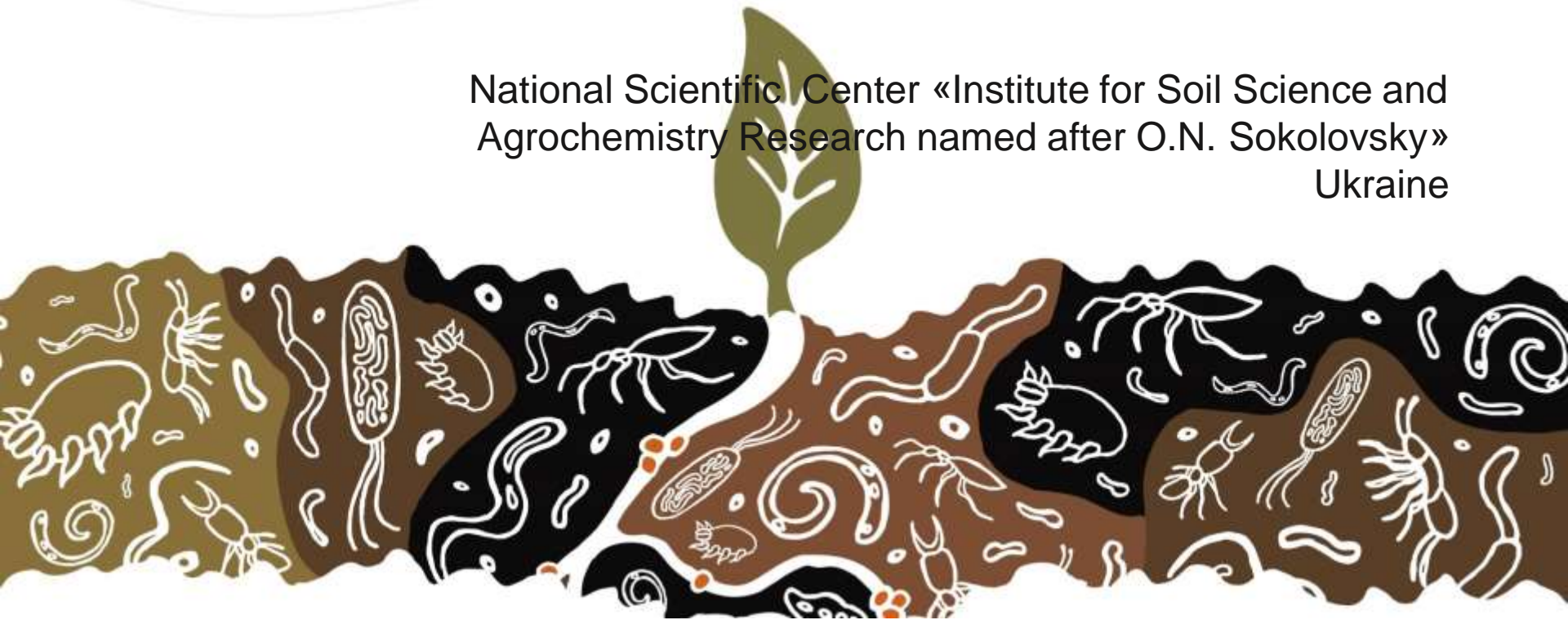


Ludmila Vorotyntseva

TRANSFORMATION OF THE SOIL MICROBIAL COMMUNITY OF THE ORDINARY CHERNOZEM IN IRRIGATION

National Scientific Center «Institute for Soil Science and
Agrochemistry Research named after O.N. Sokolovsky»
Ukraine



Soil biodiversity plays an important role in the functioning of ecosystems and their provision of services - providing, regulating, supporting.

Microorganisms are very sensitive to changes of environmental factors, therefore, the number of microflora and the activity of microbiological processes can be diagnostic indicators of estimation of soil properties transformation.

They provide sustainable management of agrolandscapes.



Irrigation leads to the restructuring of the entire soil ecosystem, changes the number and ratio of different groups of microflora, the nature and orientation of biochemical processes.

The aim of the researches was to determine the change in the microbial community of chernozem ordinary in irrigation by water of various quality (unsalted and saline waters).



THE OBJECTS OF RESEARCHES

The researches were conducted in Steppe zone of Ukraine, where most of the irrigated land is located.



The objects of researches were the irrigated agrolandscapes of Donetsk region (Ukraine) - Slavyansk and Maryinka stationary experimental sites



THE OBJECTS OF RESEARCHES

- **Slavyansk stationary experimental site**

For irrigation unsalted waters are used (mineralization 0.61-0.63 g/dm³). It classified as suitable for irrigation on agronomic and ecological criteria's.

- **Maryinka stationary experimental site.** Soils are long irrigated by saline waters (mineralization - 2.9-3.2 g/dm³). They are estimated as unsuitable for irrigation, but given the lack of unsalted waters in this region, they are used for irrigation.

Irrigated soils a long time (45-50 years) have been used in irrigated agriculture. Irrigated soil is **ordinary chernozem**.

The object-comparison were similar non-irrigated soils.

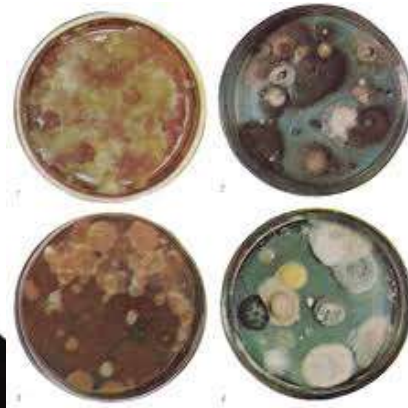


METHODS OF RESEARCHES

Soil samples for microbiological researches were taken from 0-25 cm layer.

We determined number of soil microorganisms belonging to basic ecological-trophic, taxonomical and physiological groups:

- organic nitrogen assimilating bacteria;
- mineral nitrogen utilizing bacteria;
- actinomycetes;
- fungi;
- oligotrophic microorganisms;
- eutrophs.



IRRIGATION WATER QUALITY

Object	pH	Mineralization, g/dm ³
Slavyansk stationar	7,5	0,61
Maryinka stationar	8,1	3,2



THE NUMBER OF MICROORGANISMS OF THE MAIN ECOLOGICAL, FUNCTIONAL, TROPHIC AND TAXONOMIC GROUPS IN THE SOILS

Stationar experimental sites	Nitrogen assimilating microorganisms, mln. CFU/g		Actino- myces, mln. CFU/g	Fungi, th. CFU/g	Oligo- trophs, mln. CFU/g	Eutrophs, mln. CFU/g
	organic	mineral				
Slavyansk, without irrigation	11,04	20,46	13,97	18,72	25,06	31,52
Irrigation by unsalted water	8,45	20,59	8,71	9,68	16,28	29,05
Maryinka, without irrigation	12,24	19,98	6,21	41,60	22,88	32,26
Irrigation by saline water	6,62	11,11	3,94	79,86	16,94	17,81
LSD ₀₅	2,55	3,02	1,01	5,13	1,92	3,01



BIOLOGICAL INDEXES

Stationar experimental sites	Summary biological index SBI, %	Biological degradation index BDI, %
Slavyansk, without irrigation	100,0	0
Irrigation by unsalted water	87,7	-12,3
Maryinka, without irrigation	100,0	0
Irrigation by saline water	64,6	-35,0



MICROBIOLOGICAL INDICATORS AND SOIL MONITORING

Microbiological indicators are important indicators for assessment of the ecology-agroameliorative condition of the irrigated soils.

Therefore we have included them in the list of mandatory indicators. We also used their for evaluation the ecosystem services of the studied soils.



EVALUATION INDICATORS PROVISION AND MAINTENANCE OF ECOSYSTEM SERVICES

Indicators	Land condition / level of provision of ecosystem services (points)		
	good / high, 10	satisfactory / middle, 5	unsatisfactory / low, 0
Irrigation water quality	1 class	2 class	3 class
Groundwater level, m	More 5	5,0-critical	Less critical
The degree of soil salinity, layer 0-100 cm	non-salted	low	medium, high
The degree of soil alkalinization, layer 0-50 cm	Non- alkalinization	low	medium, high
Soil pollution category, layer 0-50 cm	permissible	moderately dangerous	dangerous



Table continuation

Mineral nitrogen content, layer 0-50 cm	high	medium	low, very low
Content of mobile phosphorus compounds, layer 0-50 cm	high	medium	low, very low
Content of mobile potassium compounds, layer 0-50 cm	high	medium	low, very low
Humus content, layer 0-30 cm	high	medium	low
Microbiological soil activity. Deviation of biological indicators from the standard,%	less than 10	10-25	more than 25





THE LEVEL OF PROVIDING AND SUPPORTING ECOSYSTEM SERVICES OF SOILS

Stationar experimental sites		Land condition / level of provision of ecosystem services (points)		
		good / high, 10	satisfactory / middle, 5	unsatisfactory / low, 0
Slavyansk	Without irrigation	8,1	—	—
	Irrigation	8,3	—	—
Maryinka	Without irrigation	8,8	—	—
	Irrigation	-	5,6	—





The results of estimation of the ecosystem services level provided by chernozem ordinary are the basis for making managerial decisions on their rational using and elaboration the complex differentiated, adapted measures for melioration and improvement of their condition.



CONCLUSIONS

Microorganisms are very sensitive to changes of ecological factors, therefore, the number and composition of microflora can be diagnostic indicators for estimation the transformation of soil properties.

High information of the microbiological indicators necessitates their inclusion in the system of indicators of ecological and ecology-agroameliorative monitoring of irrigated soils.





**Thank you for
your attention**