

## RESEARCH REGARDING THE INFLUENCE OF INTERMEDIATE CROPS ON POTATO HARVEST AND QUALITY FOR CONSUMPTION

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### Abstract

*The research was carried out in the Bozovici Depression located in southwest Romania. From which it follows that the area falls under the moderate temperate continental climate. The soil type is semicarbonat eutric alluvial soil. The experiments were bifactorial in which factor A was the preceding plant and factor B was the number of nests/hectare. The choice of the bean (*Vicia faba* L) used as an intermediate plant is motivated by its ecological flexibility and the amount of green mass it produces. The synthesis of the harvest results obtained in the experimental cycle 2021-2023 for potatoes showed that the highest harvest was obtained in the variant autumn barley + grain of 32,376 kilograms/hectare followed by the variant of autumn wheat + grain of 31,287 kilograms/hectare, and the lowest harvest was obtained in the variant in which the potato followed after grain corn of 26,492 kilograms/hectare. Among the plots tested, the variant with 65,000 nests/hectare stood out.*

**Key words:** potato, intermediate crops, yield impact.

### INTRODUCTION

The research was carried out on the potato crop, currently spread in 140 countries of the world and represents after FAO, the fourth source of food energy, after rice, wheat and maize. In Romania, the potato ranks 4<sup>th</sup> in terms of area, after corn, wheat and sunflower (Hinda et al., 2023). Currently, in the transformation of intensive, ecological agriculture, of particular attention are the research on intermediate crops, respectively in rotations, after a main crop, with early harvest (wheat, barley, rapeseed, etc.) to follow an intermediate crop (successive) with soil ameliorating characteristics, from which biomass used as green fertilizer is obtained (Si J et al., 2024). Frequently, intermediate plants are used in agricultural practice in intermediate crops, to obtain biomass for animal feed or even for grains (Hinda et al., 2021). In this regard, Berca, 2011, mentions that through intermediate crops the functions of feed production, green fertilizer, reduction of CO<sub>2</sub> in the soil and soil protection function are fulfilled. By permanently covering the soil with vegetation, a permanent accumulation of biomass is obtained, which ensures the

enrichment of the soil with nitrogen and carbon and thus contributes to its reconstruction and development. (CKM system). In the soil reconstruction function, protection against erosion, weeding, soil structuring, increased biological activity should also be estimated (Niedziński et al., 2024).

Results on the importance of using legumes in successive crops, on the economic and ameliorative effect are also present works (Muntean, 2003; Borcean et al., 2004; Imbrea; 2019; Hinda, 2021).

### MATERIALS AND METHODS

The research was carried out between 2021 and 2023 in the Bozovici Depression, located in southwest Romania. The area falls within the temperate continental climate. The geographical position, the relief, as well as other local factors give the area its own climatic dynamic, in which Mediterranean and oceanic influences are felt. The perennial average rainfall varies between 670 - 750 mm. The average annual temperature is 9.3°C. The soil type is semicarbonat eutric alluvial. The experiments were bifactorial type with 3 repetitions, in which factor A was the

intermediate crops used, and factor B the number of potato nests, with the following graduations of factors: Factor A - a1 winter barley in succession with grain; a2 winter wheat, in sequence with grain; and a3 grain maize. Factor B number of potato nests, with graduations: b1 - 55000 nests/ha; b2 - 60000 nests/ha, b3 -65000 nests/ha and b4- 70000 nests/ha. The choice of grain (*Vicea faba* L) as a successive plant after barley and wheat respectively was made because it is a species adapted to areas with moderate humidity, with good ecological flexibility, which ensures good crops of vegetative mass with an improving effect on the soil. The potato variety was Productive, from the semi-late maturity group, from the quality class A/B, with a production capacity of 52 t/ha. It is worth mentioning that in vegetation develops a rich leaf bush with semi-erect port. Of the cereals, preference was given to barley, since it leaves the field early in June, and wheat, which leaves the field in the first half of July. Preparing the land after

harvesting the grain for the grain carried out a work with the gruber, associated with the tusk harrow. The harvesting of the grain was carried out in autumn, after the arrival of frosts by rolling it, after which it was plowed at 23-25 cm. Fertilization for the potato was done with N<sub>120</sub>P<sub>80</sub>K<sub>80</sub>. In the spring the field was worked with the combiner in aggregate with fields of tusked harrows. Potato planting was carried out in the first half of March, at the distance between rows of 70 cm and a depth of 6-7 cm. Weed control was carried out by herbicide. During the vegetation, two rebellions and 3 treatments against diseases and pests were carried out. The harvesting of potatoes was done on the date of drying of the stems and the ripeness of the tubers.

## RESULTS AND DISCUSSIONS

A summary of the potato crop results is given in the following (Table 1).

Table 1. Summary of potato yield

Factor A	Number of nests/ha				Factor A means			
	55000	60000	65000	70000	Yield kg/h	%	Diff kg/ha	Signif.
Barley + grain	28927	31033	34856	34688	32376	100		
Grain + grain	28189	30210	33827	32922	31287	97	-1089	XX
Corn	24579	25163	28556	27672	26492	82	-5884	XXX

DL 5% = 1256 kg/ha DL 1% = 2079 kg/ha DL 0.1% = 3891 kg/ha

Factor B averages

Nest/ha	55000	60000	65000	70000
Yield kg/ha	27232	28802	32413	31760
%	100	106	119	117
Diff. kg/ha		1570	5181	4528
Signif.		X	XXX	XXX

DL 5% = 2264 kg/ha DL 1% = 3106 kg/ha DL 0.1 = 4227 kg/ha

From the data presented it results that the largest potato harvest, on average on the 4 planting densities of 32376 kg/ha was obtained in the autumn barley rotation and grain in successive crop, followed by the variant in which the potato followed wheat and grain in successive crop of 31,887 kg/ha. The lowest average harvest was obtained in the variant in which the potato followed grain corn, of 26,492 kg/ha. The difference in harvest between the variants in which barley harvested 10 days

earlier than wheat and grain sowing gained 10 days during the growing season, the green mass production of the grain crop was higher, which benefited the potato that followed the following year. The smallest potato harvest was in the corn grain rotation with 18%, respectively with 5884 kg/ha statistically assured as very significantly negative. Among the densities used for the potato, the variant with 65,000 nests/ha was noted, in which the harvest was higher by 19%, compared to the control variant

with the density of 55000 nests/ha, respectively there was a very significant difference of 5181 kg/ha. Increasing the density to 70000 nests/ha is not motivated, the harvest increase was 17% compared to the control variant.

The results of the quality analyses recorded on the potato in the experimental cycle 2021-2023 include: annual analyses of each variant on the percentage of starch and data on the average starch production of the variants taken in the study.

The results of the average quality analyze show close values between the variants of the barley + grain precursors (17.6%) and the wheat + grain variant (17.7%). The highest content of 18.2% was determined in the variant in which the preceding plant was grain corn (Figure 1). The results show that between the barley + grain and barley + wheat precursors the values were significantly equal, and after maize the content was higher because the nitrogen content in the soil was lower than in the variants in which the favorable effect of the nitrogen content left in the soil was felt. It follows that the higher nitrogen content in the soil negatively influenced the accumulation of starch.

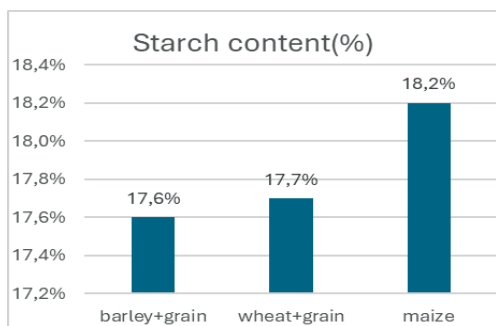


Figure 1. Average starch content depending on the walkers

The average starch content depending on the number of nests and the 3 preceding plants varied between the limits of 17.7% in the version with 60000 nests/ha and 18.0% in the version with 70000 nests/ha (Figure 2). The data represent average summary values from the experimental cycle mentioned, the annual data being influenced by the annual climatic conditions and are dimmed on the average.

On the basis of tuber production and starch content, starch production/ha was determined. Data are presented in Tables 2 and 3.

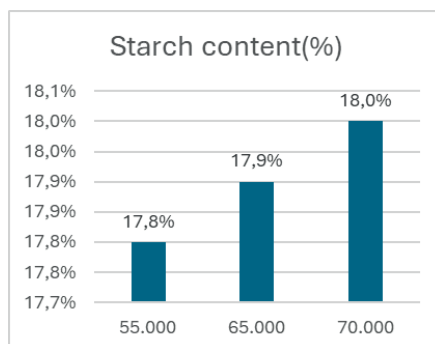


Figure 2. Average starch content as a function of density (number of nests/ha) of potato crop

Table 2. Starch production depending on the preceding plant

Pre-culture	Barley + grain	Grain + grain	Grain maize
Potato harvest kg/ha	32376	31287	26492
Amount of starch kg/ha	5698	5537	4821
%	100	97	87
Difference kg/ha		-161	-877

Table 2 shows that the largest amount of starch was obtained in the variant when barley and grain were pre-potato in successive crop from the variant with wheat and grain rotation in successive crop, the amount of starch decreased by 3%, respectively by 161 kg/ha. The smallest amount of starch was obtained in the potato rotation after grain maize, with 13% and 877 kg/ha respectively. It follows that the beneficial effect of grain grown in successive cereal crops was also felt on starch production.

Table 3. Starch production by crop density

Density Nests/ha	55000	60000	65000	70000
Potato harvest kg/ha	27232	28802	32413	31760
Amount of starch kg/ha	4683	5897	5801	5716
%	100	109	124	122
Difference kg/ha		414	1118	1033

The Table 3 shows that, depending on the density of the culture, the amount of starch compared to the control variant increased by 9% in the variant with 60000 nests/ha, by 24% in the variant with 65000 nests/ha and showed a downward trend in the variant with 70000 nests/ha to 22%.

It follows that by increasing the number of nests per hectare, compared to the variant with 55000 nests/ha, the amount of starch increased by 414 kg/ha in the version with 60000 nests/ha, by 1118 kg/ha in the version with 65000 nests /ha and by 1033 kg/ ha in the version with 70000 nests/ha.

## CONCLUSIONS

The research was carried out in the Bozovici Depression, Patas territory, located in southwest Romania.

The research carried out between 2021 and 2023 on the introduction of intermediate crops in the rotation for potato cultivation, respectively after the straw cereal crops (barley and wheat), the introduction of grain (L) for green mass, used as green fertilizer, led to obtaining a harvest increase in potato for consumption of 18%, compared to the potato grain corn rotation practiced in the area.

After harvesting grain barley in the second half of June, the use of grain as green fertilizer, harvested before frost came, increased the potato harvest by 18%, compared to potato rotation after corn.

After the wheat crop, harvested in the first decade of July, the use of the grain as green fertilizer increased the potato harvest by 11.8%. The optimum potato density, where the highest harvest was obtained, was 65000 nests/ha of 34856 kg/ha after barley + grain, and after wheat and grain was 33827 kg/ha, compared to the corn grain potato variant, of 28356 kg/ha.

On average, after the three variants of previous crops, the harvest increase was 19% in the variant with 65000 nests/ha, compared to the control variant with 55000 nests/ha.

Increasing the density to 70,000 nests/ha is not justified, the harvest increase being only 17%.

The amount of starch obtained for potatoes in the rotation after barley and grain was 5698 kg/ha, after wheat and grain was 5537 kg/ha compared to potato grown after corn where the amount of starch was 4821 kg/ha.

In the version with a density of 65000 nests/ha, the largest amount of starch was obtained, of 5801 kg/ha, compared to 4683 kg/ha in the version with a density of 55000 nests/ha.

In conclusion, intermediate crops are of particular importance in the stage of

transformation of agriculture to an intensive one, but to ensure, besides increasing crops, soil protection, by enriching with humus and improving physical and biological characteristics.

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