

Effect of The Previous Cropon Soil Fertilyand Seed Potato Yield

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ABSTRACT

A crop rotation system has many benefits such as reducing soil erosion and increasing fertility and crop yield. The experiment was conducted on the irrigation field of the formal potato seed multiplier Company "Elite seed" from 2015 to 2018.

The main purpose of the research is to multiply the types of crops that are part of the potato rotation, to improve the structure, to investigate and determine the effect of the crops grown in rotation on the physical, chemical, and biological quality of the soil and how well they are to the next crop, and to solve the problems of crop development.

Four types of potato rotations were included in the study, and in increasing seed potato yield and soil fertility green manure fallow – potato - wheat rotation or green manure had better benefits than other rotations (green manure plowing in the field in July).

Soil samples were taken from 0-20 cm depth before the planting and after the harvest of potatoes each year. According to the results of the soil analysis of the experimental field, the humus content of the green manure fallow soil increased by an average of 0.35% improved from another previous crop. Also, in the soil of green manure fallow the amount of nitrogen easily used by plants was 0.3-0.8 mg/kg (spring), which had a good effect on the yield of the potato crop planted the following year.

In the future, the result of the experiment suggested that the use of green manure fallow as a rotation with potatoes will help in increasing the yield and quality of potatoes.

INTRODUCTION

Potato has an important role as a food source since it produces more food per unit area per unit of time than conventional cereal crops and thereby holds promise for food for the fast-growing human population.

Potato (*Solanum tuberosum* L.) is most important food crop in Mongolia. Due to increasing potato production areas, it is required to improve the quality of potato seed material. But, poor quality of seed potatoes is a major yield-reducing factor in potato production.

Potato is a crop that uses soil fertility intensively. Planting in the same field for many years in a row can cause major problems such as disease and pests during the growing season, yield reduction, and poor-quality potatoes.

According to the research of the Soil Agrochemical Laboratory of the Institute of Plant Agricultural and Science in Darkhan-Uul province, the nitrogen supply of 46.0 thousand/ha area was 68.3%, the phosphorus supply

was 46.0%, and the potassium supply was 70.5%.

It has been shown that it is necessary to reduce and use rotations that increase the variety of cultivated plants.

In recent years, crop rotation is one of the Eco-friendly methods.

MATERIALS AND METHODS

The experiment was conducted on the irrigation field of the formal potato seed multiplier company "Elite seed" in Khushaat sum of Selenge province (Photo 1).



Photo1. Field of experience

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The four different crop rotation has three systems. The experimental field was 140 m² per plot, with three replications following potato planted preceding wheat, rapeseed, green manure fallow, carrot, and onion.

Types of potato rotation

- Wheat– Potato –Wheat / W-Po-W /
- Green manure fallow (Peas + Buckwheat rice mix) - Potato – Wheat / GMF-Po-W /
- Rapeseed - Potato – Wheat /Rs-Po-W /
- Onion – Potato – Carrot / O-Po-C /

A mixed soil sample of 0-20 cm was taken from each plot of the experimental area, and the basic agrochemical parameters were determined by the Soil Agrochemical Laboratory of the Institute of Plant Agricultural and Science. Among them: soil humus was determined by the Turing method, nitrate nitrogen by the Disulfa-phenol method, mobile phosphorus by the Michigan method, exchangeable potassium by a flame photometer, and soil environment by a potentiometer.

The yield was calculated as each replicate's average number and weight of tubers from 10 plants. By dividing the total number and weight of tubers by the number of measured plants, the index of one bush was obtained, and the yieldof1 ha was calculated based on the yield of one bush

RESEARCH RESULT

According to the research, when the soil samples were analyzed before planting potatoes, the content of humus, nitrogen, phosphorus, and potassium was not the same due to the previous cultivation, but the GMF-P-W rotation was superior in terms of overall soil fertility and biochemical parameters. According to the results of the soil analysis conducted after harvesting potatoes, there was a slight increase in humus, and a decreasein nitrogen, phosphorus, and potassium content.

The average results of 2015-2018 for soil humus and agrochemical plant are shown / in Figure 1 /.

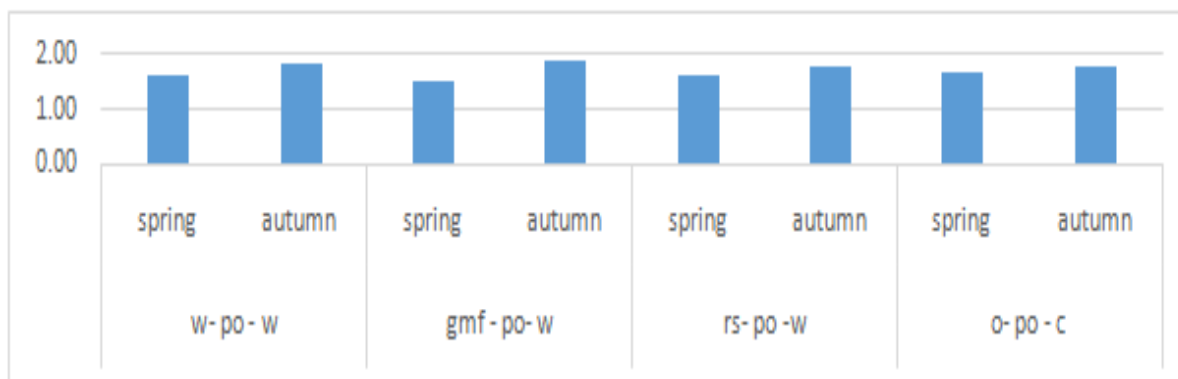


Figure1. Amount of humus in soil, %

It is a good thing that soil humus increased by 0.23% from 1.53 to 1.68% in spring and from1.78 to 1.88% in autumn due to previous crops. Soil analysis samples taken before and after potato planting in onion fields showed an average increase of 0.13% in humus content and

an average increase of 0.35% in green manure fallow. Green manure fallow enriched the soil with the highest amount of humus compared to the other alternatives, as was observed in the results of the soil analysis and during the study.

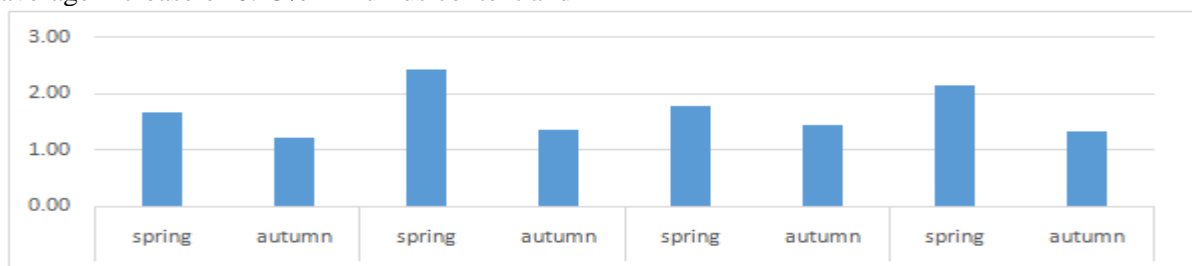


Figure2. Amount of soil nitrogen content, mg/kg

When determining the content of nitrogen in spring and autumn samples taken from potato fields planted with various previous crops, it

decreased to 1.66-2.45 mg/kg before potato planting and 1.22-1.44 mg/kg in autumn. From this, approximately 0.73 mg of nitrogen was

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taken from the soil per 1 kg of soil during the growing period of the potato. Potato crops planted after rapeseed had the lowest use of 0.34 mg/kg nitrogen, and green manure fallow crops used 1.1 mg/kg nitrogen. It was concluded that the content of nitrogen, which can be easily used by plants, was high in the 0-20 cm depth of the soil after following with green manure fallow, which creates the possibility to have a good effect on the growth and yield of

crops planted in the next year. The amount of phosphorus used by potato plants grown in each rotation was determined in spring and autumn in soil samples.

According to the results of the analysis, potatoes planted after wheat used 0.05 mg/100 g or less than other versions, and potatoes planted after rapeseed used 0.45 mg of phosphorus from 100 g of soil during the growth period.

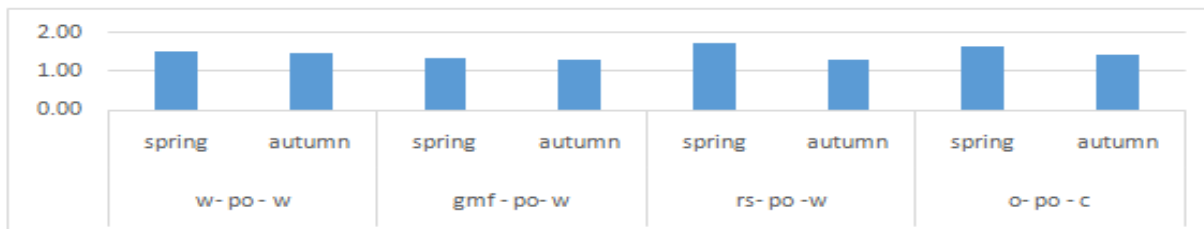


Figure3. Amount of soil phosphorus content, mg/ 100 g

During the research, it was found that the potassium content in the field soil was 6.00-6.88 mg/100 g in the spring, and decreased to 4.12-4.40 mg/100 g after the harvest. Potatoes use a lot of potassium during the growing season, it has an important effect on soil fertility.

After planting green manure fallow and rapeseed in, soil exchange was used more, which contributed to the increase in yield. Figure 4 shows that the least potassium (1.62 mg/100 g) was used for planting potatoes in the field planted with wheat for 2 consecutive years.

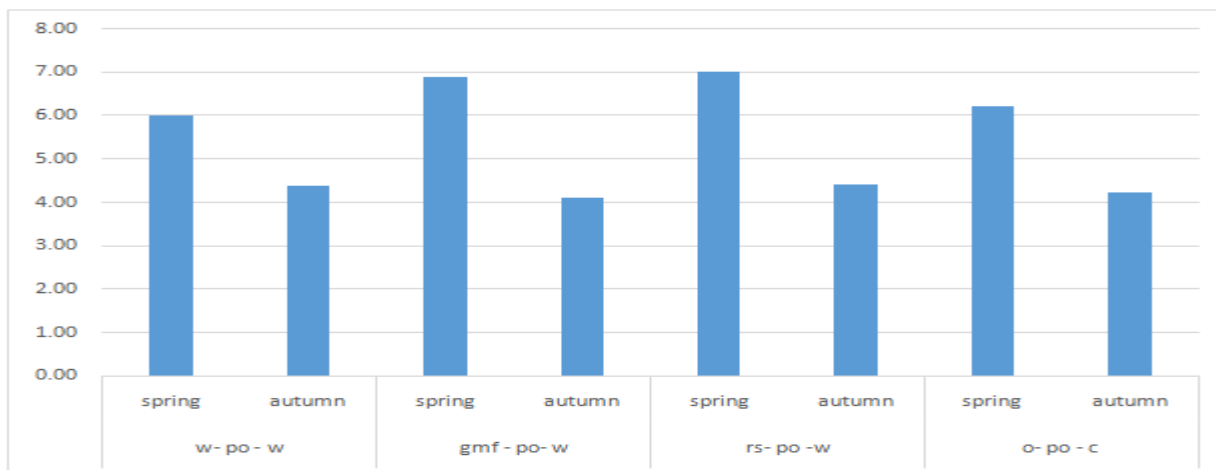


Figure4. Amount of soil potassium content, mg/100 g

Dr. R. Baljinnayam has clearly written in his work that potato cultivation intensively uses potassium during the development of vegetative organs, especially during flowering and tuber formation [2].

Tables 1 and 2 show the changes in the yield and biochemical parameters of potatoes planted after various types of cultivation, depending on the rotation involved in potato cultivation.

Table1. Yields of potatoes

№	Type crop rotation	Yield per bush		Number of bulbs per tuber	Yield t/ha
		Number of tubers	weight, g		
1	W – Po- W	7.2	558.2	79.3	22,9
2	O – Po - C	8.5	655.1	78.3	27,2
3	GMF- Po -W	9.1	896.7	101.5	36,5
4	Rs- Po - W	7.2	631.4	88.2	26,0

W – Wheat, Po - potato, O – onion, C – carrot, GMF – green manure fallow, Rs – rape seed

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According to a 4-year study of potato crop rotation, after green manure fallow is planted potato yields 36,5 t/ha, which is 93-136 t/ha better than potato yield after planting other plants. The potato crop planted after wheat had

the lowest yield. The number of tubers per bush of potato planted after types crop rotation was 7.2-9.1 bushels, while potatoes planted after green manure fallow planted of potato yield 0.6-1.9 tubers more than other plants.

Table 2. Biochemical analysis of potatoes

№	Type of crop rotation	Vitamin C, mg/%	Starch, %	Sugar,%	Dry matter content,%
1	W – Po- W	9.1	15.3	2.7	20.3
2	O – Po - C	9.2	16.3	2.9	20.6
3	GMF- Po -W	8.9	14.6	3.0	19.8
4	Rs– Po - W	8.8	15.3	2.9	20.3

In the studied rotations involving potatoes, potato tuber starch and dry matter were the lowest with 14.6% and 19.8%, respectively, in the 3 fields of green manure fallow. This is similar to the results of other researchers' research, as the amount of starch and dry matter decreased when the yield of potatoes grown in the green manure fallow field increased.

DISCUSSION

Pryanishnikov. D. I. (1963) noted that a good previous not only increases the yield of potatoes, but also improves the taste

and quality, and according to the results of our research, the yield and biochemical parameters of seed potatoes planted with while potatoes planted after green manure fallow planted of potato were the best.

According to the results of our research, green manure fallow-potato-wheat with legumes not only improves the biochemistry of tubers, and soil fertility, has a positive effect on humus content and physical properties, but also increases the yield, which is similar to the results of other researchers.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
*ургац	Between Groups	123094.826	3	41031.609	5.396	.003
	Within Groups	334595.929	44	7604.453		
	Total	457690.755	47			
Азотын зөрүү	Between Groups	2.851	3	.950	.798	.501
	Within Groups	52.368	44	1.190		
	Total	55.219	47			

*ургац - yield

As can be seen from the above mathematical processing, the yield of potato crops grown indifferent precursors is significantly different from each other, the p value is less than 0.05.

CONCLUSION

- Green manure fallow increases the nitrogen content in the soil layer where the roots of the plants are located, which can be easily used by the plants and has a good effect on the growth and yield of the next year's crops.
- Green manure fallow – Potato - Wheat rotation in high-yielding green manure for potato harvested 93-136 t/ha better potato yield than other rotations.
- The rotations involving potato cultivation improved the soil fertility and had a good effect on the yield increase. In addition, green manure fallow-potato-wheat rotation was superior to other rotations in terms of

soil fertility, tuber biochemical quality, and yield.

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