CROP PRODUCTION

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PRODUCTIVITY OF WINTER WHEAT AT PRESOWING PROCESSING OF SEEDS BY THE GROWTH REGULATOR

Research article

Abstract

The most important task at all stages of development of modern agriculture is to increase the yield and quality of grain. Plant growth regulators can play an important role in this. In this paper, the influence of winter wheat seed treatment with fungicide Polaris and the use of Melafen growth regulator in winter wheat crops in the Ufa region of the Republic of Bashkortostan are considered. Treatment of seeds with fungicide Polaris in combination with preparations for the care of crops provided a yield of 58.9-68.7 centner/ha. The use of Melafen growth regulators in the experiment in the Ufa region of the Republic of Bashkortostan affected the increase in crop yield to 63.6-74.1 centner/ha, depending on the processing scheme used.

Keywords: winter wheat, protectant, growth regulator, plant height, yield.

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ПРОДУКТИВНОСТЬ ОЗИМОЙ ПШЕНИЦЫ ПРИ ПРЕДПОСЕВНОЙ ОБРАБОТКЕ СЕМЯН РЕГУЛЯТОРОМ РОСТА

Научная статья

Аннотация

Важнейшей задачей на всех этапах развития современного сельского хозяйства является увеличение урожайности и качества зерна. Большую роль в этом могут сыграть регуляторы роста растений. В данной работе рассмотрено влияние протравливания семян озимой пшеницы фунгицидом Поларис и применение регулятора роста Мелафен в посевах озимой пшеницы в условиях Уфимского района Республики Башкортостан.

Обработка семян фунгицидом Поларис в сочетании с препаратами по уходу за посевами обеспечивало получение урожайности на уровне 58,9-68,7 ц/га.

Применение в опыте регулятора роста Мелафен в условиях Уфимского района Республики Башкортостан отразилось на повышении урожайности культуры до 63,6-74,1 ц/га в зависимости от применяемой схемы обработки.

Ключевые слова: озимая пшеница, протравитель, регулятор роста, высота растений, урожайность

1. Introduction

Winter wheat (Triticum) – one of the most common crops of the globe. In our country it is the main food crop. In its grain a lot of protein, vitamins, enzymes and other valuable substances necessary for the normal development of the human body. The protein content reaches 16%, nitrogen-free extractives 63%, fat and fiber 2%. It is a valuable crop in the field rotation and a good precursor for a number of crops - potatoes, corn, sugar beets and others [8], [9]. The protein content of winter wheat is superior to all cereals. Cultivation of winter wheat by intensive technology increases productivity, stabilizes it and improves the quality of grain.

Winter wheat is a high-yielding crop (second only to rice). The average yield in Russia is 30 centner /ha, in advanced farms - 50-60 centner/ha, the highest yield in Russia was obtained in the Krasnodar region - 103.6 centner/ha, and in the world, in Canada - 170 centner/ha [6].

Increasing the production of grain of this crop is a priority for agriculture. Therefore, an important place in the technology of winter wheat cultivation is given to pre-sowing seed treatment [7].

In modern agricultural technologies are widely used preparations for pre-treatment of seeds and non-root treatments, which increase the stress resistance of plants, while reducing the pesticide load on the agrocenosis. This allows to realize the genetic potential of grain crops, to ensure consistently high quality yields and to increase the level of profitability of cultivation of grain crops, so the use of growth regulators mixed with protectants for pre-sowing seed treatment is considered to be a promising direction.

The application of growth regulators is one of the methods providing increase of efficiency of use genetic potential of plants and the high soil fertility and good seed treatment enhances germination, especially at early sowing or the return of cold weather, as one of the causes of death of seeds, the development of harmful microorganisms. In this regard, a significant interest is the growth regulator Melafen, and protectant Polaris.

2. Methods

The object of research was soft winter wheat varieties Volzhskaya K. seed pre-treatment was carried out fungicidal protectant Polaris and synthetic growth regulator Melafen.

In the phase of seedlings-tillering and heading, depending on the variant used: G - herbicide, I - insecticide, M - Melafen, F - fungicide. Treatment according to the scheme of experiment was conducted: a systemic herbicide Grenades with a norm of 25 g/ha, insecticide Imidor 60 ml/ha fungicide the Title of Duo – 250 ml/ha, a growth regulator Melaphen – 5 ml/ha. Observations, surveys and analyses were conducted in accordance with conventional methods.

Field experiments (2017-2018) to study the yield and quality of winter wheat were conducted in the experimental field of the department of crop production and agriculture of the Bashkir state university. The experiment is represented by 19 variants in 4 replications and has an area of 1216 m^2.

Table 1 – Scheme experience

№ п/п		Sowing	Phase germination-tillering	The phase of earing
1	(C) Control	C1	-	-
2	(M) Melaphen	M1	-	-
3		M2	G + I	-
4		M3	-	I + F
5		M4	G + I	I + F
6		M5	G + I +M	-
7		M6	G + I +M	I + F
8		M7	G + I +M	I + F +M
9		M8	G + I	I + F +M
10		M9	-	I + F +M
11	(P+M) Protectant + Melaphen	P+M1	-	-
12		P+M2	G + I	-
13		P+M3	-	I + F
14		P+M4	G + I	I + F
15		P+M5	G + I +M	-
16		P+M6	G + I +M	I + F
17		P+M7	G + I +M	I + F +M
18		P+M8	G + I	I + F +M
19		P+M9	-	I + F +M

** G - herbicide, I - insecticide, M - Melafen, F - fungicide, P - protectant.*

3. Results

Winter wheat is a common grain crop, quite demanding to external conditions. Under the influence of negative environmental factors, with a significant deviation of meteorological and climatic conditions of the weather from the recommended, there is a mass death of shoots of this crop over large areas.

In our experience, winter wheat was sown on August 25, 2018. Under optimal timing of sowing seedlings appeared 10-12 days. The period from germination to tillering took plants from 13 (sowing with presowing treatment Melafen, and protectant + Melafen) to 14 days (control version).

Analysis of the passage of the following phases - from tillering to termination of vegetation showed that plots with different pre-sowing treatment have a shorter period in contrast to the control - 35 days, which is less than 2 days, respectively) (table 2).

Table 2 – Phenological observation of winter wheat plant growth and development depending on processing conditions (2018-2019)

Interphase periods of plant development:	Duration of days depending on treatment		
	control	Melaphen	protectant + Melaphen
from sowing to germination	11	10	11
from germination to tillering	15	14	14
from tillering to the end of the growing season	37	35	35
from termination to resumption of vegetation	159	156	157
from resumption of vegetation to earing	71	67	68
from the earing to the flowering	8	7	8
from flowering to full ripeness	40	39	38
vegetation period duration (in days)	341	328	331

From cessation to resumption of vegetation plants also took a different amount of time. Indicators ranged from 156 to 159 days. The minimum time it took for sowing with pre-treatment Melafen - 156 days.

The period from vegetation renewal to earing took from 67 to 71 days. In the control variant, the values reached 71 days. The phases from earing to flowering took 7-8 days. The development of plants from flowering to full ripeness ranged from 38 to 40 days.

Thus, the length of the growing season of winter wheat, depending on the processing took from 328 to 341 days. The shortest vegetation period of plants was observed in crops with presowing treatment with growth regulator Melafen, and amounted to 328 days.

The growth and development of winter wheat depend on agrotechnical and agrometeorological factors, as well as on the biological characteristics of the variety [5].

The height of the plants in the experiment ranged from 90,1 cm to 110,0 cm. The highest rates in option 7, with presowing treatment of Melafen (G+I+M in the phase of the germination-tillering, I+F in the phase of earing). In the control variant, winter wheat plants reached a height of 93 cm. the Values below the control were observed in variants 9 (M), 13 (P+M) and 17 (P+M) – 92 cm, 90.1 cm and 92 cm, respectively (figure 1).

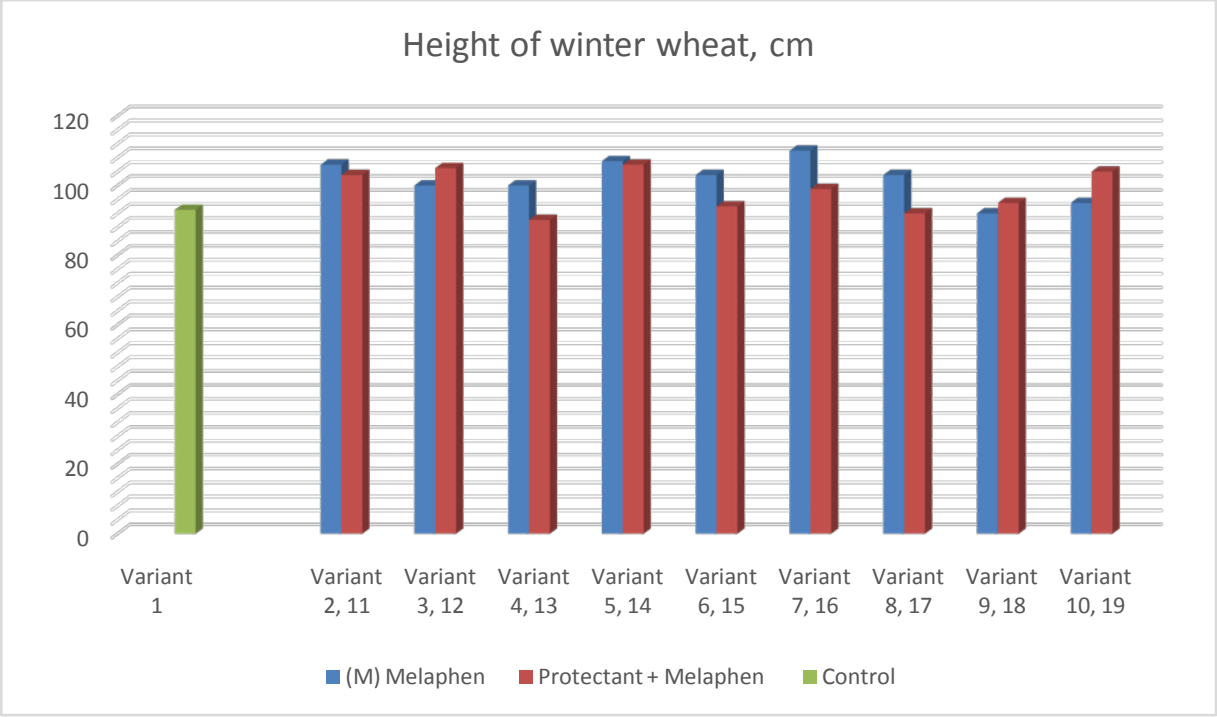

Figure 1 – Height of winter wheat plants in the phase of full ripeness of plants, cm, 2018-2019

Thus, plants with presowing treatment with Melafen growth regulator had the best values of 92-110 cm, while with treatment with a protectant mixed with a growth regulator - 90.1-106 cm.

The density of standing plants is one of the indicators of the degree of development of plants, as well as an important factor affecting the value of the winter wheat crop. It is subject to regulation and is one of the most important factors of productivity programming [2].

In our crops, the density of standing in the germination phase was at the level of 542-557 pieces/ m^2, before harvesting 288 pieces/ m^2 (control variant) - 820 pieces /m^2 (variant 2 with presowing treatment with a growth regulator). Plant safety from 52.4 to 149.1 cm (figure 2).

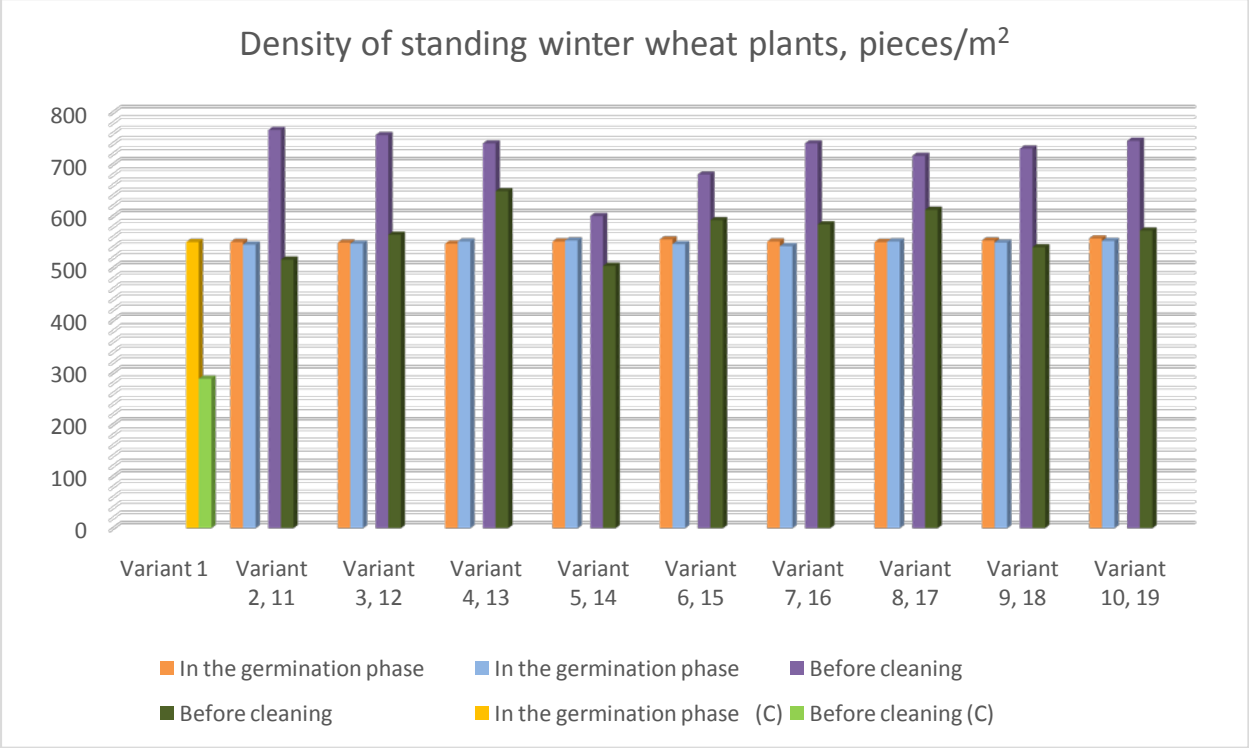

Figure 2 – Standing density and safety of winter wheat plants, pieces/m^2 (2018-2019)

Thus, the best indicator was observed in crops with pre-sowing treatment Melafen, where the density of standing plants before harvesting reached 600-766 pieces /m^2, and with the treatment of P+M – 516-648 pieces /m^2.

Grain yield is most determined by the density of productive stems. The density of the stem strongly reacts to changes in the level of external factors, and it reflects the conditions of formation of crops throughout the vegetation [1].

The yield of winter wheat in this crop was in the range of 45.4-74.1 centner/ha. the Greatest performance had a variant of experience 8, with presowing treatment by growth regulator, as well as G+I+M in the phase of seedlings-tillering, and I+F+M in the phase of earing, exceeding the control variant by 28.7 centner/ha. In variants 2-10, the yield of winter wheat fluctuated at the level of 63.6-74.1 centner/ha, while in 11-19, with presowing treatment P+M – 58.9-68.7 centner/ha (figure 3).

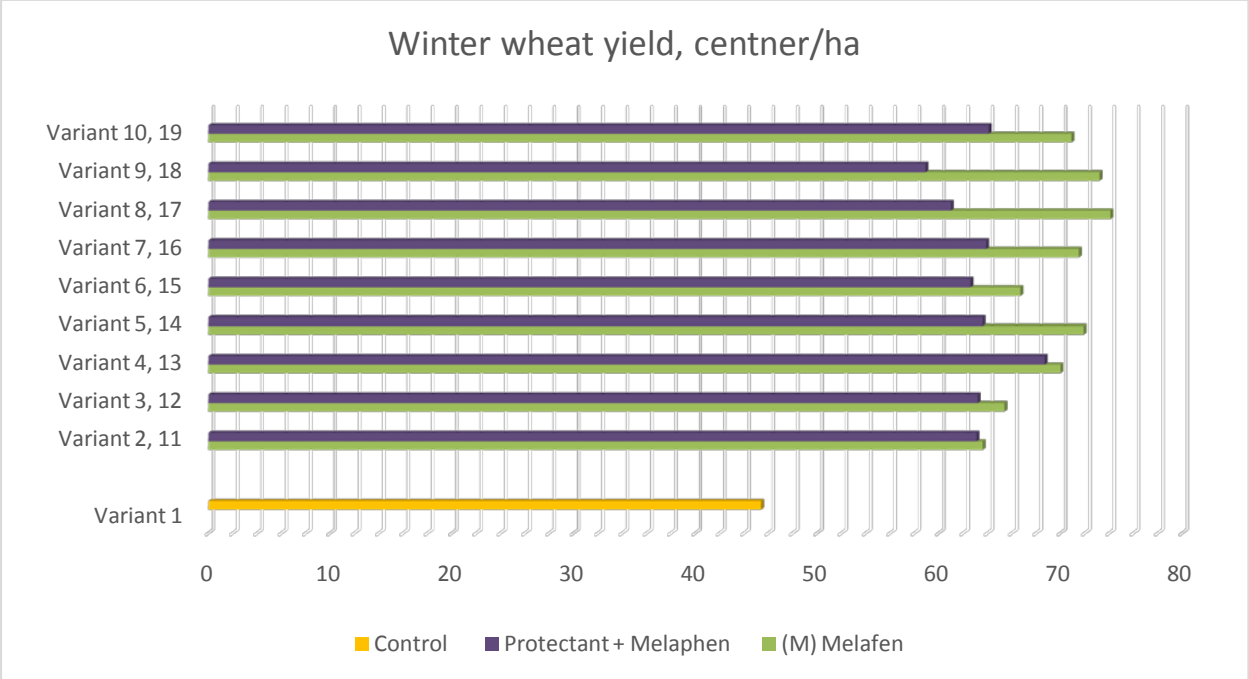

Figure 3 – Winter wheat yield, center/ha (2018-2019)

Thus, the analysis of the results of the study on such indicators as phenological observations, plant height, standing density and safety, yield, allows us to conclude that the variant with presowing treatment with growth regulator Melafen and treatment of G+I+M in the phase of germination-tillering and I+F+M in the phase of earing have the highest rates in the experiment. Presowing seed treatment with Polaris protectant mixed with Melafen growth regulator had lower efficiency in contrast to seed treatment with Melafen growth regulator only. Presowing treatment of winter wheat seeds only by the growth regulator led to an increase in the yield of winter wheat grain to the level of 63.6-74.1 centner /ha.

Conflict of Interest **Конфликт интересов**

None declared. Не указан.

References in the original language other than English

1. Кузнецов И.Ю. Регуляторы роста для озимой пшеницы / И.Ю. Кузнецов, А.В. Поварницына // XXII Международные научные чтения (памяти Б.Ф. Галеркина):сборник статей Международной научно-практической конференции (Москва, 1 марта 2018 г.) - Москва: Ефир, 2018. – С. 30-32.

2. Надежкин С.Н. Клевер луговой /С.Н. Надежкин, И.Ю. Кузнецов, Х.М. Баймиев // – Башкирский государственный аграрный университет. Уфа, 2006.

3. Пруцков Ф.М. Озимая пшеница/ Ф.М. Пруцков // – 2-е изд., перераб. и доп. – Москва : Колос, 1976. – 352 с.

4. Орлов А.Н. Урожайность и качество зерна яровой пшеницы в зависимости от элементов технологии возделывания [Текст] / А. Н. Орлов, О. А. Ткачук, Е. В. Павликова // Достижения науки и техники АПК. – 2009. - №7. - С. 28-30.

5. Исмагилов Р.Р. Озимая пшеница в Башкортостане : учеб. пособие /Р. Р. Исмагилов, Р. Р. Гайфуллин, Н. Р. Бахтизин // – Уфа : Башкирский ГАУ, 2006. - 168 с.

6. Власов А.Г. Совершенствование защитных мероприятий в посевах яровой пшеницы: монография / А.Г. Власов, Ю.А. Миренков // – Горки: Белорусская государственная сельскохозяйственная академия, 2010. – 136 с.

7. Гриценко В.В. Защита растений / В. В. Гриценко, Д. А. Орехов, С. Я. Попов // – М.: Мир, 2005. – 488 с.

8. Правдюк П.И. Изучение эффективности протравителей семян против болезней на озимой пшенице/П.И. Правдюк, Н.Н.Лысенко // Russian Agricultural Science Review. 2015. Т. 5. № 5-1. С. 216-222.

9. The Effect of Sudan Grass on the Mixed Sowing Chemical Composition of Annual Forage Crops. Igor Yu. Kuznetsov, Bulat G. Akhiyarov, Ilgiz G. Asylbaev, Firzinat A. Davletov, Vladislav S. Sergeev, Rishat R. Abdulvaleyev, Azat V. Valitov, Azat M. Mukhametshin, Dayan S. Ayupov and Ruzil G. Yagafarov, 2018. Journal of Engineering and Applied Sciences, 13: 6558-6564. DOI: 10.3923/jeasci.2018.6558.6564.

References in English

1. Kuznecov I.Ju. Reguljatory rosta dlja ozimoj pshenicy [Growth Regulators for Winter Wheat] / I.Ju. Kuznecov, A.V. Povarnicyna// XXII International Scientific Readings (in memory of B.F. Galerkin): collection of articles of the International Scientific and Practical Conference (Moscow, March 1, 2018) – M.: Efir, 2018. – P. 30-32. [in Russian]

2. Nadezhkin S.N. Klever lugovoj [Meadow clover] /S.N. Nadezhkin, I.Ju. Kuznecov, H.M. Bajmiev // – Bashkir State Agrarian University. Ufa, 2006. [in Russian]

3. Pruckov F.M. Ozimaja pshenica [Winter wheat] / F.M. Pruckov. – 2nd edition, addit. – M. : Kolos, 1976. – 352 p. [in Russian]

4. Orlov, A. N. Urozhajnost' i kachestvo zerna jarovoj pshenicy v zavisimosti ot jelementov tehnologii vozdelyvanija [Yield and grain quality of spring wheat depending on the elements of cultivation technology] / A.N. Orlov, O.A. Tkachuk, E.V. Pavlikova // Dostizhenija nauki i tehniki APK. – 2009. - №7. - P. 28-30. [in Russian]

5. Ismagilov R.R. Ozimaja pshenica v Bashkortostane : ucheb. posobie [Winter wheat in Bashkortostan: a manual] /R. R. Ismagilov, R. R. Gajfullin, N. R. Bahtizin // – Ufa: Bashkirskij GAU, 2006. - 168 p. [in Russian]

6. Vlasov A.G. Sovershenstvovanie zashhitnyh meroprijatij v posevah jarovoj pshenicy: monografija [Improving protective measures in spring wheat crops: a monograph] / A. G. Vlasov, Ju. A. Mirenkov // – Gorki: Belarusian State Agricultural Academy, 2010. – 136 p. [in Russian]

7. Gricenko V.V. Zashhita rastenij [Plant protection] / V.V. Gricenko, D.A. Orehov, S.Ja. Popov // – M.: Mir, 2005. – 488 p. [in Russian]

8. Pravdjuk P.I. Izuchenie jeffektivnosti protravitelej semjan protiv boleznej na ozimoj pshenice [Study of the effectiveness of seed protectants against diseases on winter wheat] /P.I. Pravdjuk, N.N.Lysenko // Russian Agricultural Science Review. 2015. V. 5. № 5-1. P. 216-222. [in Russian]

9. The Effect of Sudan Grass on the Mixed Sowing Chemical Composition of Annual Forage Crops. Igor Yu. Kuznetsov, Bulat G. Akhiyarov, Ilgiz G. Asylbaev, Firzinat A. Davletov, Vladislav S. Sergeev, Rishat R. Abdulvaleyev, Azat V. Valitov, Azat M. Mukhametshin, Dayan S. Ayupov and Ruzil G. Yagafarov, 2018. Journal of Engineering and Applied Sciences, 13: 6558-6564. DOI: 10.3923/jeasci.2018.6558.6564.