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INFLUENCE OF DETONATION TREATMENT ON PHYSIOLOGICAL GROUPS OF SOIL MICROORGANISMS

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Abstract:

The article describes the soil cultivation technology development using gas-dynamic cultivators in order to create optimal soil conditions for the cotton growth and development. As a result of the developed technology application, an increase in the physiological groups of soil microorganisms has been achieved.

Keywords Gas-dynamic ripper, physiological group, atmospheric carbon, loosening, biological activity, enzymatic activity.

Currently, the agricultural industry has many opportunities to maintain or increase the productivity of the soil by introducing special natural or synthetic nutrients.

By fertilizing the soil and plants, it is possible to optimize due to the prompt and timely introduction of various scarce chemical components necessary to ensure the normal growth and development of crops.

In modern times, there is a number of specialized technologies that allow to achieve high efficiency through the use of various combinations of fertilizers, as well as equipment (sprayers, spreaders, tanks, complex units) and technology.

In addition to the usual traditional methods widely used in the agricultural technology of our zone, there are also alternative ones, in particular carbon farming, which combines many agricultural methods aimed at using atmospheric carbon in soil, crop roots, timber and leaves.

In addition to hydrogen and carbon, the composition of the fuel for the engine also contains chromium, calcium, sulfur, iron and silicon in smaller quantities. Engine oil contains calcium, phosphorus and zinc. The thermal efficiency of the engine determines the chemical composition of the exhaust, which depends on the brand of fuel, the speed of the engine, the size of the load, the operating temperature and the characteristics of the injection. The composition of the exhaust is also affected by fuel additives.

Heavy metals, toxic to humans, are converted into additional nutrients that can be absorbed by crops. In other words, due to special additives, exhaust gases can become a source of providing plants with microelements.

The main benefits of nitrate flue gas are:

- acceleration of metabolic processes and preservation of hydrogen in the roots;
- greater volume of carbon dioxide in the soil;
- an increase in the concentration of copper in culture tissues;
- activation of the growth of crops that respond positively to sodium, especially with insufficient supply of potassium, in such crops sodium improves the water balance;
- decrease in the absorption of chloride by cultures that cannot tolerate sodium;
- in plant tissues the pH level rises, which helps to protect them from pathogens and improve the absorption of nitrates.

Moreover, the moisture in the exhaust can condense in the seeds during cooling, activating their germination.

It has now been scientifically proven that the number of live bacteria, parasites or fungi on seeds treated with carbon monoxide is much lower than on seeds without treatment.

The basis of the developed mechanized method of loosening the soil surface and destruction of the soil crust by microexplosions is based on the principle of impact on the soil by a shock wave formed as a result of detonation of fuel-air mixtures in the tubes of an explosion generator. In this case, the shock wave creates a pulse pressure on the soil surface with a high gradient of growth. In this case, the plants are not damaged, since the mechanical contact of the tool with the soil is completely excluded.

It should be noted that the issues of technique and technology for the destruction of the soil crust and soil loosening by the shock wave coming out of the explosion generator are not sufficiently developed. It is necessary to pay special attention to the consequences of the impact of detonation shock waves on soil and plants.

Soil cultivation and destruction of the soil crust were carried out by installing a GDRP, by acting on the soil with air shock waves without mechanical contact with the working bodies.

The cultivator allows the cultivation of the soil both in the pre-sowing period and at the stages of vegetative growth and development of cotton.

The working bodies of the GDRP are paired pipes with a cylindrical turbulator common to each pair of pipes and a common combustion chamber for each pair of pipes at the inlet.

The open ends of the pipes are directed towards the cultivated soil and are equipped with mufflers.

The soil cultivation of the GDRP was carried out in the following mode: the distance from the cut of the detonation tube to the soil surface was 30-50 mm, the width of capture of each pair of the tube was up to 200 mm.

Sprouted cotton was processed using a protective screen (Fig. 1). In this case, the distance from the bush to the defender was 100 mm, the width of the treatment zone was 200 mm, and the shock wave frequency was 8 Hz.

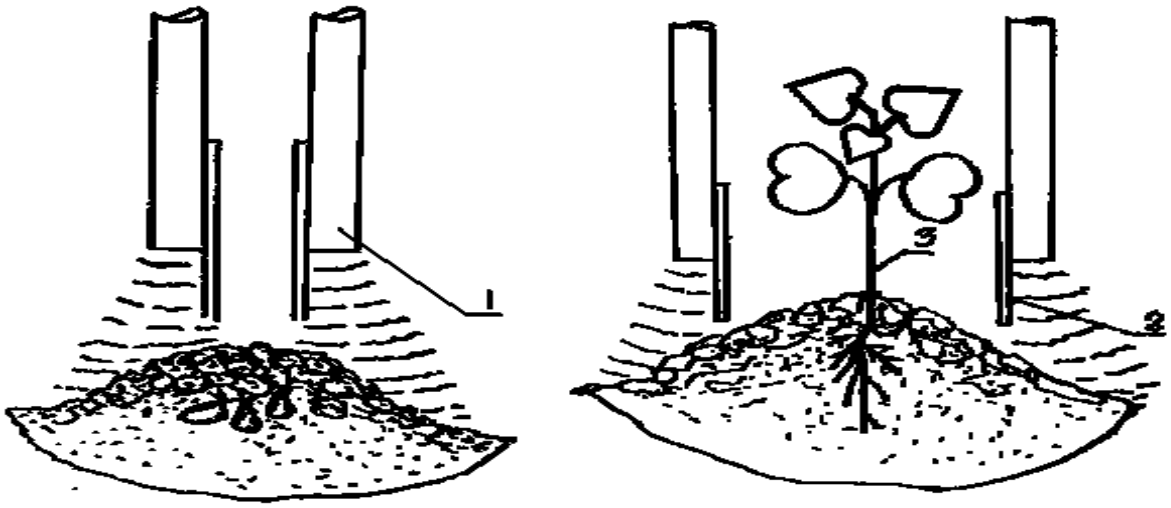

Fig. 1. Screen layout and layout.

Soil cultivation according to the experimental scheme was carried out in all replicates on the same day.

To determine the agrophysical and agrochemical properties of the soil before and after sowing cotton, soil samples were taken at five points of the field along the horizons of 0-10 cm, 10-30 cm, 30-50 cm.

Soil samples were taken after each treatment according to the experimental design. The total and mobile forms of N, P, K, total alkalinity, pH of the soil environment were determined in the soil samples taken. In order to determine changes in the chemical composition of the soil, the same analyzes were carried out in soil samples taken 30 minutes later, 24 hours after each treatment with the GDRP installation in the first 3 variants of the experiment.

After the processing of the experimental fields by the GDRP, systematic observations were made of the emergence of seedlings, the growth and development of cotton.

In soil samples taken from experimental plots before and after treatment with the GDRP installation, along with the determination of their physical and chemical properties, the effect of treatment on soil microorganisms was also studied. For this, the soil samples taken on the same day were delivered to the Fergana Regional Sanitary and Epidemiological Station, where microbiological sowing and microflora counts were carried out with the participation of the author. In this case, the main attention was paid to the total microbial number and the amount of anaerobic bacteria from the genus Clostridium, which play an important role as nitrogen fixers.

Soil cultivation with the GDRP installation has a definite effect on the content of individual physiological groups of microorganisms. It is also known that mineral fertilizers activate the vital activity of microorganisms of many physiological groups.

The number of aerobic and anaerobic nitrogen fixers, denitrifiers, ammonifiers, cellulose-destroying bacteria, actinomycetes and fungi, and microorganisms of the autochthonous group increases in soils.

Sometimes there is an inhibition of certain groups of microorganisms by mineral fertilizers and a decrease in their activity. The liming of sod-podzolic soils had a positive effect on the number of ammonifiers, nitrogen fixers, and nitrifiers.

Table 1.
Changes in the physiological groups of soil microorganisms

Timing of sampling Depth, cm	Depth, cm	Physiological groups of organisms					
		Butyric acid	Denitrifiers	Ammonifiers	Nitrifiers	Azotobacteria	Aerobic cellulose times.
2016							
Before processing (6.07)	0-10	10^4	10^6	10^6	10^3	10^4	10^3
	10-30	10^5	10^6	10^7	10^4	10^4	10^3
30 minutes after treatment (6.07)	0-10	10^5	10^4	10^5	-	10^6	10^5
	10-30	10^6	10^5	10^6	10^5	10^5	10^4
One day after treatment (7.07)	0-10	10^6	10^5	10^7	10^5	10^5	10^4
2018							
Before processing (9.06)	0-10	10^6	10^5	10^5	10^4	10^5	10^4
	10-30	10^6	10^5	10^6	10^4	10^4	10^4
30 minutes after treatment (9.06)	0-10	10^6	10^6	10^8	10^5	10^6	10^3
	10-30	10^7	10^6	10^7	10^6	10^5	10^5
One day after treatment (10.06)	0-10	10^7	10^4	10^5	10^5	10^6	10^5

The cultivation of irrigated meadow saz soils has a distinct effect on the number of individual physiological groups of microorganisms. Consideration of individual groups of microorganisms showed that when processing with the GDRP installation, the number of oily fermentation bacteria, ammonifiers, nitrifiers, and azotobacteria increases in the soil (Table 1). The first of these groups of bacteria take part in the primary assimilation of plant residues and the formation of humus, and the rest - in the processes of humus oxidation and mineralization.

It should be noted that the number of denitrifiers during processing by the GDRP unit decreases, which has been proven with large losses of gaseous nitrogen in the control variant (106) as compared with the experimental 104. Among the nitrogen fixers, the most important are azotobacteria.

Studies have shown that nitrogen fixation by azotobacteria and cellulose destruction by aerobic bacteria occurs most intensively in the 0-10 cm layer and, in general, in the plow horizon in the variants with soil cultivation with the GDRP installation.

Different physiological groups of soil microorganisms reflecting the direction of biological processes in the soil, characterize its nitrification capacity, i.e. the degree of accumulation of nitrates in it. Studies have shown that in the soils of the experimental variant, nitrates were accumulated in the amount of 2.4 mg, while in the control (before treatment) it was slightly lower (Table 2.).

Table 2.
Changes in the nitrification activity of soil microorganisms

Experience options	Depth cm	The original content	Accumulated N-NO3 for 15 days			
			water	Pea flour	$(NH_4)_2SO_4$	$Ca(HPO_4)_2$
Before processing	0-10	0,098	0,916	8,110	23,410	1,034
	10-30	0,082	0,713	7,913	19,820	1,315
30 minutes after treatment	0-10	0,210	0,854	13,810	25,650	1,210
	10-30	0,242	1,241	9,810	24,020	1,133
One day after treatment	0-10	0,323	1,530	9,033	26,530	4,135
	10-30	0,410	1,832	11,843	28,940	2,128

In determining the degree of soil fertility, it is important to study the biological activity, which is the total result of biochemical processes occurring in the soil.

It has been established that soil cultivation with the GDRP installation affects the biological activity of the soil. The data on the enzymatic activity of soils given in Table 3. show that the biological activity of the soil in the experimental (treated) version is slightly higher than in the untreated version.

Table 3.

Dynamics of the enzymatic activity of soils

Variants	Depth cm	Catalose	Urease in mg	Invertase in mg glucose	Phosphatase mg	Release of carbon dioxide (CO2), kg / ha
2016 г.						
Before processing	0-10	3,7	1,17	9,0	0,24	207,4
	10-30	5,3	1,25	11,0	0,18	223,6
30 minutes after treatment	0-10	8,8	2,39	19,0	0,37	266,8
	10-30	6,9	2,13	13,0	0,29	229,0
One day after treatment	0-10	5,8	1,74	15,0	0,30	249,8
	10-30	6,3	2,06	12,0	0,26	228,5

It is known that when microorganisms assimilate organic matter, a large amount of carbon dioxide is released and minerals assimilated by plants are released.

When determining the biological activity of soils in the experimental and control plots, this indicator was also taken into account. As shown in the table. 3. The largest amount of CO_2 was released in the soil from the experimental plot (266.8 kg / ha), while in the control this indicator is slightly lower (207.4 kg / ha).

It has been established that tillage by shock waves leads to an increase in the total microbial number in the arable layer (0-30 cm). A day later, continuous growth of small colonies of microorganisms is observed. On days 3-4, the number of microbial bodies decreases again, and a decrease in the number of phytogenic microorganisms is also observed.

By quantitatively taking into account individual physiological groups of microorganisms, it has been recorded that the number of bacteria of oil-acid fermentation, ammonifiers, nitrifiers, and azobacteria is increasing in the soil.

It was found that the level of biological activity of the soil increases. This can be indicated by the results of studies, where the release of CO2 in the soil of the experimental site is 266.8 kg / ha, and in the soil of the control plot - 207.4 kg / ha.

LITERATURE

1. Юлдашев Г., Аскаров Х. Изменение гумуса, органического и минерального углерода в орошаемых луговых сазовых почвах пустынь. ISSN 2311-2158. The Way of Science. 2017. № 1 (35), с.65-67.
2. Сулаймонов О.Н., Аскаров Х.Х. Влияние газодетонационных волн на мелиоративные свойства засолённых почв. Сборник статей XI Международная научно-практическая конференция "Аграрная наука - сельскому хозяйству" г. Барнаул, ФГБОУ ВО "Алтайский государственный аграрный университет", 2016, с. 245-246.
3. 3. Сулаймонов О.Н., Аскаров Х.Х. Нетрадиционно-инновационные методы обработки почв. Актуальная наука Международный научный журнал. №9 (26) 2019.- с.34-378.
4. Сулаймонов О.Н., Аскаров Х.Х., Йигиталиев Д.Т. Влияние детонационной обработки на свойства орашаемых луговых сазовых почв и урожайность хлопчатника. Актуальная наука Международный научный журнал. № 9 (26) 2019, 78-90 стр.
5. Сулаймонов О.Н., Аскаров Х.Х., Йигиталиев Д.Т. Способы обработки почв в целях борьбы с образованием поверхностной корки // Universum: Химия и биология : электрон. научн. журн. 2020. № 7(73).
6. Сулаймонов О.Н., Аскаров Х.Х., Йигиталиев Д.Т. Влияние детонационной обработки на биологическую активность почв, рост, развитие и плодоношение хлопчатника. Мелиорация как драйвер модернизации АПК в условиях изменения климата, Материалы Международной научно-практической интернет-конференции 13-20 июля 2020 г., г. Новочеркасск. с.161-166.
7. Nazirova R. M., Sulaymonov O. N., Usmonov N. B.//Qishloq xo'jalik mahsulotlarini saqlash omborlari va texnologiyalari// 0'quv qo'llanma. Premier Publishing s.r.o. Vienna - 2020. 128 bet.

8. Nazirova, R., Xamrakulova, M., Usmonov, N. (2021). Moyli ekin urug'larini saqlash va qayta ishlash texnologiyasi. МОНОГРАФІЯ. https://doi.org/10.36074/naz-xam-usm.monograph
9. Nazirova R.M., Usmonov N.B., Askarov H.H.// Technology of storing grain in a cooled state// Do desenvolvimento mundial como resultado de realizacoes em ciencia e investigacao cientifica: Colecao de trabalhos cientificos «ΛΌΓΟΣ» com materiais da conferencia cientifico-pratica internacional. vol 1, page 93-95 URL: https://ojs.ukrlogos.in.ua/index.php/logos/article/view/4923
10. Nazirova R.M., Usmonov N.B., Bakhtiyorova D// Innovative technologies for grain storage of different crops// Academicia an international multidisciplionary research journal. 2020. vol 10.issue 6, june, pages 222-228. URL: https://saarj.com/academicia-past-issue-2020/
11. Nazirova Rakhnamohon Mukhtarovna, Mamajonov Gaybullo Gayratjon ugli, and Asqarov Hasanboy Kholdoraliyevich, "TECHNOLOGY OF LONG-TERM STORAGE OF SOME TYPES OF FRUITS AND VEGETABLES USING SORBENTS", *IEJRD - International Multidisciplinary Journal*, vol. 5, no. 5, p. 4, Aug. 2020. http://www.iejrd.com/index.php/%20/article/view/1109