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PRODUCTIVITY OF SPIKED GRAIN CROPS IN SHORT-TERM CROP ROTATIONS OF WESTERN FOREST-STEPPE

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The peculiarities of winter wheat and spring barley crop capacity formation in short-term crop rotations with various grain crops saturation presented below. Increase of crop capacity significantly depended on a preceding crop in crop rotation.

The main and the most essential part of the agriculture system is the adequate crop rotation. They take a special place because of their favorable influence on the fertility of soil and crop capacity of crops. The productivity of crop rotations depends on saturation with main crops and levels of fertilization.

After full studying of scientifically grounded crop rotations according to specific conditions followed by other technological measures, it is possible to increase productivity of arable lands by 25–30%, and at the estimation of some scientists – by 40–50% [4].

In the current conditions of the development of competitive intensive agricultural there is a necessity of growing crops in repeated sowings and saturation of crop rotations with them. It becomes extremely important to know the maximum possible and economically profitable saturation of crop rotation with grain crops taking into consideration organizational and natural conditions [5].

The main measure to stop and prevent the development of negative processes and crises phenomena in agriculture is scientifically grounded location of grain crops in crop rotation. While applying them, arable lands and fertilizers are used more productively, the amount of weeds is reduced, the influence of pests and diseases on sown crops decreases with the minimal use of preparations [3]. All factors mentioned above influence positively on the environment, open additional opportunities to increase grain products followed by decrease of expenses on its production.

Over the last years, in the structure of sowing areas under crops of the majority of farming enterprises significant changes happened, due to the market conditions. These enterprises grow mostly highly liquid crops (winter rape, maize, winter wheat), which makes possible to get high profits. However, such structural changes lead to deterioration of selection of preceding crops, biological influence of which is an important factor of increasing productivity of crop rotations [1].

Taking into account all above mentioned information, Institute of Agriculture of Western Polissya studied dependence of productivity of crops on the level of saturation of short-term crop rotations by them.

The aim of the research was to define the influence of various preceding crops on productivity of winter wheat and spring barley in short-term crop rotations with various saturation by grain crops.

Methods of research. Soil of the researched area is dark-grey podzolized light-loamy. The arable layer of soil is characterized by the following elements: humus – 1,75-1,93%, pH – 5,6-6,0, a sum of absorbed bases 8,08-8,60 mg-equiv per 100 g of soil, slightly hydrolyzed nitrogen – 112-122 mg/kg, moving forms of phosphorous – 219-252 mg/kg, exchange potassium – 80-95 mg/kg.

There were examined variants of three-field and four-field crop rotations saturated with grain crops from 66,6 to 100%, there were applied the following schemes of rotation of crops: maize for silage – winter wheat – winter rye; maize for silage – winter wheat – winter wheat; maize for silage – winter wheat – spring barley (grain–cultivated crop rotations saturated with grain crops up to 66,6%); maize for silage – winter wheat – spring barley – spring rye; maize for silage – spring barley – oatmeal – winter wheat (grain–cultivated crop rotations saturated with grain crops up to 75%); maize for grain – spring barley – winter rape – winter wheat; maize for grain – spring barley – winter wheat (grain–cultivated crop rotation with 100% saturation by crops grown for grain).

Mineral fertilizers were applied in the form of ammonium nitrate, ordinary superphosphate and potassium magnesia: for maize – $N_{150}P_{90}K_{120}$, spring barley, winter rye; winter rape, oatmeal – $N_{60}P_{60}K_{60}$, winter wheat – $N_{90}P_{60}K_{60}$.

During the experiment were grown varieties of crops registered in the Register of Varieties of Ukraine.

The main factor which determines the efficiency of certain agricultural measure are the following: yield capacity of crops and productivity of crop rotation in general.

Results of the research. According to the results of the research there was defined the dependence of the grain crops yield on a preceding crop and its position in the crop rotation (Table 1). The highest yield of winter wheat within four years of the research was obtained after such preceding crops as winter rape and maize for silage – 5,17-5,19 t/ha. Yielding capacity of winter wheat significantly decreased after stubble preceding crops of: spring barley – by 1,07 t/ha, oatmeal – by 0,94 t/ha, winter wheat – by 1,45 t/ha.

1. Yielding capacity of winter wheat and spring barley depending on a preceding crop, average for 2006-2010.

Preceding crop	Grain yield of winter wheat	Grain yield of spring barley
Winter rape	5,19	–
Spring barley	4,12	–
Maize for silage	5,17	4,34
Winter wheat	3,74	3,76
Oatmeal	4,25	–
Winter wheat + green manure	–	4,01
Maize for grain	–	4,10
HIP_{05}	1,5	1,3

The highest yield of spring barley (4,34 t/ha) was obtained after maize for silage. To reduce a negative influence of stubble preceding crop in crop rotation highly saturated with grain crops after winter wheat, was planted intermediate crop on green manure (white mustard), due to this the yield of spring barley was on 0,25 t/ha higher, compared with variant without any green manure, in this case this index was the lowest (3,76 t/ha).

The most productive were crop rotations highly saturated with grain crops (up to 100%), that provided grain crops yielding capacity of 5,01-5,29 t/ha. In three-field crop rotations with 66,6% saturation with grain crops, 33,3% of which constituted maize for silage, the yield of grain was 6,90-7,68 t; fodder – 7,96-8,15 t. Grain cultivated crop rotations saturated with grain crops up to 75% provided the yield of 6,21-6,44 t of grain and 7,43-7,50 t of fodder per 1 hectare of crop rotation area.

Grain-cultivated crop rotations with 100% grain crops saturation turned to be the least productive, the yield of grain crops constituted 5,02 t, and of fodder crops – 6,64 t from 1 hectare of crop rotation area (Table 2).

2. Productivity of crop rotations depending on their saturation with grain crops, average for 2006-2010

№ of variant	Structure of the sowing area, %								Crop capacity, t/ha	Yield from 1 ha of crop rotation area, t		
	Total of grain crops	including							Grain crops	Grain units	Fodder units	Digestible protein
		Spring barley	Maize for grain	Winter rye	Winter rape	Oatmeal	Maize for sillage	Winter wheat				
1	75	25,0	25,0	–	25,0	–	–	25,0	5,01	5,42	6,73	0,41
2	100	33,3	33,3	–	–	–	–	33,3	5,29	5,02	6,64	0,37
3	66,6	33,3	–	–	–	–	33,3	33,3	4,56	6,90	7,56	0,48
4	75,0	25,0	–	25,0	–	–	25,0	25,0	4,68	6,44	7,50	0,47
5	66,6	–	–	–	–	–	33,3	33,3	4,28	7,68	8,15	0,53
6	75,0	25,0	–	–	–	25,0	25,0	25,0	4,34	6,21	7,43	0,47
7	66,6	–	–	33,3	–	–	33,3	33,3	4,96	7,37	8,17	0,51

The results of the research show that the increase of the proportion of winter wheat in structure of sowings leads to the decrease of its crop capacity. That is why during specialization on the production of commercial winter wheat grain, the optimal saturation of crop rotations with the crop should be 30%. If the proportion rises up to 40–50%, it is necessary to allocate not more than 75% of its sowing areas after preceding crops.

Conclusions. The highest yield of winter wheat was obtained after such preceding crops as maize for silage and winter rape. The low yield is obtained after stubble preceding crops, the yield of grain decreases to 0,94-1,45 t/hectare. Application of green manure after a stubble preceding crop provides the increase of crop capacity of spring barley. Grain-cultivated crop rotations with 66,6-75% grain crops saturation provide a high level of productivity.

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Фурманец М.Г. Продуктивность зерновых колосовых культур в короткоротационных севооборотах Западной*Лесостепи*

При современных условиях интенсивного развития земледелия возникает потребность выращивания культур в повторных посевах с насыщением севооборотов зерновыми. Основным способом для предупреждения развития негативных процессов и кризисных явлений в земледелии является научно обоснованное размещение зерновых культур в севооборотах, в следствии чего продуктивнее используются удобрения, снижается засоренность, уменьшается влияние вредителей и болезней на посевах зерновых культур при максимальном использовании препаратов.

Цель исследований — установить влияние разных предшественников на продуктивность пшеницы озимой, ячменя ярого в короткоротационных севооборотах с разным насыщением зерновыми культурами.

В работе использовались общенаучные и специальные методы. Основным методом исследования был полевой, который дополнялся анализами за общепринятыми в земледелии, агрохимии, растениеводстве та статистике методиками.

Установлено, что наивысшая урожайность пшеницы озимой (5,17 – 5,19 т/га) получена после предшественников рапса озимого и кукурузы на силос.

Значительно снижалась урожайность после стерневых предшественников: ячменя ярого — на 1,07 т/га, овса — на 0,94 т/га, пшеницы озимой — на 1,45 т/га.

Наивысшую урожайность ячменя ярого (4,34 т/га) получили после кукурузы на силос в четырехпольном севообороте насыщением зерновыми до 75%.

***Ключевые слова**: севооборот, предшественник, урожай, продуктивность, зерновые культуры.*

Furmanets M.H. Productivity of spiked grain crops in short-term crop rotations of Western forest-steppe

In the conditions of the development of competitive intensive agricultural production there is a necessity of growing crops in replanting and saturation of crop rotations with principal crops. The main way to stop and prevent the development of negative processes and crises phenomena in agriculture is scientifically grounded location of grain crops in crop rotation. While applying this, arable lands and fertilizers are used more productively, the amount of weeds is reduced, the influence of pests and diseases on sown crops decreases with the minimal use of preparations.

The aim of the research is to define the influence of various preceding crops on crop capacity of winter wheat and spring barley in short-term crop rotations with various grain crops saturation.

General scientific and specific methods were applied in the research work. The main method was the field one which was supplemented by analyses carried out according to generally accepted agricultural, agrochemical and plan cultivation methods.

There are presented the results of the research of the influence of preceding crops on crop producing capacity of winter wheat and spring barley in short-term crop rotations with various grain crops saturation.

It has been ascertained that the highest yield of winter wheat (5,17-5,19 t per hectare) was obtained after such preceding crops as winter rape and maize for silage. Crop capacity significantly decreased after stubble preceding crops: spring barley – by 1,07 t per hectare, oatmeal – by 0,94 t per hectare, winter wheat – by 1,45 t per hectare.

The highest yield of spring barley (4,34 t per hectare) was obtained after maize for silage in four-field crop rotation saturated with grain crops up to 75%.

***Key words:** crop rotation, preceding crop, yield, crop producing capacity, grain crops.*