Siderations Improve the Chemical Properties of Gray-Earth Soils in Uzbekistan

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ABSTRACT

Sidereal crops have a positive effect on the agrochemical properties of the soil. In the plots, when plowing green masses of peas, rye and typhon at the end of the growing season, the content of humus in the soil becomes higher by 0.03-0.06% and also has a positive effect on increasing the amount of nitrates and phosphorus. The increase in the yield of raw cotton on the plots during the introduction of siderites was 0,46–0,86; 0,48–0,97; 0,42-0,71 t/ha. The profitability of production was 75.3-178.5 %.

Keywords: Sidereal crops, serozem, agrochemical properties of the soil, cotton

Introduction: Intermediate crops as organic matter are not only an important source of karma production, but are also of great agro technical importance. Currently, on the basis of numerous studies of national and foreign scientists, it is established that intermediate crops during their growth have a positive effect on the structure of the soil and its fertility.

Increasing the fertility of cotton fields is one of the main links in the struggle to increase the yield of cotton, the productivity of cotton growers and increase the potential fertility of the soil.

In cotton fields, it is necessary not only to restore the soil structure lost due to improper tillage with heavy tools and irrigation, but also to continuously restore the enrichment of the soil with organic substances by applying both manure and green fertilizers. Sideral crops are widely used in Europe and Asia and are attracting increasing attention as one of the most effective means of increasing soil fertility. Under the sideral crops, arable land is used, which has been released from the main crop. Siderats are cultivated in the remaining period of summer and the warm part of autumn. After plowing the sideral mass, the nitrification process can last for more than several years, during which there is an increase in the yield of subsequent crops.

During sideration, the soil receives a lot of growth substances, hormones, and vitamins necessary for living organisms inhabiting the soil (Krasilnikov, 1940). Siderates protect the soil from erosion, increase the efficiency of washing irrigation, promote the desalination of green soils, as a result, improve the thermal properties of the soil, increase the content of humus in them. Also, the amount of assimilable forms of nitrogen and phosphorus in the soil increases dramatically during sideration (Halmanov 2010, 2017). The best phosphorus-dissolving cultures in the experiments were mustard and a mixture of mustard with shabdor (Oripov 1983). A number of researchers have established the solvent effect of root secretions on soil phosphates in some plants, in particular, it was found that rye, oats, mustard on sandy soils are able to convert insoluble phosphorus compounds into digestible forms (Giedroyc, 1932). The authors suggest using such plants for the purpose of sideration.

To identify the possibility of using different crops in the conditions of the Zarafshan Valley,

we set ourselves the task of identifying the influence of various forms of siderates on the change in humus and nutrient reserves on gray-earth soils.

Methods and conditions of the experiment: To solve these problems, field experiments were conducted on typical serozems of farms in the Samarkand region and light serozems of the Navoi region.

Field experiments were conducted in 2000-2011. The best options were tested in the cotton farms of the Samarkand and Navoi regions. The experiments were carried out in 4 short repetitions. The placement of plots is one-tier. With a four-fold repetition of seven variants, there were 28 plots in total. The area of each plot was 240 m2, with a length of 50 m, a width of 4.8 m. Sideral crops were sown in the first decade of October. The seeding rate of peas is 50 kg / ha, rye 80 kg/ ha, typhon 4 kg / ha, a mixture of half the norm and 1/3 parts, followed by watering the norm at the rate of 500-600 m3 / ha to obtain friendly seedlings of crops.

In March and before the plowing of the green mass in April, a second irrigation was carried out with a rate of 600-700 m3 of water per hectare. In the spring, before plowing, all sideral crops were fed with nitrogen at the rate of 100 kg / ha and by the time of plowing (April 20), they accumulate more than 35-39 t/ha of green mass. In the soil, humus was determined by the Tyurin method, total nitrogen by Kjeldahl, nitrate nitrogen by Grandvallage, mobile phosphorus by Magichin, while soil samples were taken in three places from each plot before plowing and at the end of August by a soil drill from a depth of 0-20, 20-40 cm. Research results: The role of organic fertilizer in plant nutrition is indisputable. The fertilizing qualities of the plowed mass depend both on the mass of the sideral crops and on their chemical composition. The main elements that can be expected to be affected by sideration are changes in the content of humus, nitrate nitrogen, mobile phosphorus, and absorbed potassium.

These issues have been thoroughly studied in numerous works carried out over the past 30-40 years, so we will limit ourselves to giving the main indicators identified by us in the course of research (Tables 1,2). A steady increase in humus was observed throughout the entire period of research, which is quite natural, since the amount of plowed phytomass during decomposition can increase the humus reserves. From Table 1, it can be seen that the humus content in the soil remains at a lower level during winter tillage than when organic matter is plowed.

On meadow soils, when plowing green masses of peas, rye and typhon at the end of the growing season, the content of humus in the soil becomes higher by 0.03%, 0.04% on variants-peas+rye, typhon+rye and typhon+peas+rye 0.04+0.04%, on typical serozems-0.04, 0.05 and 0.06%, on light serozems-0.04-0.05% and 0.06%.

The same pattern is observed on the lower 20-40 cm layers of soil. The humus content increases in the soil on all plots when organic biomass is introduced, the positive change in the humus content in the soil was 0.04-0.06%.

The important role of nitrogen and phosphorus in plant nutrition is indisputable. Studies of the migration of nitrate nitrogen and phosphorus in the soil have shown that the introduction of organic fertilizers in the form of sideral masses has a positive effect on the increase in the amount of nitrates and phosphorus. The greatest increase in the content of N03 and P2O5 was observed in the variants when plowing siderate pea+rye, typhon+rye, typhon+pea+rye. The increase in the amount of nitrates occurs before the flowering phase – the fruit formation of cotton and in connection with the mineralization of organic matter and the activity of free-living bacteria that fix nitrogen.

Of particular interest are studies of the effects of organic fertilizers on soil phosphate reserves. It is known that there are a significant number of inaccessible forms of phosphorus compounds in the soil. The study of the dynamics of phosphorus compounds in the soil shows that organic fertilizers are able to convert a significant part of the insoluble phosphates into a soluble state (Table 1,2).

The data obtained allow us to judge the high efficiency of green fertilizers as a means of increasing the solubility of phosphates.

Table 1.

The effect of sideration on the content of nutrients in the soil at the end of the growing season(2000-2011)

№	Experience options	Soil layer	Gray-earth typical soils			Light gray-earth soils		
			humus, (%)	mobile nitrogen, mg / kg. dry. soils	mobile phosphorus, mg / kg. dry. soils	humus, (%)	mobile nitrogen, mg / kg. dry. soils	mobile phosphorus, mg / kg. dry. soils
1	Chill (control)	0-20 20-40	0,91 0,76	9,0 6,1	31,4 16,2	0,83 0,73	7,2 4,2	24,2 19,9
2	Peas	0-20 20-40	0,95 0,79	15,1 10,7	36,0 24,7	0,88 0,77	10,2 8,4	27,9 24,2
3	Rye	0-20 20-40	0,95 0,79	14,3 9,9	36,2 25,4	0,87 0,76	9,6 8,1	27,6 23,5
4	Typhon	0-20 20-40	0,95 0,79	13,2 9,4	34,0 25,1	0,87 0,76	9,2 7,5	27,1 23,0
5	Peas+rye	0-20 20-40	0,96 0,80	16,9 11,7	36,7 29,3	0,89 0,77	11,3 9,2	28,8 25,3
6	Typhon+rye	0-20 20-40	0,97 0,80	16,1 11,0	36,4 29,0	0,88 0,77	10,7 8,8	28,4 24,8
7	Typhon+peas+rye	0-20 20-40	0,97 0,81	18,3 14,1	37,4 30,1	0,89 0,78	12,2 9,8	29,9 25,7

Table 2.

Effect of sideration on the total nitrogen and phosphorus content in gray-earth soils (2000-2011)

№	Opita options	Soil layer	On typical serozems		On light serozems	
			Total nitrogen	Total phosphorus	Total nitrogen	Total phosphorus
1	Chill (control)	0-20 20-40	0,060 0,051	0,137 0,135	0,059 0,056	0,165 0,162
2	Peas	0-20 20-40	0,069 0,060	0,141 0,139	0,068 0,066	0,166 0,164
3	Rye	0-20 20-40	0,068 0,060	0,143 ,139	0,067 0,065	0,168 0,164
4	Typhon	0-20 20-40	0,066 0,058	0,140 0,138	0,066 0,064	0,167 0,163
5	Peas+rye	0-20 20-40	0,071 0,064	0,143 0,138	0,069 0,066	0,167 0,164
6	Typhon+rye	0-20 20-40	0,070 0,062	0,142 0,139	0,069 0,067	0,168 0,165

7	Typhon+peas+rye	0-20 20-40	0,073 0,065	0,143 0,139	0,070 0,066	0,170 0,166

Conclusions:

Sidereal crops have a positive effect on the accumulation of nitrogen and phosphorus, increasing soil fertility. This activates the activity of microorganisms in the soil, stimulates the decomposition of organic matter, and nitrogen and phosphorus become available for other crops, in particular, for cotton.

Better provision of plants with the necessary nutrients with the help of sideral crops creates conditions in the soil for enhanced mineral nutrition of plants and has a significant impact on the yield and product quality.

The increase in the yield of raw cotton on plots with the introduction of siderates was 0.48-0.97; 0.42-0.71 t / ha. The profitability of production was 75.3-178.5 %.

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