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ECONOMIC EFFICIENCY OF FERTILIZERS' APPLICATION FOR SPRING WHEAT UNDER DIFFERENT SOIL TILLAGE TECHNOLOGIES OF GREYZEM HAPLIC SOIL

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Abstract. *The effect of fertilizers' application for different soil tillage technologies of greyzem haplic soil on economic efficiency of spring wheat has been determined. The ammonium nitrate (AN) and urea-ammonium nitrate solution (UAN) were applied under ploughing and mini-till, as well as under no-till and slit-formation. The minimal process costs were invariant with no-till and UAN application (4902,03 UAH/ha). Maximal revenue (3017,84 UAH/ha) and maximal profitability (58,1 %) were got in UAN application for slit-formation of the greyzem haplic soil*

Key-words: *spring wheat, soil tillage, fertilizers, economic efficiency*

Today, market conditions require producers to reduce production costs while ensuring maximum profit. Among the agronomic practices of spring wheat raising, fertilization and tillage usage are among the most expensive sections. Therefore, minimization of tillage, which limits the physical impact of machinery on the soil [1] and over time optimizes physical, agrochemical and other soil properties [3, 5] in this aspect is the most practical.

Implementation of resource-saving cultivation can reduce the cost of fuel-oil materials and payment of labor even up to 60% [2, 4]. Meanwhile, the rejection of plowing significantly increases the amount of tall weed on the fields that may result

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in yield reduction and increased costs for using herbicides. Furthermore, minimization of tillage raises questions about the quality of fertilization used for spring wheat depending on the choice of aggregate [1]. This is a prerequisite for economic relevance of studies of the effectiveness of fertilizers for spring wheat by different methods of cultivation.

Purpose of research is to establish the economic efficiency of using fertilizers in spring wheat under different tillage methods in left-bank forest-steppe of Ukraine.

Research materials and techniques. Research was carried out within a long-term study at the Dushechkin O.I. chair of agro-chemistry and quality of plant products of NULES of Ukraine in the fields of LLC "Biotech Ltd" of Boryspil region of Kyiv area in conditions of left-bank forest-steppe of Ukraine in 2012–2014.

Soil of the research area is greyzem haplic soil rough-dust light loam soil. Arable soil was characterized by a low supply of easy hydrolysable nitrogen, medium movable compounds of phosphorus and exchange potassium.

Field research with spring wheat was laid in four times repetition of randomized application options. The size of the cultivated area was 416 m^2, of which accounted – 400 m^2. Experiments included following fertilizers: ammonium nitrate (N – 34,5 %), ammophos (N:P – 12:42%), potassium chloride (K_2O – 60%) and carbomide-ammonium mixture (32%).

Zymoyarka Spring wheat was a cultigen. Accounting of yield was performed by sample area technique. Economic efficiency was calculated at 2012-2014 prices.

Research results. Our studies showed that the introduction of minimum tillage of greyzem haplic soil, the yield of spring wheat grew by 0,23 t/ha for incorporation of ammonium nitrate into the substance $N_{100}P_{80}K_{80}$ and by 0,45 t/ha for making urea-ammonia mixture compared with the corresponding ploughing tillage for fertilizing soil (Table 1). This also stipulated the growth of yield cost by 421,42 UAH/ha and 824,85 UAH/ha respectively. While using direct seeding of spring wheat, yield of the grain increased by 0,10 t/ha for the use of Naa and decreased by 0,26 t/ha while using carbomide-ammonium mixture compared with the corresponding variants with minimum tillage, which led to the higher yield cost by 183,30 UAH/ha and a decrease by 494,91UAH/ha respectively. Slotting of greyzem haplic soil created an

environment of growth and development of spring wheat plants, which led to maximum yield, 4650 t/ha while using ammonium nitrate and 4,48 t/ha for incorporation of carbomide-ammonium mixture. Yield cost comprised 8,248.50 UAH/ha and 8211,84 UAH/ha respectively.

Minimum tillage provided lower expenses for soil cultivation, which resulted in lower production costs by 710,18 UAH/ha for using ammonium nitrate, and by 482,64 UAH/ha for making urea-ammonium mixture. The introduction of direct sowing significantly reduced the cost of tillage, fuel and oil materials, but increased expenditure on herbicides and depreciation of precision seed drill that stipulated the reduction of production costs by only 242,00 UAH/ha with the use of Naa, and by 239,17 UAH/ha for the introduction of carbomide-ammonium mixture compared with corresponding options in minimum tillage of greyzem haplic soil. Soil slotting stipulated expenses in soil tillage, fuel and oil materials compared to minimum tillage and direct sowing, which contributed to the increase in production costs by 5714.46 UAH/ha by incorporation of ammonium nitrate, and by 5194,00 UAH/ha with the use of carbomide-ammonium mixture, which is 325,35 UAH/ha less while applying Naa, and by 429,84 UAH/ha lower for the use of carbomide-ammonium mixture compared with corresponding options of ploughing tillage.

Production costs for all methods of greyzem haplic soil tillage were higher when using ammonium nitrate, which is associated with lower cost of 1 kg of active ingredient of nitrogen in carbomide-ammonium mixture.

Yield value and production costs for spring wheat have stipulated the minimum income for ploughing tillage of greyzem haplic soil. It comprised 577,32-1616,51 UAH/ha. With minimum tillage, the profit increased by 1,8-3,0 times compared to

1. Economic efficiency of using different methods of soil tillage and fertilizers for Zymoyarka cultigen spring wheat, mean value for 2012–2014.

Experiment option	Crop capacity, t/ha	Crop value, UAH/ha	Production costs, UAH/ha	Profit, UAH/ha	Level of profitability, %	Cost recovery, UAH/UAH
plough tillage of soil (25-27 cm)						
$N_{100}P_{80}K_{80}$ (Naa)	3,61	6617,13	6039,81	577,32	9,56	0,10
$N_{100}P_{80}K_{80}$ (N UAN)	3,95	7240,35	5623,84	1616,51	28,7	0,29
minimal tillage of soil (12-14 cm)						
$N_{100}P_{80}K_{80}$ (Naa)	3,84	7038,72	5329,63	1709,09	32,1	0,32
$N_{100}P_{80}K_{80}$ (N UAN)	4,40	8065,20	5141,20	2924,00	56,9	0,57
without tillage of soil (direct sowing)						
$N_{100}P_{80}K_{80}$ (Naa)	3,94	7222,02	5087,63	2134,39	42,0	0,42
$N_{100}P_{80}K_{80}$ (N UAN)	4,14	7570,29	4902,03	2668,26	54,4	0,54
slotting (38-40 cm)						
$N_{100}P_{80}K_{80}$ (Naa)	4,50	8248,50	5714,46	2534,04	44,3	0,44
$N_{100}P_{80}K_{80}$ (N UAN)	4,48	8211,84	5194,00	3017,84	58,1	0,58

plowing (1709,09–2924,00 UAH/ha). Direct sowing of crop stipulated the profit growth by 1,7–3,7 times compared to plowing. The maximum level of profit was obtained by slotting of soil. It increased by 1,2 times compared to direct sowing of spring wheat, by 1,9–4,4 times - compared to plowing, and 1,5 times - compared to minimum tillage. When using carbomide-ammonium mixture, profit increased by all methods of cultivation as compared with the use of ammonium nitrate and comprised 1616,51-3017,84 UAH/ha.

Plough tillage stipulated the minimum level of profitability and comprised 9,56–28,7%. Return expenses amounted to 0,10–0,29 UAH for 1 UAH of expenses. For minimum tillage, this figure increased to 32,1–56,9 %. Direct sowing of crop stipulated profitability at 42,0–54,4% and return expenses – 0,42–0,54 UAH for 1 UAH of expenses. Maximum level of performance achieved by slotting of soil and comprised 44,3-58,1 % and 0,44–0,58 UAH for 1 UAH of expenses respectively. When using carbomide-ammonium mixture, profitability was higher compared to incorporation of ammonium nitrate and comprised 28,7–58,1 %.

Conclusion

Introduction of resource-saving methods of cultivation greyzem haplic soil created conditions that determined the increase in profitability of spring wheat. In addition, the introduction of carbomide-ammonium mixture also stipulated the rise of this index if compared to the use of ammonium nitrate. Namely, incorporating carbomide-ammonium mixture into the substance $N_{100}P_{80}K_{80}$ for spring wheat by slotting (38-40 cm) of greyzem haplic soil stipulated maximum profit of 3017,84 UAH/ha and profitability by 58.1%.

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ЕКОНОМІЧНА ЕФЕКТИВНІСТЬ ЗАСТОСУВАННЯ ДОБРИВ ПІД ПШЕНИЦЮ ЯРУ ЗА РІЗНИХ СПОСОБІВ ОБРОБІТКУ ТЕМНО-СІРОГО ОПІДЗОЛЕНОГО ҐРУНТУ

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Анотація. *Вивчено вплив застосування добрив за різних способів обробітку ґрунту на економічну ефективність вирощування пшениці ярої. Вносили аміачну селітру та КАС за полицевого та мінімального обробітку, прямого посіву, щілювання. Мінімальні виробничі витрати було отримано за прямої сівби пшениці ярої за внесення КАС (4902,03 грн./га). Максимальний прибуток (3017,84 грн./га) та рівень рентабельності (58,1 %) було отримано за внесення КАС за щілювання темно-сірого опідзоленого ґрунту*

Ключові слова: *пшениця яра, обробіток ґрунту, добрива, економічна ефективність*

ЭКОНОМИЧЕСКАЯ ЭФФЕКТИВНОСТЬ ПРИМЕНЕНИЯ УДОБРЕНИЙ ПОД ПШЕНИЦУ ЯРУЮ ПРИ РАЗНЫХ СПОСОБАХ ОБРАБОТКИ ТЕМНО-СЕРОЙ ЛЕСНОЙ ПОЧВЫ

А. В. Быкин, Н. П. Бордюжа, Ю. А. Борисенко, О. О. Бадяка

Аннотация. *Изучено влияние применения удобрений при различных способах обработки почвы на экономическую эффективность выращивания пшеницы ярой. Вносили аммиачную селитру и КАС при вспашке, минимальной обработке почвы, прямом посеве, щелевании. Минимальные производственные затраты были получены при прямом посеве пшеницы ярой при внесении КАС (4902,03 грн./га). Максимальная прибыль (3017,84 грн./га) и уровень рентабельности (58,1 %) были получены при внесении КАС при щелевании темно-серой оподзолённой почвы*

Ключевые слова: *пшеница ярая, обработка почвы, удобре[illegible], экономическая эффективность*

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