European spring wheat varieties in the conditions of the Tyumen region

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Abstract. The comparative evaluation of varieties of European selection on the signs of resistance to major diseases and elements of productivity was carried out in the research. Varieties of European selection were conditionally resistant to diseases of root system during the period of sprouting - full maturity, in phyto-examination of seeds the number of fungal infection increased to the standard level with each year of the study. Diseases spreading on the aboveground vegetative part of the plant had a significant impact and subsequently reduced the yield of the crop by 0.3-0.8 t/ha. The resistance of the compared varieties to Septoria nodorum and susceptibility to Puccinia graminis, Septoria tritici was determined. The highest yield of 3.6-4.1 t/ha was obtained in the varieties Goplana, Arabella, which is higher than the standard by 14-20% The varieties Goplana and Arabella with sufficiently high yield and grain quality are suitable for cultivation in these conditions, but for varieties need intensive technology, development of agronomic techniques, which determines the possibility of commercial and scientific use.

1 Introduction

Use The main factor influencing the successful use of a variety is yield and a certain resistance to pathogens [1]. Root rot has a significant distribution and changes its effect depending on the agrotechnique, weeds, the presence of pest entomofauna [2-3]. The main control of root rot is provided by a combination of the use of chemical treatments, resistance of the variety to epiphytotic manifestations [4-5]. Weather conditions, cultivation technology, agronomic practices, and crop rotations with the inclusion of green manure are regulators of the phytosanitary situation in the agrocenosis [6-8].

2 Materials and methods

Field studies on the comparative evaluation of spring wheat varieties were conducted in the Northern Trans-Urals, a branch of the Tyumen Scientific Center of the SB RAS in 2018-2020. The object of research were varieties Omskaya 36 (st) taken as a standard, and varieties of foreign selection from the same geographical area of cultivation Goplana, Mandarin, Arabella, all varieties belong to the medium and medium-ripening groups of ripeness. Energy and germination of seeds were determined in accordance with GOST

12038-84 - Seeds of crops. Methods for determination of germinating capacity. The presence of fungal diseases on plants during the growing season was considered according to the methods [9-10]. Field experiments were laid according to the method [11], with a plot area of 20 m2. Soil of the experimental plot was dark gray forest, heavy loam. Meteorological conditions of the growing season in the years of research by the sum of effective temperatures above 50C were close to the average annual rate (97-107%), precipitation availability for May-August (115-123% of the norm).

3 Results and Discussion

One of the main indicators of fungicide application for seed dressing is the presence of a certain amount of infection on seeds. Phyto-examination of seeds of local varieties showed the presence of fungi p. Alternaria - 10-58%, p. Fusarium - 2-7%, Bipolaris sorokiniana - 0-4% in European varieties only fungi p. Alternaria 0-7 % and seed moldiness in the first year of testing, and then with each year there was an increase in seed infection to the level of local varieties. Root disease caused by helminthosporidosis-fusarium infection developed unevenly during the season.

At the beginning of the growing season foreign varieties were less affected by root rot compared to the standard Omskaya 36 (by 1-3%), and during the growing season to the phase of full ripeness the variety Goplana had a greater lesion of root disease by 10-14%. Mandarin (3.41-16.04%) and Arabella (0.85-18.5%) varieties showed the least damage by root rot in 1.5-2.5 times (table 1).

Table 1. The spread of root disease, %.

Growth phase	Spring wheat variety				NSR_{05}
	Omskaya 36 (st)	Goplana	Mandarin a	Arabella	
Tillering phase	4.72	3.41	3.41	0.85	0.56
Maturity phase	21.86	31.77	16.04	18.5	3.2

Diseases (Blumeria graminis, Puccinia recondite, Puccinia graminis, Septoria tritici., Septoria nodorum) with high epiphytotic load on plants (Puccinia graminis) - 5-50%, (Septoria tritici.) - 10-30% in 2018 and (Septoria tritici.) - 40% and (Septoria nodorum) - 30% in 2019 were observed on spring wheat plants during the 3-year growing season. Varieties in susceptibility to (Puccinia graminis) variety Mandarina, Arabella, (Septoria tritici.) absolutely all varieties, (Septoria nodorum) variety Omskaya 36(st) and high resistance of studied varieties were determined (table 2).

Table 2. Leaf-borne diseases in spring wheat varieties, %.

Variety	Disease progression, %				
	Puccinia recondite	Puccinia graminis	Septoria tritici.	Septoria nodorum	On average over 3 years, %
	2018/2019				2018-2020
Omskaya 36	2.5/1	4.5/0	10/1	0/10	10.3

Goplana	0/0	0/0	20/4	0/0	8.3
Mandarina	5/3.5	25/0	20/5.5	0/0	20.3
Arabella	0/1	10/0	20/15	0/0	16.3
NSR_{05}	3/0	5/0	6/6	0/5	2.1

- values less than 5%

A certain resistance of varieties is associated with the growing season, less affected early-ripening and late-ripening varieties. Application of methods of chemical protection against leafroll diseases also confirms that the effectiveness of the technique is higher in susceptible varieties (table 3).

Table 3. Effectiveness of chemical protection against diseases

Fungicides	Biological efficiency, %		
	mid-early variety Omskaya 36 st	mid-late variety Goplana	mid-maturing varieties Mandarina, Arabella
1. propiconozole, 140 g/l + tebuconazole, 140 g/l + epoxiconazole, 72 g/l = 0.6 l/ha	72.0	81.25	88.0
2. spiroxamine, 250 g/l + tebuconazole, 167 g/l + triadimenol, 43 g/l = 0.6 l/ha	79.42	83.6	87.5
3. propiconozole, 200 g/l + tebuconazole, 200 g/l = 0.3 l/ha	79.42	73.44	90.6
average by grade	76.94	79.43	88.7

On varieties during the growing season were applied 3 fungicides with different composition of active substances, where the effectiveness of protection agents varied depending on the ripeness of the variety, the most stable effect in all varieties were observed for the preparation number 2 (79-87%), and the highest on the mid-ripening varieties 88.7%.

Analysis of lodging samples shows their significant difference, and determines the properties of the variety, its use under certain conditions. To reduce the risk of lodging it is necessary to take into account the morpho-physiology of the variety, climatic features and

technological methods in the cultivation of a particular genotype [12]. The length of the stem of the local selection Omskaya 36 (st) varied by year from 93-101 cm, which caused lodging in conditions of overwatering in the second half of the growing season, and the varieties of foreign selection all short stemmed 65-84 cm and resistant to lodging. Spike length is a minor feature and has little effect on the yield, had a difference in the length of the spike variety Arabella 7.7-9.0 cm slightly exceeding the standard and 1.0-1.6 cm other varieties. The increase in the traits (weight of 1000 grains, weight of grains per ear, the number of grains in the ear) is a positive relationship with the yield of the crop [13]. The varieties Omskaya 36, Arabella had a high weight of 1000 grains 40,5-41,0 g, the variety Goplana decreased the weight of 1000 grains from 44,5 g to 36 g with each year of testing. Arabella variety was distinguished by the number of spikelets in the spike 14-15 pcs, by the number of grains in the spike varieties Mandarin - 33.7 pcs, Arabella - 35.8 pcs. Arabella variety was distinguished by high values for most structural elements of the plant. Varieties Omskaya 36 and Arabella stood out for gluten content of 26-28%, and the grain of other varieties did not get high quality indices (table 4).

Table 4. Structural analysis of spring wheat varieties.

Plant length. cm	Spike length. cm	Number of spikelets. pcs.	Number of grains. pcs.	Gluten. %	Weight of 1000 grains. g	Yield. t/ha
spring wheat Omskaya 36 st						
97 (93-101)	7.9 (7.3-9.2)	13.44 (11.9-15.5)	25.7 (20.6-28.5)	26.57 (23-30)	41.0 (38-43.4)	2.99
spring wheat Goplana						
77.5 (72-83)	6.5 (5.5-7.4)	12.13 (11.0-14.3)	26.46 (23.7-28.5)	23.1 (21-25.7)	36.0 (33-38.8)	3.62
spring wheat Mandarina						
78.8 (72-84)	7.08 (6.5-8.2)	13.77 (11.5-16.9)	33.74 (29.4-37.4)	19.69 (17-21.4)	32.9 (26-38.1)	3.19
spring wheat Arabella						
67.7 (65-70)	8.37 (7.7-9.0)	14.87 (12.2-16.3)	35.86 (33.7-38.0)	28.28 (17-29.5)	40.6 (39-41.9)	3.41
NSR_{05}	3.1	0.32	0.7	5.2	4.2	2.4

Yield as the main indicator of the studied method or variety specimen determines the effectiveness of its further use in the average 3 years stood out varieties Goplana and Arabella with a yield of 3.9-4.1 t / ha, which is higher than the standard of 0.42-0.63 t / ha or 14-20%.

4 Conclusion

During the study period of varieties, there was an alignment in seed infestation by fungal microflora at the level of local varieties. The relative resistance of the studied varieties Mandarin, Arabella to root diseases and absolute to (Septoria nodorum) and high susceptibility to (Puccinia graminis) were determined. According to the indicators of the structural elements of the plant, a significant excess is noted in the variety Arabella and the yield of varieties Goplana and Arabella with an excess of the standard of 14-20%.

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