MICROBIOLOGICAL PROCESSES TAKE PLACE IN THE SOIL DURING THE MAIN TILLAGE AFTER WINTER WHEAT IN DIFFERENT PERIODS AND METHODS

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After the autumn wheat harvest, a significant increase in soil agrochemical properties and microbiological activity was observed when plowing at 28-30 cm depth in the fall after plowing at 28-30 cm depth and cultivating a repeat crop in the summer. Microbiological high activity (ammonifiers, spore-forming, oligonitophils, actinomycetes) in the topsoil is explained by the fact that, firstly, the root and root remnants treatment , and secondly, the secondary crops planting has a positive effect on soil overall properties.

Microorganisms in-depth study found in the soil is one of the most pressing issues for today, increasing soil fertility and productivity and obtaining quality and abundant yields. Because it is impossible to make the soil fertile and fertile without a deep understanding of the irrigated soils biology, without studying the microbiological processes that take place in it [2].

A.L. Toropkina [3] in her study explained that the microbiological rhythm of gray soils is related to the agrotechnical measures effect carried out during the cotton cultivation .

One of the important indicators of soil biological activity is its ability to break down cellulose, compared with tillage in a 0-30 cm alkaline black soil layer in general, the flax stem breakdown was greater during plowing than on surface tillage. In the lower layers of the surface treated soil, the mineralization processes are reduced in the uncultivated layers, which indicates that the energy of CO_2 emission and nitrification process is weakened. [4].

The soil water-physical, agrochemical and microbiological properties deterioration with the increase in volume weight has been reflected in the scientific work of a number of foreign scientists. [5-6].

Soil fertility is directly related to its agrophysical, agrochemical, organic and mineral composition, humus layer, the set of beneficial microorganisms.

While many researchers agree that the microorganism development dynamics varies depending on driving methods and crop type, we took soil samples during the experiment and conducted microbiological analyzes on groups of microorganisms in it. Preliminary analyzes show that the increase, development and decrease in the microorganisms activity depends on the cultivation methods, crop type and irrigation. The analysis showed that in the typical gray soil of irrigation the microbiological process involves different physiological groups of bacteria: ammonifiers, oligonitrophils, as well as actinomycetes belonging to Streptomuces, Streptoverticillium and fungi belonging to Penicillium, Aspergillus, Fusarium families. Periodic watering, optimal temperature, good aeration, neutral or weakly alkaline environment during the growing season of the plant - all this had a positive effect on the microorganisms development.

Although a large amount of data on the amount and microorganisms distribution in the soil has been collected, their activity in relation to the decay wheat germ and roots process in different drives under typical gray soil conditions has been poorly studied. It is known from the literature that the microorganisms development dynamics varies depending on the cultivation method , the crop type, for this purpose in 2011-2012 after 30, 90, 180 and 250 days after the burial of autumn wheat roots and specimens samples of soil 0-15, 15-30 cm were obtained and microbiological analyzes were performed on microorganisms groups in it (Table 1).

Thirty days after the burial of the stalks and root remnants of winter wheat, ammonifiers were used to drive high levels of bacteria at 28-30 cm in the summer after the winter wheat harvest and to re-sow the crop, cin the right fall plowed at 28-30 cm (3) in the variant 0-15 cm layer $37x10^6$, 15-30 cm layer $29x10^6$, watered after the autumn wheat harvest, plowed to a depth of 28-30 cm in the summer (2) in the 0-15 cm layer of the variant $21x10^6$ and in the 15-30 cm layer $12x10^6$, after irrigation of autumn wheat was observed 0-15 cm $13x10^6$, 15-30 cm $18x10^6$ of variant (1) plowed to a depth of 28-30 cm in summer without irrigation. Our control variant (4) was based on the results of 180-250 analysis days, as autumn plowing was carried out at 28-30 cm depth in late November after the autumn wheat harvest. The lowest amounts of ammonifiers occurred in the autumn and winter months, and in the spring they were quantitatively activated after 250 days with the soil climatic conditions optimization. During this period, an increase in soil moisture and microbiological activity was observed to accelerate the decay of root and root debris in these variants. Decreased activity of microorganisms was observed in the variant irrigated after autumn wheat at 28-30 cm depth in summer and in the variant plowed at 28-30 cm depth in summer without irrigation after autumn wheat.

A high amount of spore-forming microorganisms 30 days after the burial of winter wheat sprouts and roots is driven by 28-30 cm in the summer after the winter wheat harvest,

replanted, then plowed to a depth of 28-30 cm in the fall in the variant 0x60 cm $60x10^3$, 15-30 cm $45x10^3$, watered after the autumn wheat harvest in the summer plowed to a depth of 28-30 cm in the 0-15 cm layer $20x10^3$, 15-30 cm layer $30x10^3$, without irrigation after the autumn wheat harvest, $12x10^3$ in the 0-15 cm layer and $15x10^3$ in the 15-30 cm layer of the variant plowed at a depth of 28-30 cm in the summer were observed. The lowest amount of spore-forming occurred in the autumn and winter months, i.e. 90-180 days ($12x10^3$ - $6x10^3$), during which time the air temperature cooled, i.e. the freezing of the soil affected the activity of microorganisms. Rainfall for 250 days and their quantitative activation in the spring months were accompanied by an increase in air and soil temperatures (4) $40x10^3$ in 0-15 cm layer and $37x10^3$ in 15-30 cm in the control option, 3- variant $52x10^3$ in 0-15 cm, $32x10^3$ in 15-30 cm, option 2 0-15 cm $30x10^3$, 15-30 cm $26x10^3$, in the 1st variant it was observed that there are $18x10^3$ pieces in 0-15 cm and $23x10^3$ pieces in 15-30 cm.

After 30 days of activity of oligonitrophils, a high amount is driven to a depth of 28–30 cm in the summer after the harvest of winter wheat, $8x10^6$ in 0-15 cm layer in the variant plowed in 28-30 cm in autumn (3) after repeated sowing, $4x10^6$ in a layer of 15-30 cm, $5x10^6$ at 0-15 cm of option (2), plowed to a depth of 28–30 cm in the summer, watered after the autumn wheat harvest, $6x10^6$ in a layer of 15-30 cm, $7x10^6$ in 0-15 cm of option (1) plowed to a depth of 28-30 cm in summer without irrigation after autumn wheat harvest, At 15-30 cm, $5x10^6$ was observed. The lowest number of oligonitrophils occurred in the autumn and winter months, i.e. 90–180 days ($11x10^5$–$17x10^5$). In the spring, temperature, irrigation, fertilizers, plant residues in the soil have a positive effect on the activity of oligonitrophilic bacteria. After 250 days, their quantity in option 1 is $20x10^6$ - $37x10^6$ maximum amount in option 2 ($30x10^6$ - $21x10^6$), in the 3rd variant ($34x10^6$ - $40x10^6$), (control) in the 4th variant a small amount ($26x10^6$ - $15x10^6$) was formed.

The group of microorganisms that use organic compounds as a source of carbon includes actinomycetes and fungi. They have the ability to break down complex compounds such as cellulose, lignin and humus in the soil.

Actinomycete activity 30 days after burial of winter wheat stalks and root remnants high yields are plowed at 28-30 cm in the summer after the autumn wheat harvest and replanted, then plowed in the fall at 28-30 cm (3) in the option 0-15 cm layer $6x10^4$, 15-30 cm layer $4x10^4$, watered after autumn wheat harvest plowed to a depth of 28-30 cm in summer (2) option 0-15 cm $7x10^4$,$4x10^4$ in a layer of 15-30 cm, $5x10^4$ in 0-15 cm of option (1) plowed to a depth of 28-30 cm in summer without irrigation after winter wheat harvest, $3x10^4$ pieces were observed at 15-30 cm. The largest amount of actinomycetes occurred in the spring ($10x10^4$ - $6x10^4$), due to which the slight normalization of air temperature in late February and March led to the activation of microorganisms.

Specific aspects were also observed in the variant distribution of microscopic fungi. As noted above, it was found that the total number of microscopic fungi relative to bacteria in the soil samples studied was low.

The activity of microscopic fungi is higher than 30 days after the burial of winter wheat in the stalks and roots plowed at 28-30 cm in summer after winter wheat harvest, plowed at 28-30 cm in autumn after repeated sowing (3) in 0-15 cm layer $15x10^3$, $9x10^3$ pieces in a layer of 15-30 cm, $10x10^3$ at 0-15 cm of option (2), watered after autumn wheat harvest and plowed to a depth of 28-30 cm in summer, $12x10^3$ in a layer of 15-30 cm, it was observed that variant (1), plowed to a depth of 28-30 cm in the summer without irrigation after the autumn wheat harvest, had $12x10^3$ grains at 0-15 cm and $5x10^3$ grains at 15-30 cm. The largest amount of microscopic fungi occurred in the spring ($12x10^4$ - $4x10^4$). It was found that their number increased by one order.

Table 1. Under typical gray soil conditions, changes in the amount of microorganisms in different variants (КХҚБ/g)

Option mode	Options name	Layer	Follow-up period			
			25.08.2011 30 days	01.11.2011 90 days	30.01.2012 180 days	13.04.2012 250 days
Ammonifiers						
1	Driving without watering to a depth of 28–30 cm in the summer after the autumn wheat harvest	0-15 15-30	$13x10^6$ $18x10^6$	$45x10^5$ $36x10^5$	$15x10^5$ $10x10^5$	$40x10^6$ $24x10^5$
2	Watering after the harvest of autumn wheat, driving at a depth of 28–30 cm in the summer	0-15 15-30	$21x10^6$ $12x10^6$	$91x10^5$ $68x10^5$	$38x10^5$ $27x10^5$	$67x10^6$ $38x10^6$
3	Irrigation after autumn wheat harvest, plowing to a depth of 28-30 cm, repeated sowing, plowing to a depth of 28-30 cm in autumn	0-15 15-30	$37x10^6$ $29x10^6$	$14x10^6$ $8x10^6$	$46x10^5$ $32x10^5$	$21x10^7$ $25x10^7$
4	After the autumn wheat harvest, plow the land in the fall to a depth of 28–30 cm	0-15 15-30			$20x10^6$ $15x10^6$	$53x10^6$ $49x10^6$
Spores						
1	Driving without watering to a depth of 28–30 cm in the summer after the autumn wheat harvest	0-15 15-30	$12x10^3$ $15x10^3$	$12x10^3$ $6x10^3$	$20x10^3$ $16x10^3$	$18x10^3$ $23x10^3$
2	Watering after the harvest of autumn wheat, driving at a depth of 28–30 cm in the summer	0-15 15-30	$20x10^3$ $30x10^3$	$27x10^3$ $12x10^3$	$23x10^3$ $30x10^3$	$30x10^3$ $26x10^3$
3	Irrigation after autumn wheat harvest, plowing to a depth of 28-30 cm, repeated sowing, plowing to a depth of 28-30 cm in autumn	0-15 15-30	$60x10^3$ $45x10^3$	$36x10^3$ $27x10^3$	$26x10^3$ $28x10^3$	$52x10^3$ $32x10^3$
4	After the autumn wheat harvest, plow the land in the fall to a depth of 28–30 cm	0-15 15-30			$24x10^3$ $28x10^3$	$40x10^3$ $37x10^3$
Oligonitrophils						
1	Driving without watering to a depth of 28–30 cm in the summer after the autumn wheat harvest	0-15 15-30	$7x10^6$ $5x10^6$	$32x10^5$ $18x10^5$	$11x10^5$ $13x10^5$	$20x10^6$ $37x10^6$
2	Watering after the harvest of autumn wheat, driving to a depth of 28–30 cm in the summer	0-15 15-30	$5x10^6$ $6x10^6$	$48x10^5$ $27x10^5$	$12x10^5$ $14x10^5$	$30x10^6$ $21x10^6$
Continuation of Table 1						
	Irrigation after autumn wheat harvest, plowing to a depth of 28-30 cm, repeated sowing, plowing to a depth of 28-30 cm in autumn	0-15 15-30	$8x10^6$ $4x10^6$	$47x10^5$ $28x10^5$	$17x10^5$ $12x10^5$	$34x10^6$ $40x10^6$

4	After the autumn wheat harvest, plow the land in the fall to a depth of 28–30 cm	0-15 15-30			$15x10^5$ $13x10^5$	$26x10^6$ $15x10^6$
Actinomycetes						
1	Driving without watering to a depth of 28–30 cm in the summer after the autumn wheat harvest	0-15 15-30	$5x10^4$ $3x10^4$	$3x10^4$ $8x10^4$	$3x10^4$ $1x10^4$	$8x10^4$ $6x10^4$
2	Watering after the harvest of autumn wheat, driving at a depth of 28–30 cm in the summer	0-15 15-30	$7x10^4$ $4x10^4$	$5x10^4$ $4x10^4$	$2x10^4$ $1x10^4$	$9x10^4$ $6x10^4$
3	Irrigation after autumn wheat harvest, plowing to a depth of 28-30 cm, repeated sowing, plowing to a depth of 28-30 cm in autumn	0-15 15-30	$6x10^4$ $4x10^4$	$4x10^4$ $6x10^4$	$3x10^4$ $2x10^4$	$10x10^4$ $8x10^4$
4	After the autumn wheat harvest, plow the land in the fall to a depth of 28–30 cm	0-15 15-30			$2x10^4$ $1x10^4$	$7x10^4$ $9x10^4$
Fungi						
1	Driving without watering to a depth of 28–30 cm in the summer after the autumn wheat harvest	0-15 15-30	$12x10^3$ $5x10^3$	$14x10^3$ $9x10^3$	$8x10^3$ $5x10^3$	$9x10^4$ $6x10^4$
2	Watering after the harvest of autumn wheat, driving at a depth of 28–30 cm in the summer	0-15 15-30	$10x10^3$ $12x10^3$	$12x10^3$ $10x10^3$	$7x10^3$ $6x10^3$	$12x10^4$ $9x10^4$
3	Irrigation after autumn wheat harvest, plowing to a depth of 28-30 cm, repeated sowing, plowing to a depth of 28-30 cm in autumn	0-15 15-30	$15x10^3$ $9x10^3$	$17x10^3$ $12x10^3$	$7x10^3$ $9x10^3$	$10x10^4$ $8x10^4$
4	After the autumn wheat harvest, plow the land in the fall to a depth of 28–30 cm	0-15 15-30			$6x10^3$ $8x10^3$	$5x10^4$ $4x10^4$

Note: Observation days began on July 25th.

In conclusion, in increasing soil fertility, root and furrow residues, as well as replanting, meet the soil's demand for organic matter, namely nitrogen, phosphorus, potassium and humus, increasing its agrochemical properties, soil mass and water permeability and porosity. As a result, the respiration rate of the soil is accelerated and its microbiological activity is improved. After the autumn wheat harvest, a significant increase in soil agrochemical properties and microbiological activity was observed in the summer by plowing to 28-30 cm depth with a simple plow, cultivating a repeat crop and then plowing to 28-30 cm depth in the fall. The high activity of microbiological (ammonifiers, spore-forming, oligonitophils, actinomycetes) in the topsoil is explained by the fact that, firstly, the treatment of root and root remnants, and secondly, the planting of secondary crops has a positive effect on soil overall properties.

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