
CROP PRODUCTION

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EFFECTIVENESS OF FUNGICIDES ON BARLEY CROPS

Research article

Abstract

The effect of fungicides used in seed dressing and spraying of barley crops on the reduction of disease development and spreading was studied. Application of fungicide Oplot and Vial Trust contributed to the reduction of barley root rot. Biological effectiveness of Oplot was 78.5 % and of Vial Trust was 81.2 %. Fungicides help to increase plant height and leaf surface index, reducing the development of diseases. Spraying of crops with Kolosal Pro proved to be more effective against leaf diseases of barley. The applied preparations helped to increase the barley yield and to obtain healthier seeds. Spraying of fungicides reduced the infection of seeds with pathogenic fungi by 5 times.

Keywords: barley, fungicides, root rot, septoriosi, helminthiasis spot disease, seed dressing, crop spraying.

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ЭФФЕКТИВНОСТЬ ФУНГИЦИДОВ НА ПОСЕВАХ ЯЧМЕНЯ

Научная статья

Аннотация

Изучено влияние фунгицидов, применяемых при протравливании семян и опрыскивании посевов ячменя, на снижение поражения развития и распространения болезней. Применение фунгицида Оплот и Виял Траст, способствовали снижению поражения ячменя корневой гнилью. Биологическая эффективность препарата Оплот составила 78,5 %, Виял Траста – 81,2 %. Фунгициды, снижая развитие болезней, способствуют увеличению высоты растений и индекса листовой поверхности. Против листостеблевых болезней ячменя опрыскивание посевов препаратами Колосаль Про оказалось более эффективным. Применяемые препараты способствовали повышению урожайности ячменя и получению более здоровых семян. Опрыскивание фунгицидами снизило заражение семян патогенными грибами в 5 раз.

Ключевые слова: ячмень, фунгициды, корневые гнили, септориоз, гелиминтоспориозная пятнистость, протравливание семян, опрыскивание посевов.

1. Introduction

Barley is grown on almost all farms. Barley is considered the main crop in peasant (farmers) households. It is mainly used for fodder purposes. The share of barley in field crop rotation is 40-50% in the majority of farms. Barley yields remain low in the Republic. Infection of the crop by various diseases [1, P.4] is one of the reasons for low barley yield. Barley diseases are widespread and harmful at the present time, yield losses can reach 20-30%. The pathogens are highly adaptive, as their spreading is more aerogenic than through the seeds. Control of these diseases requires the mandatory use of protective measures during the growing season [2, P.3].

To control barley diseases it is not enough just to treat seeds nowadays, it is necessary to choose multi-component preparations affecting several pathogens at the same time.

Barley pathogens affect the roots, leaves, stems, or spikelets. The plant is covered with spots or plaque at the initial stage of infection, depending on the type of disease. Later, the affected areas enlarge and the plant loses its ability to develop normally. Seedlings are thinned when young sprouts are infected, as the sprouts begin to rot and die before they have had time to get stronger. This is how root rot pathogens are affected. Ears formation and grain ripening are slowed when adult plants are affected, resulting in yield losses. Root rots and leaf diseases of barley appear annually in the conditions of our Republic. High

barley yield is difficult to obtain without protective measures. There is a lot of information about the necessity of pesticides application for barley yield preservation in the literature [3, P.298], [4, P.6-7], [5, P.105].

The assortment of plant protection agents that are approved for use in the Russian Federation has been significantly updated in recent decades [6].

Application of chemical preparations together with biological preparations and plant growth stimulators has become a significant focus in recent years, as evidenced by the expansion of their range, appearance of new preparations in the market. Application of biological preparations promotes an increase of barley resistance to diseases and an increase of crop yield.

The purpose of the research is to determine the effectiveness of fungicides against barley diseases.

2. Methods

Experiment scheme: Factor A is seed dressing:

1. Control (without dressing);
2. Oplot (0.5 l/t);
3. Vial Trust (0.4 l/t);

Factor B is spraying of crops:

1. Control (without spraying);
2. Kolosal Pro (0,3 l/ha);
3. Triafof (0,5 kg/ha).

The experiment was carried out on the production crops in 2018-2019. The area of the plot is 1 hectare, repetition is three times. The counting area is 1 hectare. The total area of the field is 150 ha. Plot placement is systematic. Barley cultivation agronomic technique was common for the region. After harvesting of the forecrop, stubble tilling, plowing, harrowing in spring, cultivation and rolling were carried out. Accounting of barley disease development and prevalence was carried out by the conventional method.

3. Results and discussion

Barley plant height and leaf surface index (LSI) were determined in the phase of tubulation and grain filling (Table 1).

Table 1 – Barley growth and development (average for 2018-2019)

Experience options		Tubing		Grain filling	
		height, cm	LSI, m ²	height, cm	LSI, m ²
Control	Control	26,5	2,85	44,7	2,44
	Kolosal Pro	28,4	3,00	46,2	2,65
	Triafof	28,0	2,85	45,7	2,55
Oplot	Control	32,3	3,25	48,4	2,84
	Kolosal Pro	35,7	3,46	56,0	2,96
	Triafof	35,0	3,42	55,2	2,92
Vial Trust	Control	37,5	3,50	58,3	3,05
	Kolosal Pro	39,0	3,68	62,9	3,30
	Triafof	38,8	3,60	61,3	3,20

Note: LSI - leaf surface index, m²

The results showed that the height of barley plants and leaf surface index changes depending on the application of fungicides. Seed dressing contributed to an increase in plant height by 5.8 cm (in the variant with Oplot) and by 11.0 cm (in the variant with Vial Trust). From fungicide Vial Trust excess was greater than from fungicide Oplot by 5.2 cm. Spraying of crops contributed to an increase in plant height. The greatest height of barley plants was in the variant with the spraying of crops with fungicide Kolosal Pro. The greatest effect was obtained from the preparation Vial Trust among the protectants. Leaf surface index increased by 0.4 and 0.65 m² from the application of etchants. Leaf surface index increased from crop spraying. The highest index of leaf surface was in the variant with dressing with Vial Trust and spraying of crops with Kolosal Pro.

The results of the study showed that the effect of fungicides for seed treatment had a positive effect in reducing the infestation of barley root rot (Table 2).

Table 2 – Effect of seed dressing on barley root rot, %

Options	tillering		milk ripeness		Biological efficiency, %
	R	P	R	P	
Control	18,6	32,0	39,5	59,5	-
Oplot	4,0	11,5	20,0	32,0	78,5
Vial Trust	3,5	11,0	18,5	33,5	81,2

Note: R – root rot development, P – prevalence

Vial Trust was more effective against root rot. The biological effectiveness of Oplot was 78.5 %, and of Vial Trust it was 81.2 %. The prevalence of root rot from the preparations decreased by 2.8-2.9 times compared to the control.

We considered septoriosis, dark brown spot on barley crops in the years of the study. Their development was reduced by spraying the plants during the growing season (Fig. 1 and 2).

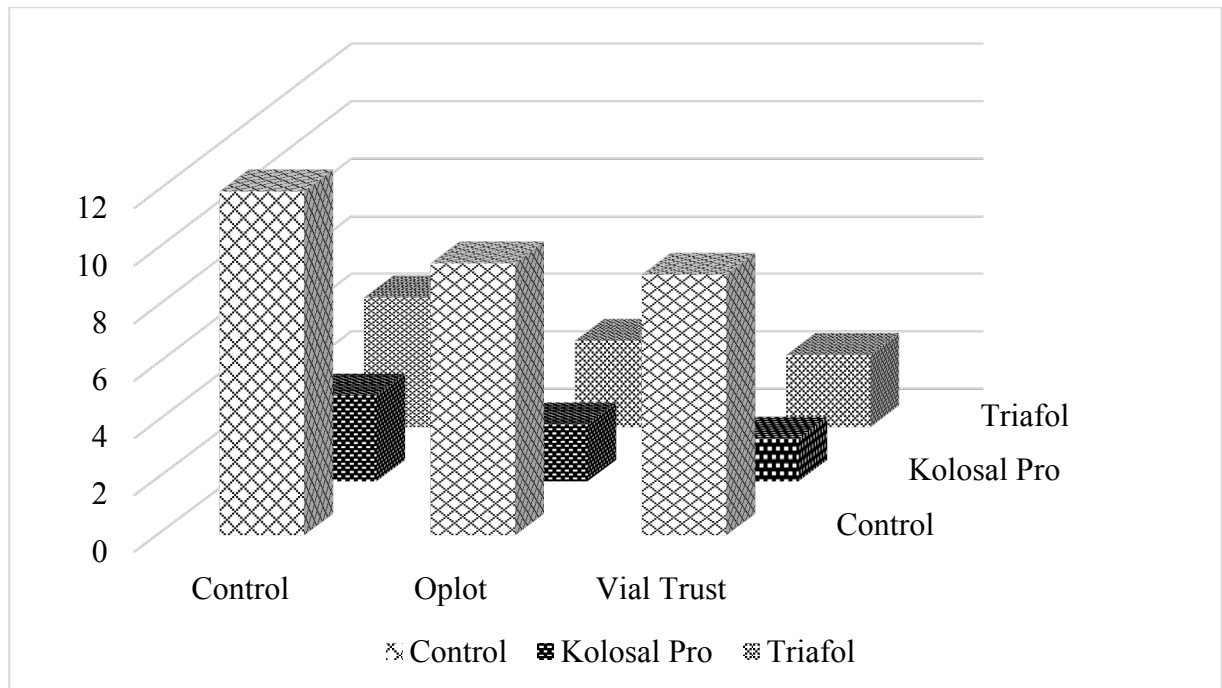


Figure 1 – Development of barley septoriosis, %

Septoriosis development decreased by 2.5 % in the variant with seed dressing Oplot, and with Vial Trust it decreased by 2.9%. Spraying of crops with fungicide Kolosal Pro contributed to the greatest reduction in disease development, the reduction was by 9.0; 7.5 and 7.6 % by variants.

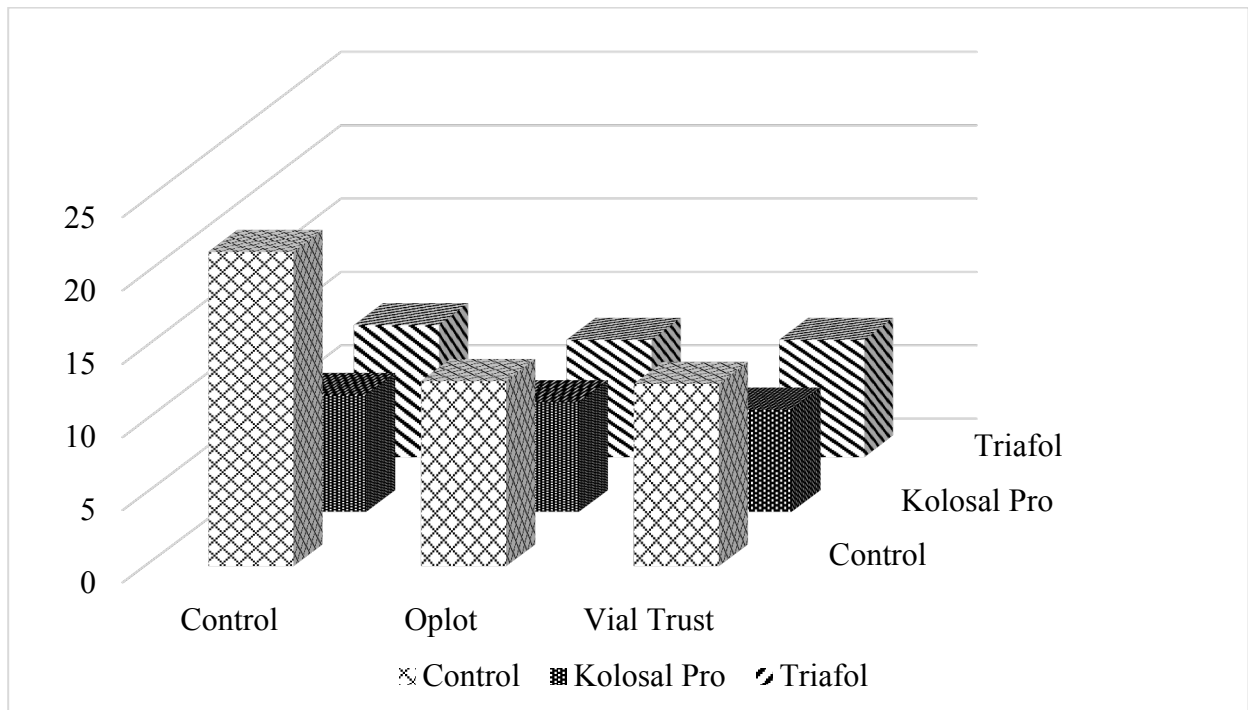


Figure 2 – Barley dark brown spot development

Treatment of seeds with preparations contributed to the decrease of barley dark brown spot development by 1.7 times. Disease development was reduced by 2.4-2.7 times by spraying barley crops. Kolosal Pro proved to be the most effective fungicide.

The least development of leaf diseases was in the variant with the spraying of crops with fungicide Kolosal Pro against the background of seed dressing with Vial Trust.

We carried out phytosanitary analysis of barley seeds in different variants after barley harvesting (Table 3).

Table 3 – Effect of fungicides on seed pathogen infestation, %

Experience options		B.sorokiniana	Altenaria sp.	Fusarium sp.	Total
Seed dressing	crop spraying				
Control	Control	38,5	11,0	3,5	53,0
	Kolosal Pro	15,0	2,5	0,5	18,0
	Triafol	16,0	2,0	1,0	19,0
Oplot	Control	28,5	10,5	2,0	41,0
	Kolosal Pro	8,5	2,0	1,0	11,5
	Triafol	7,5	3,0	2,0	12,5
Vial Trust	Control	22,5	12,0	2,5	37,0
	Kolosal Pro	7,0	2,0	1,5	10,5
	Triafol	6,0	3,5	0,5	10,0

Phyto-examination showed that barley seeds were affected by fungi of *Bipolaris sorokiniana*, fungi of *Altenaria* sp. and *Fusarium* sp. The use of fungicides for seed dressing contributed to healthier barley seeds. Seed dressing and spraying of crops contributed to the reduction of infection of seeds with helminthosporiosis, alternariosis and fusariosis.

We obtained the highest barley yield in the variant with seed dressing with Vial Trust and spraying of crops with fungicide Kolosal Pro (2.41 t/ha on average for 2 years). Yield increase was 0.28 and 0.64 t/ha from seed dressing with Oplotom, and it was 0.54 and 0.79 t/ha from Vial Trust.

4. Conclusion

The highest plant height and leaf surface index in the period of barley grain ripening were in the variant with the treatment of seeds with fungicide Vial Trust and spraying of crops with fungicide Kolosal Pro (32.9 cm и 3.30 m²). Both Oplot and Vial Trust showed approximately equal effectiveness against barley root rot (78-81%). Spraying of crops with Kolosal Pro was the most effective against leaf diseases. Disease development was reduced by 2.7 times. The seeds grown in the variant with seed dressing and crop spraying were less infected by pathogens. The number of seeds infected with pathogens was less than 5 times. The applied preparations helped to increase the yield of barley by 0.64-0.79 t / ha.

Conflict of Interest

None declared.

Конфликт интересов

Не указан.

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