald-Lyaju method, mobile phosphorus and exchangeable potassium by the Machigin and Protasov method, and humus by the I.V. Tyurin method. Total NRC amounts were determined from plant samples taken at the end of the application period.

Agrophysical properties of the soil: «Методы агрохимических, агрофизических и микробиологических исследований в полевых хлопковых районах» [4; 187 p.] method, soil volume, and mass N.A. Kachinsky, humus content; I.V. Tyurin, total amount of nitrogen and phosphorus P.P. Gritsenko, I.M. Maltseva, nitrate nitrogen, Grandvald Lyaju, mobile phosphorus B. The amount of exchangeable potassium was

ISSN 2181-0626 1/2023y.

determined by the methods of P. Machigin and P. V. Protasov. Mathematical analysis of results of field experiments by B.A. Dospekhov [2; 352 p.] (M., 1985), and calculation and phenological observations in «Methods of conducting field experiments» [1; 147 p.] were held on this basis.

Experience system

№	Planting period	Planting scheme	Theoretical seedling thickness, thousand bush/ha
1	15.03.	60X20-1	83,333
2		60X25-1	66,666
3		60X30-1	55,555
4		60X35-1	47,619
5	25.03.	60X20-1	83,333
6		60X25-1	66,666
7		60X30-1	55,555
8		60X35-1	47,619
9	05.04.	60X20-1	83,333
10		60X25-1	66,666
11		60X30-1	55,555
12		60X35-1	47,619

The first (at the time of the experiment) determinations of the volume mass of the soil of the experimental area were carried out, and the next one was carried out at the end of the plant vegetation (after harvesting) (Table 2). These checks were carried out in all years of the experiment. The volume mass of the soil in each 10 cm of the layer up to 100 cm of the experimental field was determined, and we averaged them by summing the layers of 0–50, 0–70, and 0–100 cm. Analysing the data obtained in the first year, the volume mass in the 0–50 cm layer of the soil was initially the same for both options at 1.41 g/cm3. and by the end of vegetation, we can see that the mass volume has slightly increased (except for options 1-4). In the first planting period, this rate remained unchanged, which can be attributed to the timely implementation of the planting period, planting scheme, and agrotechnics. It can be noted that the changes in the next layer of soil (0-70 cm) have changed depending on 0-50 cm. In this case, it can be observed that in options 1-4 it remained unchanged from the beginning, and in the remaining options it increased slightly and corresponded to the same 1.43 g/cm^3. Similarly, in the 0-100 cm layer of the soil, the volume and mass remained unchanged in the variants during the first planting period (var. 1-4) (1.44 g/cm3 both at the beginning and at the end of vegetation). In the remaining 5–12 variants of the experiment, it was 1.45 g/cm^3, a little higher than the first one. In some variants (6, 11, and 12), this indicator increased to 1.46 g/cm^3. Apart from the planting period, the number of plants also influenced this.

Examining the results of the second (2021) year of the experiment, we can see that the pattern of the previous year has been preserved. Only in the 0–50 cm layer of the soil, in options 1–4, was an increase in volume mass observed. It was 1.38 g/cm^3 at the beginning and 1.39 g/cm^3 at the end of the vegetation period.This year, the change in soil density was not only dependent on planting dates but also on planting schemes. It was the same 1.39 g/cm^3 in the first planting period (15.03) of the amaranth plant in options 1-4 and in the second planting period (25.03) in options 5 and 6 with more seedlings. Also, in options 7 and 8 with a slightly lower number of seedlings on 25.03 and options 9 and 10 with a higher number of seedlings planted on 5.04, the same value was 1.40 g/cm^3. In the remaining 11th and 12th variants of the experiment, the volume mass was the highest and increased by 0.03 g/cm^3. In the 0-70 cm soil layer, the change

was similar to that in the previous layer options, but in the 0-100 cm layer, it was slightly different. It was observed that only the last planting period (05.04) increased by the same 0.02 g/cm^3 in all options 9–12.

Table 2

Volumetric weight of experimental field soil at the beginning and end of vegetation, in g/cm^3

Options	Volume weight 2020			Volume weight 2021			Volume weight 2022		
	0-50	0-70	0-100	0-50	0-70	0-100	0-50	0-70	0-100
1	1,41/1,41	1,42/1,42	1,44/1,44	1,38/1,39	1,40/1,41	1,42/1,43	1,40/1,41	1,41/1,42	1,42/143
2	1,41/1,41	1,42/1,42	1,44/1,44	1,38/1,39	1,40/1,41	1,42/1,43	1,40/1,41	1.41/1,42	1,42/1,43
3	1,41/1,41	1,42/1,42	1,44/1,44	1,38/1,39	1,40/1,42	1,42/1,43	1,40/1,41	1,41/1,42	1,42/1,43
4	1,41/1,41	1,42/1,43	1,44/1,44	1,38/1,39	1,40/1,42	1,421,43	1,40/1,42	1,41/1,43	1,42/1,43
5	1,41/1,42	1,42/1,43	1,45/1,45	1,38/1,39	1,40/1,42	1,42/1,43	1,40/1,42	1,41/1,43	1,42/1,43
6	1,42/1,42	1,42/1,43	1,45/1,46	1,39/1,39	1,40/1,42	1,42/1,43	1,40/1,42	1.41/1,43	1,42/1,43
7	1,41/1,42	1,42/1,43	1,44/1,45	1,39/1,40	1,40/1,42	1,42/1,43	1,40/1,42	1,41/1,43	1,42/1,43
8	1,42/1,42	1,42/1,43	1,44/1,45	1,38/1,40	1,40/1,43	1,42/1,44	1,40/1,43	1,41/1,44	1,42/1,45
9	1,41/1,42	1,41/1,43	1,44/1,45	1,38/140	1,40/1,42	1,42/1,44	1,40/1,43	1,41/1,44	1,42/1,45
10	1,41/1,42	1,41/1,43	1,44/1,45	1,38/140	1,40/1.43	1,42/1,44	1,40/1,43	1.41/1,44	1,42/1,45
11	1,41/1,43	1,42/1,43	1,44/1,46	1,39/141	1,40/1,43	1,42/1,44	1,40/1,43	1,41/1,44	1,42/1,45
12	1,41/1,43	1,42/1,43	1,44/1,46	1,38/141	1,40/1,43	1,42/1,44	1,40/1,43	1,41/1,44	1,42/1,45

Note: The initial volume weight of the soil in the figure is equal to the volume weight of the soil at the end of vegetation in the denominator.

In the third year of the experiment, we can see that the volume mass of the soil has increased from the beginning in all layers of the soil. 0-50 of soil; in layers 0-70 and 0-100 cm, it was found that the volume mass increased by the same 0.01-0.03 g/cm^3.

The amaranth plant leaves a large amount of roots and shoots (1.25–1.52 t/ha, depending on the options) in the soil after harvesting. This affects soil properties, including bulk density. In order to find out, after the experiment and before planting the next crop (in the spring), we continued to study the volume and mass of the soil again (Table 3). When we analysed the obtained data, we saw that the volume mass of the soil appeared differently according to the experimental options. In the first year of the experiment, in options 1 and 2, the amount of soil in the 0–50 cm layer was 1.39 g/cm^3, in options 3-6 it was 1.40 g/cm^3, and in options 7–12 it was 1.41 g/cm^3. and in the 0-70 cm layer of the soil, it corresponded to 141 g/cm3 in options 1-3 and 1.42 g/cm^3 in options 4–12. The same change was observed in the 0-100 cm layer of the soil. In general, after the amaranth plant, the volume mass of the 0-100 cm layer of soil has decreased, and it has become useful for the next crop.

The data obtained after the second year of the experiment were slightly different from the first year, with the same 1.37 g/cm^3 in the 0-50 cm soil layer for options 1–5, 1.38 g/cm^3 for options 6–10, and 1 for options 11 and 12. corresponded to.39 g/cm^3. In the 0-70 cm layer of the soil, it was 1.39 in options 1 and 2, 1.40 in options 3-10, and 1.41 g/cm^3 in options 11 and 12, while in the 0-100 cm layer it was 1.41; it was found that it was 1.42 g/cm^3 in options 7-10 and 1.43 g/cm^3 in options 11 and 12.

Table 3

Bulk density of experimental field soil before subsequent cropping, in g/cm^3

Options	Volume weight 2021			Volume weight 2022			Volume weight 2023		
	0-50	0-70	0-100	0-50	0-70	0-100	0-50	0-70	0-100
1	1,39	1,41	1,43	1,37	1,39	1,41	1,39	1,40	1,41
2	1,39	1,41	1,43	1,37	1,39	1,41	1,39	1.40	1,41
3	1,40	1,41	1,43	1,37	1,40	1,41	1,39	1,40	1,41
4	1,40	1,42	1,44	1,37	1,40	1,41	1,39	1,40	1,41
5	1,40	1,42	1,44	1,37	1,40	1,41	1,39	1,41	1,42
6	1,40	1,42	1,44	1,38	1,40	1,41	1,39	1,41	1,42
7	1,41	1,42	1,44	1,38	1,40	1,42	1,40	1,41	1,42
8	1,41	1,42	1,44	1,38	1,40	1,42	1,40	1,41	1,42
9	1,41	1,42	1,44	1,38	1,40	1,42	1,40	1,41	1,42
10	1,41	1,42	1,44	1,38	1,40	1,42	1,40	1.41	1,42
11	1,41	1,42	1,44	1,39	1,41	1,43	1,40	1,41	1,42
12	1,41	1,42	1,44	1,39	1,41	1,43	1,40	1,41	1,42

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In the third year of the experiment, it was found to be the same 1.39 g/cm3 in options 1-6 and 1.40 g/cm3 in options 7–12, different from previous years (in the 0–50 cm layer). In the 0-70 cm layer of the soil, it changed slightly and was 1.40 g/cm3 in options 1-4 during the first planting period and 1.41 g/cm3 in options 5–12. A similar situation was observed in the 0-100 cm layer of the soil.

Based on the obtained data, it can be said that it is appropriate to set the planting date as March 15 for growing amaranth in the light grey soils of the Namangan region. Also, planting amaranth in the 60x25-1 system during this period with 66,600 seedlings will reduce the volume of soil and ensure good growth of the next planted crop.

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УДК: 631.67:631.4+631.95+631.46

АКТИВНОСТЬ ФОСФАТМОБИЛИЗУЮЩИХ БАКТЕРИЙ В ОРОШАЕМЫХ ТИПИЧНЫХ СЕРОЗЕМНЫХ ПОЧВАХ ПО ВИДАМ СЕЛЬСКОХОЗЯЙСТВЕННЫХ КУЛЬТУР

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Аннотация. В статье представлены результаты исследований активности фосфат мобилизуюших бактерий в зависимости от типа сельскохозяйственных культур в типичных орошаемых сероземных почвах. Одной из глобальных экологических проблем земледелия