American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 03 ISSUE 01 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1290679216
Publisher: Oscar Publishing Services

Journal Website: https://theusajournals.com/index.php/ajahi

Research Article

ECOLOGICAL ROLE OF DIFFERENT SIDERATE CROPS IN IMPROVING SOIL PROPERTIES

Submission Date: January 20, 2023, Accepted Date: January 25, 2023,
Published Date: January 30, 2023
Crossref doi: https://doi.org/10.37547/ajahi/Volume03Issue01-01

Kh.F. Batirov
Professor, Doctor Of Agricultural Sciences, Department Of Ecology And Safety Of Life Activity, Samarkand State University Named After Sharof Rashidov, Uzbekistan

Sh.M. Turdimetov
Doctor Of Biological Sciences, Department Of Soil Science, Gulistan State University, Uzbekistan

R.B. Nurillaeva
Researcher Student, Gulistan State University, Uzbekistan

ABSTRACT

The article describes the importance of various siderate crops in maintaining soil fertility. Biomass accumulated in the soil, level of preservation from erosion, effect on soil temperature in oil radish, rye and oil radish+rye options were studied.

KEYWORDS

Oilseed rape, rye, soil erosion, soil temperature, soil leaching, siderate crops, legumes, forage crops.

INTRODUCTION

It is known that in the last quarter of the last century and now environmental problems are given wide importance, which can be called the basis of harmony between man and nature. From this point of view, mutual relations between soil, field crops and environment are given great importance in agriculture. This, in turn, absolutely requires the deepening and expansion of our imagination, knowledge and experience in this regard.

American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 03 ISSUE 01 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1290679216
Publisher: Oscar Publishing Services

It should be noted that environmental problems are increasing in agriculture as well. First of all, we can give an example of toxic substances accumulated in the soil as a result of the use of mineral fertilizers and pesticides. Regarding agricultural ecology, there are many views, theories, in-depth researches, and different opinions about the influence of this or that level on the field. These confirm that agricultural laws, systems, crop rotations and agro-technological measures vary by region.

It is known that active mineralization of humus occurs in conditions of intensive farming. This leads to deterioration of agrochemical, physico-chemical, biological and other properties, that is, to a decrease in soil fertility. That is why it is important to maintain humus balance using organic fertilizers. As a result of the use of siderate crops, the quantity and quality of humus can be improved. This can also be seen from the reviews of the following studies.

V.V. Ivenin, V.L. Strokin, A.V. Ivenin [1] made special experiments to study the effect of siderate crops on soil properties. Among siderate crops, it was found that perennial lupine accumulates relatively more green mass.

B.Lei, J.Wang, H.Yao [2] increased the yield of rice as a result of using siderates. This is a reduction in the process of soil erosion, an improvement in density, It is explained by the optimization of soil properties such as water permeability, porosity, moisture storage capacity, enzyme activity and soil environment (pH). They emphasize that the properties of the soil should be taken into account when choosing siderat crops.

P.Sullivan [3] studied the effect of vetch planting on corn yield. In studies, the cost of planting a siderate crop is covered by the additional yield from the corn crop. Due to the improvement of soil properties, the productivity of corn planted in the following years has increased.

Mishchenko Y.G. and others [4] conducted studies on the effect of siderate crops on the yield of potatoes. The type and number of weeds also decreased as a result of planting oil radish. An inverse correlation between oil radish phytomass and weed damage was found.

S.Sharma and others [5] experimentally studied the enrichment of the soil with phosphorus and organic residues and the increase in the number of water-resistant microaggregates as a result of planting siderate crops.

A.A. Aytemirov, M.B. Khalilov, T.T. Babaev., Z.G.Amiralievlar [6] determined that the water-physical, agrobiological and agrochemical properties of the soil are significantly improved as a result of siderates. Siderates also performed a phytosanitary function - weed pollution, diseases and pests decreased, and protected the soil from wind and water erosion.

R.F. Gakhramanova [7] determined that the length of cotton, the number of sympiodal branches, and the number of flowers were more productive compared to the control variant under the influence of siderate crops. These indicators were especially noticeable during the flowering phase.

E.P. Gorelov, H.F.Botirov, V.L.Dobrodomov [8], H.F.Botirov [9-10] and others say that the most important aspects of using siderates are, first of all, the correct selection of their representatives and paying serious attention to seed breeding issues. is considered.

In the experiments of H.F.Botirov, G.R.Karaev [11], they calculated the organic mass left in the soil as a result of

American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 03 ISSUE 01 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1290679216
Publisher: Oscar Publishing Services

planting siderates alone or in a mixed manner. In both variants, compared to the control (plough), it left more organic mass and prevented the plowed layer particles from being washed away. The amount of biomass is 28.-31.2 t/ha, root residues 8.6-10.9 t/ha when planting typhon; in rye crop biomass 24.0-26.8 t/ha, root residues 5.4-7.3 t/ha; and in the mixture of typhon and rye, the biomass was 39.2-43.6 t/ha, and the root residues were 12.9-15.4 t/ha.

N.Usmonov, T.Ostonakulovov [12] determined the improvement of the aggregative state of the soil tillage layer, agrophysical, water properties, nutritional regime and microbiological processes when summer and autumn siderate crops are used.

In the studies of R. Oripov, A. Borievs [13], the yield of winter wheat was 62.3-65.1 centners as a result of the use of previous crop quality mash and rapeseed, and 12.6-15.4 t/ha additional yield compared to the control winter wheat variant.

In the experiments of Sh.M. Turdimetov and others [14-18], attention was paid to the properties and characteristics of Mirzachol oasis soils, increasing their fertility by planting legumes and fodder crops. After planting these crops, it was observed that the yield of cotton and winter wheat increased.

Research methods. Studies were conducted in four variants and four repetitions. The first control option is plow, the second option is oil radish, the third option is rye and the fourth option is oil radish+rye. These variants were carried out in fields with three different slopes and the accumulated plant mass (t/ha) was taken into account. Also, the depth of soil freezing in the variants planted with these siderates was studied. Soil contamination rates were also studied in variants planted with siderates on moderately and strongly washed soils. Therefore, in the research methods, the plant mass, freezing depth and erosion protection properties of different siderate crops were studied in the soil.

Results and discussions. Soil and climate conditions must be taken into account when choosing siderate crops. In irrigated gray soils that are poor in humus, enrichment with organic matter is an important issue. Plant biomass is the basis of soil organic matter.

Considering the above, we conducted special experiments on irrigated gray-meadow soils to study the effect of siderate crops on soil fertility. According to the results of the experiment, it was observed that siderates accumulated a certain amount of plant biomass residues when planted in autumn for winter vegetation compared to the control (plough) (Table 1).

Table 1

Amount of organic mass in the tillage (0-40 cm) layer

Crop	Slope, 0	Slope-part	Plant biomass, t/ha	
			total	including the root
Plow (control)	0-1,0	high	-	-
	1,0-2,0	medium	-	-
	2,0 >	lower	-	-
	0-1,0	high	29,1	9,5

American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 03 ISSUE 01 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1290679216
Publisher: Oscar Publishing Services

Radish with oil	1,0-2,0	medium	27,0	8,1
	2,0 >	lower	25,4	7,0
Rye	0-1,0	high	27,0	8,2
	1,0-2,0	medium	25,2	7,7
	2,0 >	lower	23,0	6,5
Radish with oil + rye	0-1,0	high	41,3	13,6
	1,0-2,0	medium	38,5	11,7
	2,0 >	lower	35,0	9,9

The data of the table confirms that the amount of total organic mass was 29.1 t/ha when the slope (slope) was 0-1.0, and 25.4 t/ha when it was > 2.0. On the other hand, in rye it is 27.0 t/ha and 23.0 t/ha, and when they are planted in a mixture, the total is 41.3 t/ha when the slope is 0-1.0, and 35.0 t/ha when it is > 2.0 and of which the proportion of root residues was 13.6 and 9.9 t/ha.

Taking into account that crops such as alfalfa, winter wheat, barley, sunflower and corn are planted in the experimental farm, we divided them into groups according to their ability to protect the soil, and the crop that best protects the soil from erosion is alfalfa, wheat, barley, rye and oil radish are good, and inter-row crops, in particular, sunflower and corn, are bad indicators.

At the same time, during the winter (December-February), we also observed the effect of siderates on the level of freezing of the surface layer of the soil and the preservation of snow cover, and the obtained data are presented in the table below (Table 2).

Table 2

Effect of siderates on soil surface layer freezing and snow accumulation

Variant	Soil layer by month, cm					
	Soil freezing			Snow cover		
	XII	I	II	XII	I	II
Plow (control)	5	7	4	0	3	7
Radish with oil	2	3	2	2	5	8
Rye	2	4	1	3	6	8
Radish with oil + rye	1	2	2	4	7	10

As can be seen from the table data, compared to the control (plow) in the experiments, the freezing of the surface layer of the soil was low when oil radish or rye was planted in pure form, and the level of snow accumulation was relatively high, but higher indicators were obtained in the option of oil radish+rye planting.

American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 03 ISSUE 01 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1290679216
Publisher: Oscar Publishing Services

It was also observed that winter siderate crops protect soil particles from being washed away compared to plow (control) (Table 3).

Table 3

Effect of siderates on leaching of soil particles

Variant	Soil leaching depending on crop and erosion level			
	Average		Strong	
	t/ha	%	t/ha	%
Plow (control)	6,4	100	9,1	100
Radish with oil	5,1	79,7	7,9	86,8
Rye	4,8	75,0	7,2	79,1
Radish with oil + rye	4,0	62,5	5,8	63,7

It is known from the experimental data that the amount of soil leaching in the control was 6.4 and 9.1 t/ha in moderate and strong levels, while this indicator was less than 2.4 and 3.2 t/ha in the option planted with oil radish + rye. Thus, we reflected only some ecological aspects of growing winter crops. We think that this problem is of particular importance in the Zarafshan oasis, and therefore it should be the object of comprehensive research.

CONCLUSIONS

The data obtained in the study of the effect of siderate crops on soil properties show that their combined application is more effective than the use of individual siderate crops. For example, the accumulation of plant mass was 35.0 t/ha in the conditions where oil radish+rye was used in conditions where the slope was >2.0. This indicates that it accumulated 37% more plant mass compared to self-application of oil radish and 52% more compared to self-application of rye. According to other indicators, the option of oil radish + rye was considered the most acceptable option.

REFERENCES

1. Ivenin V.V., Strokin V.L., Ivenin A.V. Green manure as an element of the biological system of agriculture in the Nizhny Novgorod region. Biological intensification of farming systems: Experience and prospects for development in modern conditions of development. Ulyanovsk, 2016. P. 78-85.
2. Lei, B.;Wang, J.; Yao, H. Ecological and Environmental Benefits of Planting Green Manure in Paddy Fields. Agriculture 2022, 12, 223. https://doi.org/10.3390/agriculture12020223
3. Sullivan P. Overview of Cover Crops and Green Manures. Appropriate technology Transfer fo Rual Areas. July, 2003.
4. Mishchenko Y.G., E.A. Zakharchenko, S.I. Berdin, O.V. Kharchenko, E.R. Ermantraut, I.M. Masyk, V.S. Tokman. Herbological monitoring of efficiency of tillage practice and green manure in potato agrocenosis. Ukrainian Journal of Ecology, , 210-219.
5. Sharma S., Kaur S., Choudhary O., Singh M., Al Huqail A., Ali H.M., Kumar R., Siddiqui M..

American Journal Of Agriculture And Horticulture Innovations
(ISSN – 2771-2559)
VOLUME 03 ISSUE 01 Pages: 01-06
SJIF IMPACT FACTOR (2021: 5. 705) (2022: 5. 705)
OCLC – 1290679216
Publisher: Oscar Publishing Services

Scientific Reports | (2022) 12:7167 | https://doi.org/10.1038/s41598-022-11106-x.

6. Aitemirov A.A., Khalilov M.B., Babaev T.T., Amiraliev Z.G. Influence of green manure on the yield of spring grain crops under irrigation conditions of the Terek-Sulak subprovince // South of Russia: ecology, development. 2018. T.13, N2. P.144-155. DOI:10.18470/1992-1098-2018-2-144-155.
7. Gakhmanova R.F. Comparative characteristics of influence. mineral fertilizers and green manure. on the phases of growth and development of cotton.. Agrarian science. 2020; 342 (10): 88–91.
8. Gorelov E.P., Batirov H.F., Dobrodomov V.L. Recommendations for the cultivation of rapeseed and perko for seeds // Ministry of Agriculture of the Republic of Uzbekistan, Tashkent, 1989, 9 p.
9. Batirov H.F. Winter crop production// Tashkent, Publishing House "Labor", 1991,164 p.
10. Botirov H.F. Growing two-year vegetable seeds in winter// SamDU printing house named after Sh. Rashidov, Samarkand, 2022, 150 p.
11. Botirov H.F., Karaev G'.R. Siderates and seed cotton yield in eroded soils. // Proceedings of the 13th republic scientific-practical conference on the topic "Intellectual potential youth in the integration of education, science and production - an important factor of the country's development". - Part IV. - Tashkent,- 2016. - P. 89-90.
12. Usmanov N., Ostanakulov T. Physical properties and agrochemical composition of potato field soil when different crop biomass is used as siderate. - J. Agro Science - Agriculture and Water Management of Uzbekistan.- 2021. - № 3. - P.62-63.
13. Oripov R., Boriev A. Effect of previous crops on winter wheat grain yield and technological quality parameters. - J. - Agroscience.- 2018. - № 7. - Б.29.
14. Turdimetov S.M., Musurmanova M.M. Properties of Soils located in different Geomorphological Conditions. American Journal of Agriculture and Horticulture Innovations. Volume 02 Issue 11-2022. pp 01-06.
15. TurdimetovSh.M., Rakhimov Z. Influence of Leguminous and Fodder Crops on Soil Agrophysical Properties and Crop Yields. Annals of Plant Sciences. Volume 11, Issue 01 (2022) pp. 4705-4711.
16. Turdimetov, S. M., Mirsharipova, G. K., Botirova, L. A., Abdujalilova, A. X., & Mustafakulov, D. M. (2020). Impact of legume crops on the agrochemical and agrophysical properties of soil in mirzachol conditions. Journal Of Critical Reviews, 7(17), 2220-2234.
17. Turdimetov, S. M., Sunnatova, D. (2017). How plant peas affect soil's agrochemical properties. In MODERN ECOLOGICAL STATE OF THE NATURAL ENVIRONMENT AND SCIENTIFIC AND PRACTICAL ASPECTS OF RATIONAL NATURE MANAGEMENT (pp. 779-781).
18. Turdimetov, S., Abdurakhmonov, I., Botirova, L., Zikirov, I., &Ashiralieva, S. (2021). Soil Quality Assessment Principles for Vegetable Crops. Annals of the Romanian Society for Cell Biology, 25(6), 9944-9952.