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EFFICIENCY OF FERTILIZING IN THE TECHNOLOGY OF GROWING BREWER'S BARLEY IN THE CONDITIONS OF WESTERN FOREST-STEPPE

KYRYIENKO H.S., junior research scientist
Institute of Agriculture of Western Polissia

The article reveals the economic efficiency of using different kinds and doses of fertilizers in brewer's barley growing.

In the conditions of the development of market relations the economic evaluation of various agricultural measures becomes very important. It essentially concerns the technologies of growing plants including brewer's barley. Herewith the cost of 1 centner of grain increases while the payback of resources use decreases, especially nowadays when intensive technologies are elaborating and introducing which have not always provided the increase in yields at the expense of supplementary use of resources. [1].

Nowadays there is a necessity in finding ways to develop such technologies which could provide economically efficient and maximum usage of photosynthetic energy of the sun in agrocoenosis without increasing production cost and expenses in general.

Constant increases in prices of mineral fertilizers as well as the transformation of areas under crops followed by their filling with "market" crops require a more radical approach to the technologies of growing and especially to fertilization of crops. Such approaches include the determination of good preceding crops among "market" crops, the use of side products of a preceding crop, the use of the potential of biologic preparations with associative effect and rates of mineral fertilizers in the corresponding correlation aimed at getting the complete potential of crop producing capacity of plants with corresponding conditioned quality indices.

Because of its weak root system barley needs to be completely provided with the nutritional elements in ready soluble forms from the first days of vegetation [2].

To gather a big yield of grain with good brewing value nitrogen fertilizers must be applied in adequate ratio together with phosphorous and potash fertilizers for barley not to lodge, that is 10-15 % less than applied in the field with barley grown for fodder [3].

The use of straw of a preceding crop nonconventional for barley used as a fertilizer leads to the deterioration of the nitrogen status of the soil, especially without balancing doses of nitrogen being applied (7-10 kg per 1 t of straw) together with a wide ratio of C:N. This, in its turn, may result in both the reduction of crop yielding capacity and the quality of crop [4,5].

Thus, in terms of the technology of growing brewer's barley after a nonconventional preceding crop (winter rape) the straw of which remains in the field

as a fertilizer, there arises the necessity of determining the efficiency of doses of mineral fertilizers, especially those nitrogen ones, side products of a preceding crop and application of nitrogen-fixing preparations.

Methods of research. Research was carried out at Rivne agricultural experimental station of Ukrainian Academy of Agricultural Sciences in 2001-2003.

The main method of research - temporary field trials, the following factors were studied:

trial 1

Factor A. Treatment of grain with biological preparations:
1) without treatment;
2) with treatment;

Factor B. Side products:
1) without straw;
2) with straw;

Factor C.Variants of fertilization:
1) without fertilizers - control;
2) $N_{30}P_{40}K_{60}$.

trial 2

Factor A. Treatment of grain with biological preparations:
1) without treatment;
2) with treatment;

Factor B.Variants of fertilization:
1) without fertilizers - control;
2) $N_{15}P_{20}K_{30}$;
3) $N_{15}P_{40}K_{60}$;
4) $N_{30}P_{40}K_{60}$;
5) $N_{30}P_{40}K_{60} + N_{30}$ – VI stage of organogenesis.

Trial 2 was carried out at the general background of fertilization – side products of a preceding crop.

A preceding crop is winter rape of Dangal variety. Soil of the trial field is typical light-humus dusty heavy loamy chernozem with the following agrochemical characteristics: content of humus 1,95-1,96% (according to Tyurin), nitrogen 11,66-11,76 mg, moving forms P_2O_5 i K_2O accordingly 26,85-39,58 and 13,18-14,5 mg per 100 g of soil (according to Kirsanov), pH of salt extract 6,0-6,2, hydrolytic acidity 0,51-2,06 mg equiv. per 100 g of soil (according to Kappen).

Total surface of the plot is $60m^2$. Record surface of the plot is $25m^2$. Repeatability – four times. The location of plots is systematic.

In the course of research the methods of field trial according to B.A. Dospekhov (1985) and other methods and state standards were used.

During the trial there were analyzed the following aspects: crop yielding capacity of two varieties of brewer's barley: Gonar and Cesar. Barley was sown in the optimal terms (I-II decades of April). Azotobacterin (a dose of 100 g) in the form of gel was used for treatment with nitrogen-fixing microbiological preparation per a hectare norm of seeds.

Results of research.

Calculations of economic evaluation showed that indices of its efficiency determined not just the amount of yield, but its classification according to quality indices (Table 1) because selling price of high-class grain of brewer's barley is higher.

Seeds treatment with a nitrogen-fixing biological preparation increased expenses for both varieties by 71 UAH/ha at the expense of buying and treating seeds with a preparation.

The removal of straw from the field and the application of mineral fertilizers also lead to the increase in expenses on 1 ha for both varieties, by 52-54 UAH/ha and 865-867 UAH/ha correspondingly. 33 % increase in expenses while applying mineral fertilizers is connected with high prices for their purchase, although application of mineral fertilizers provided higher net-operating profit for Gonar variety by 94-662 UAH/ha more if compared with a control variant – without fertilizers, where its level was within 2661-3122 UAH/ha, at the same time it reduced its profitability by 30-62 %. In case of Gonar variety the application of mineral fertilizers increased the content of protein which resulted in getting less profit from selling because of a lower price of low-quality products. At the same time, net-operating profit in case of the control variant (without fertilizers) was 73-600 UAH/ha higher and was characterized by profitability 22-92 % higher. Cesar variety and pay-back index were characterized by the same tendency.

1. Economic efficiency of brewer's barley fertilization after winter rape

Fertilization			Economic efficiency factors							
			Gonar				Cesar			
Seed treatment with a biological preparation (Factor A)	Side products of a preceding crop (Factor B)	Variants of fertilization (factor C)	expenses per 1 ha	cost of yield, UAH	net-operating profit, UAH	profitability, %	expenses per 1 ha	cost of yield, UAH	net-operating profit, UAH	profitability, %
Without treatment	without straw	*without fertilizers	1701	4699	2998	176	1702	5008	3306	194
		$N_{30}P_{40}K_{60}$	2566	5658	3092	121	2567	5475	2908	113
	with straw	* without fertilizers	1647	4308	2661	162	1648	4548	2900	176
		$N_{30}P_{40}K_{60}$	2514	5837	3323	132	2514	5341	2827	112
With treatment	without straw	* without fertilizers	1772	4894	3122	176	1772	4593	2821	159
		$N_{30}P_{40}K_{60}$	2637	5655	3018	114	2637	6244	3607	137
	with straw	* without fertilizers	1718	4533	2815	164	1719	5268	3549	206
		$N_{30}P_{40}K_{60}$	2585	5837	3252	125	2586	5535	2949	114

* control

Increase in doses of mineral fertilizers was the cause of increase in expenses by 1 ha for both varieties of rape by 386-1730 UAH/ha (Table 2). At the same time, increase in doses of mineral fertilizers lead to decrease in brewing value of barley

grain, which resulted in reduction of economic efficiency factors (net-operating profit, profitability, pay-back). It characterized both varieties. Maximum decrease in economic efficiency factors for both varieties was recorded while applying $N_{60}P_{80}K_{120}$, where N_{30} was applied at the IV stage of organogenesis because grain belonged to III class by its quality factors and was not suitable for brewing purposes. As for Gonar variety maximum net-operating profit was provided by application of the dose $N_{30}P_{40}K_{60}$, which was within 3323 – 3578 UAH/ha.

2. Economic efficiency of seeds treatment with a biological preparation and mineral fertilizers in the technology of brewer's barley growing

Fertilization		Economic efficiency factors							
Treatment with a biological preparation (Factor A)	Gonar	Gonar				Cesar			
		expenses per 1 ha	cost of yield, UAH	net-operating profit, UAH	profitability, %	expenses per 1 ha	cost of yield, UAH	net-operating profit, UAH	profitability, %
Without treatment	without fertilizers - control	1647	4309	2662	162	1648	4943	3295	200
	$N_{15}P_{20}K_{30}$	2033	5073	3040	150	2035	5431	3398	167
	$N_{15}P_{40}K_{60}$	2320	5593	3273	141	2321	5837	3516	151
	$N_{30}P_{40}K_{60}$	2514	5837	3323	132	2514	5341	2827	112
	$N_{30}P_{80}K_{120} + N_{30}$ (IV)	3377	4349	972	29	3378	4465	1087	32
With treatment	without fertilizers - control	1718	4927	3209	187	1719	5268	3549	206
	$N_{15}P_{20}K_{30}$	2104	5431	3327	158	2104	5561	3457	164
	$N_{15}P_{40}K_{60}$	2391	5251	2860	120	2392	5565	3173	133
	$N_{30}P_{40}K_{60}$	2585	6163	3578	138	2586	5535	2949	114
	$N_{30}P_{80}K_{120} + N_{30}$ (IV)	3448	5760	2312	67	3448	4746	1298	38

For Cesar variety the maximum rate was a control one – without fertilizers, it constituted 3295 – 3549 UAH/ha. It shows that the improvement of nutritional soil status due to mineral fertilizers application resulted in deterioration of brewing value of grain and consequently decrease in its economic efficiency factors.

Conclusions. In brewer's barley growing the key factor of its efficiency is the peculiarity of varieties and their reaction to corresponding technological measures. In case of Gonar variety the highest net-operating profit – 3578 UAH/ha, was provided by seeds treatment with a nitrogen-fixing biological preparation and application of $N_{30}P_{40}K_{60}$. In case of Cesar variety, crop yielding capacity of grain was higher if compared to Gonar variety, however, its reaction to fertilization factors was deterioration of brewing value of barley which resulted in reduction of economic efficiency factors.