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TECHNOLOGICAL MEASURES BIOLOGIZATION INFLUENCE ONTO PRODUCTIVITY OF WINTER WHEAT AT CROP SHORT-TIME ROTATIONS

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Presented are the effectiveness studies results on using different predecessors, spring fertilization (N_{85}) and the main tillage systems for winter wheat at crop short-time rotations.

Keywords: winter wheat, primary tillage predecessors, fertilizer

Introduction. Organic agriculture, namely arable farming, must support and strengthen the health of soil, plants, animals, people and the planet, integrally and in full scope, with the account to the living ecological system cycles such improvement never interfering nor involving the system's disfunction but aimed to protect the ecology and environmental balance, the health of present and future generations.

Along with biological agents main tillage represent an effective factor in the compound density of the soil, since the mechanical treatment main task is to create such a soil composition, which would contribute to favorable growth and development of crops [6].

The established content in water-resistant aggregates was higher with plowing green mass of winter rye and clover - respectively 71.1 and 67.7%; being slightly below when fallow making manure - 66.8%, while at control area under oats crops (unfertilized fallow) it was 58.6% [1].

One of the main reasons for the need of alternating single-species crops in the rotation is that they do significantly differ in consuming nutrients from the soil and this agriculture basic principle is an important agro-technical tool of obtaining high and stable yields. [2].

The advanced economies' practice shows that in different soil and climatic zones the manure or compost additives at doses of 30-60 t/ha is the main mean for obtaining high and stable yields. However, these recent years, the manure is in short supply and there arises a problem of finding other sources of organic matter to be introduced into the soil [5]. The use of green manure crops can increase soil organic matter, humus, nitrogen in the soil, improves the soil agrophysical properties [4].

Zonal tillage systems should be moisture-accumulating and ensure high efficiency of the precipitation intake by the plants. The tillage systems' key bottleneck relates to their inadequacy to the regional arid conditions [8] .In the same time a large number of published works do note the positive impact onto

yields of such biologization methods as the use of green manure crops and binary crop. [3]

The fallow field's positive influence in the following year reveals mainly in the weeds reduction, as well as increased moisture reserves [7].

The purpose of study. Researching the effect of different tillage systems and the technological measures' biologization for short-time crop rotations with various fallow species (black, cropped, sidereal and peas for grain) onto efficiency and quality of winter wheat fields in Southern Ukraine steppes .

Study methodology.

In the experiment the Shestopalovka winter wheat was sown with a seeding rate of 4.5 million. pcs. seeds per 1 ha

The experimental series was laid in a 4-fold repetition. The accounting plot area: 100 m^2.

The experimental series' setup.

Factor A: primary tillage systems in crop rotation: (muck at control plot, combined, subsurface, small fraction).

Factor B: different fallow types: (black, sidereal (winter vetch), sidereal (peas + mustard) and peas for grain).

Factor C: spring creep-feeding with nitrogen fertilizers: with (N_{85}) fertilizing and without additives.

The results of research. In the context of 2013-2014 agricultural year we have experimentally found a certain effect produced by elements of biologization and various primary tillage systems in short-time crop rotations at the Southern Ukraine steppes zone. The lowest average yield of winter wheat in the experiment amounted to 1.80 t/ha on the background of small primary tillage in peas-involving crop rotation without fertilization and 2.49 t/ha on the spring fertilization background (Table 1)**.**

Table 1

Influence of tillage systems and predecessors onto winter wheat yield in short-time crop rotations t/ha (2014)

Tillage systems (factor A)	Fertilization (factor C)	Predecessor (factor B)				Average mean
		Black fallow (control plot)	Sidereal fallow (winter vetch)	Sidereal fallow (peas+ mustard)	Peas for grain	
muck (control plot)	With fertilizers	2,71	2,65	2,41	2,17	2,48
	Without fertilizers	3,55	3,34	2,78	2,81	3,12
Combined	With fertilizers	2,45	2,76	2,14	2,09	2,36
	Without fertilizers	2,86	3,16	2,54	2,42	2,74
Subsurface	With fertilizers	2,35	2,65	2,08	2,12	2,30
	Without fertilizers	3,23	3,19	2,74	2,31	2,87
Surface tillage	With fertilizers	2,22	2,74	2,19	1,80	2,24
	Without fertilizers	2,68	2,93	2,51	2,49	2,65
Average		2,76	2,93	2,42	2,28	2,60
HIP_{05}, t/ha :**A** = 0,21 ;**B** = 0,21 ;**C** = 0,15;**AB** = 0,42;**AC** = 0,30;**BC** = 0,30;**ABC** = 0,60						

The green manure use at field crop rotations (winter vetch) gave at our experiment the winter wheat grain yield average increase for all primary tillage systems by 0.17 t/ha, when compared to black fallow. Moreover, applications of nitrogenous fertilizer (N_{85}), provided a steady rise in the winter wheat yield for all tillage systems in average, by 0.07 t/ha. In green manure crop rotation (peas + mustard) the winter wheat grain yield decreased by 0.34 t/ ha, and case of peas, respectively, by 0.48 t/ha compared to fallow. However, compared with green manure crop rotation (winter vetch), the above-mentioned rotations give a lower indexes: by 0.51 t/ha and 0.65 t ha respectively.

Studying the primary tillage systems' effect on the winter wheat productivity we noted in the experimental series its growth with black fallow combined to moldboard tillage systems, the yield being 3.55 t/ha on the background of spring fertilization. The combined tillage systems use resulted in the yield decrease of 0.23 t/ha, the subsurface system lowered result for 0.55 t/ha, and small fraction system - for 0,48t/ha.

For sidereal fallow (vetch winter) the winter wheat greatest grain yield was obtained with moldboard tillage systems - 3.34 t/ha with yield fluctuations between 2.93 and 3.19 t/ha for shallow subsurface and plowless farming systems. The combined system of tillage in crop rotation variance gave an intermediate value: 3.16 t/ha.

The greatest winter wheat productivity after the green manure fallow (peas + mustard) was obtained from subsurface tillage and moldboard tillage systems, respectively: 2,74 - 2,78 t/ha, whereas the variances with the surface tillage and combined shallow tillage systems were inferior to the subsurface and moldboard tillage respectively by 0.20 - 0.23 and 0.24 - 0.27 t ha.

Significantly less than the winter wheat yields were results obtained in the experiment of peas-to-grain crop rotation where average yields were inferior (for all tillage systems) to the black fallow variance: without fertilization by 0.39 t/ha, and when fertilizers added, by 0.57 t/ha. At the same time, there was a decrease in the winter wheat productivity compared to green manure fallow (peas + mustard) respectively by 0,16 - 0,13 t/ha, and the green manure fallow (winter vetch) by 0,66 - 0 64 t/ha

The systems of combined and surface tillage applied to peas-and-grain rotation gave the lowest levels of grain yield, respectively without fertilizing - 2,09-1,80 t/ha and 2.42 -2, 49 t/ha with fertilizers. However, it should be noted that such rotation variance with the subsurface soil treatment (fertilizers not introduced) gave a slightly greater winter wheat efficiency: 2.12 t/ha and, when fertilizing, the result was contrary, lowered; 2.31 t/ha as compared to the variance of tillage combined system in green manure fallow crop rotation (peas + mustard), where its productivity was respectively 2.08 - 2,74t/ha.

Conclusions. The effected research results serve in basis to conclude the following with preliminary hypothesis formulation: considering the 2013-2014 agricultural year, situation, the use of black and green manure fallow (vetch winter) for short-time crop field rotations ensured the winter wheat yield growth on the background of spring feeding by 0,44-0,51 and 0,57-0,64 t/ha, respectively,

compared with the sidereal fallow (peas + mustard) and peas-to-grain rotation on average for all tillage systems.

Analyzing the effect of different tillage systems in the main crop rotations, we can determine the tendency of growth in winter wheat productivity on a background of moldboard tillage with spring fertilizing (N85), where the highest average grain yield in all crop rotations has been obtained: 3.12 t/ha.

The winter wheat crops spring fertilizing with the norm (N_{85}) provided in this experimental series the increase in average grain yield for all tillage systems from 0.44 t/ha in the green manure fallow rotation (winter vetch) to 0.65 t/ha in the black fallow rotation. The yield increase in crop rotations with green manure fallow (peas + mustard) and peas only had an intermediate value.

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ABSTRACT

E.A. Yurkevich, C.C. Sokolov, V.G. Druziak, Q.T. Al-Janabi. ***Technological measures biologization influence onto productivity of winter wheat at crop short-time rotations.*** *Presented are the results of studies on the effectiveness of primary tillage, spring fertilization and winter wheat under predecessors. It was found that under the conditions of the 2013-2014 agricultural year the use of black and green manure (winter vetch) fallow at short-time field rotations ensured the growth of winter wheat yield on a background of spring feeding by 0,44-0,51 and 0,57-0,64 t/ha, respectively, compared with the sidereal fallow (peas + mustard) and peas grain, result averaged for all tillage systems. The tendency of winter wheat yield growth on the background of the spring fertilizers feed (N_{85}) and moldboard tillage system, gave the highest average grain yield of all predecessors - 3.12 t/ha.*

Keywords: winter wheat, predecessors, primary tillage, fertilizer.

Аннотация

Е. А. Юркевич, К.К. Соколов, В.Г. Друзьяк, К.Т. Аль-Джанаби. ***Влияние биологизации технологических мероприятий на продуктивность пшеницы озимой в короткоротационных севооборотах.*** *Представлены результаты исследований по изучению эффективности систем основной обработки почвы, весенней подкормки и предшественников под пшеницу озимую. Установлено, что в условиях 2013-2014 сельскохозяйственного года использование чёрного и сидерального (вика озимая) паров в короткоротационных полевых севооборотах обеспечило рост урожайности пшеницы озимой на фоне весенней подкормки на 0,44-0,51 и 0,57-0,64 т/га соответственно по сравнению с сидеральным паром (горох+горчица) и горохом на зерно в среднем по всем системам обработки почвы. Отмечена тенденция роста урожайности зерна пшеницы озимой на фоне весенней підкормки (N_{85}) и системы отвальной обработки почвы, где был получен самый высокий средний урожай зерна по всем предшественникам - 3,12 т/га.*

Ключевые слова: пшеница озимая, предшественники, системы основной обработки почвы, удобрение.

Анотація

Є.О. Юркевич, К.К. Соколов, В.Г. Друз'як, К.Т. Аль-Джанабі. ***Влив технологічних заходів на продуктивність пшениці озимої у короткоротаційних сівозмінах.*** *Представлені результати досліджень з вивчення ефективності систем основного обробітку ґрунту і попередників під пшеницю озиму. Встановлено, що в умовах 2013-2014 сільськогосподарського року, застосування чорного і сидерального (вика озима) парів у короткоротаційних польових сівозмінах забезпечило зростання врожайності пшениці озимої з весняним підживленням на 0,44-0,51 и 0,57-0,64 т/га відповідно у порівнянні з паром сидеральним*

(горох+гірчиця) і горохом на зерно, в середньому по всіх системах обробітку ґрунту. Відмічена тенденція зростання урожайності зерна пшениці озимої на фоні весняного підживлення (N_{85}) і системи полицевого обробітку ґрунту, де був отриманий самий високий врожай зерна по всіх попередниках - 3,12 т/га.

Ключові слова: пшениця озима, попередники, системи основного обробітку ґрунту, удобрення.