Crop management of unsatisfactory overwintered winter rapeseed in the south of Russia

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Abstract

Application of fungicides in a dose of 1.0 l/ha has led to decrease in spreading and development of the main diseases of winter rapeseed (*Phoma*, *Sclerotinia*). An essential difference in efficiency of action of applied fungicides it is not revealed. The most significant productivity of seeds of winter rapeseed is received in variants with application of fertilizer N_{120} in two terms and spraying of plants by fungicide in two terms – 2.78 t/ha, and the least on the control (without fertilizer and fungicide application) – 1.41 t/ha.

In case of damage of an above-ground part of plants of winter rapeseed at a plant density in the spring not less than 20 plants on 1 m^2, crop management consists in stimulation of growth of plants by nitrogenous fertilizer in two terms (N_{60} + N_{60}) and chemical protection against diseases with use of fungicides at rates 1.0 l/ha, applied 2-times with an interval in 25 days. In this case an economically significant seed yield of winter rapeseed excluding necessity of a reseeding of a field by summer cultures will be received.

Key words: winter rapeseed, plant density

Introduction

In the south of Russia 120-150 thousand ha of winter rapeseed are annually cultivated. One of factors of formation of high yield of culture in the given region is the successful overwintering of plants over 75 %. The cause of death of rapeseed during overwintering is in general an influence on plants of temperatures of air more low -17…-20°C in the absence of a snow. The factor promoting damage or death of plants from short-term influence of low temperatures, excessive development and loss of resistance to the unfavorable weather phenomena, when duration of the autumn season of vegetation of a rapeseed exceeds 70 days (reaching 85-90 days) under daily average temperatures of air above climatic norm. The given tandem of weather anomalies becomes recently traditional for the south of Russia.

Decrease of the influence of winter negative temperatures is possible by screening of varieties, optimization of terms of sowing, an optimal plant density, application of fertilizers and growth regulators.

It is noticed, that at plants of winter rapeseed with the dead above-ground part and damaged apical point and the unaffected root system formed shoots in spring on the root neck from adventive buds (at the average 4-5 shoots on 1 plant). Such plants infected by pathogens through infected areas of tissues in the course of vegetation can die or form low seed yield. The unsatisfactory overwintered winter rapeseed requires a complex of measures for optimization of a mineral nutrition and chemical protection against diseases.

Materials and Methods

Researches on studying of possibility of minimizing the consequences of unsatisfactory overwintering and sowing efficiency increase have been studied on a winter rapeseed variety Loris. The plant

density was 20 plants per 1 m^2. The experience scheme included: 1. Fertilizing - for growth stimulation used N_{60} and N_{120} in two terms - prior to the beginning of spring vegetation and after 2 weeks after vegetation renewal; 2. Application of fungicides (Folikur, Kolosal and Amistar) in doses 0.5, 0.75 and 1.0 l/ha in 2 terms - in the beginning of shoots' growth and in 25 days after the first processing.

Results

The phytopathologic assessment has shown that application of fungicides in a dose of 1.0 l/ha has led to decrease in spreading and affection degree of the main diseases of winter rapeseed (*Phoma*, *Sclerotinia*). An essential difference in efficiency of action of applied fungicides it is not revealed (table 1).

Table 1 Spreading and development of the main diseases on winter rapeseed

depending on the fungicide treatment (2009-2010)

Variant			Spreading, %		Affection degree, %	
Preparation	Consumption rate	Terms of application*	*Foma*	*Sclerotinia*	*Foma*	*Sclerotinia*
Control, without treatment			15.0	10.0	3.7	10.0
Kolosal	0.5	1	15.0	10.0	3.7	10.0
		1, 2	9.0	9.0	2.2	5.5
	0.75	1	9.0	9.0	2.2	5.5
		1, 2	8.0	8.0	2.0	5.0
	1.0	1	8.0	8.0	2.0	5.0
		1, 2	7.0	7.0	1.7	4.2
Folikur	0.5	1	14.0	10.0	3.5	7.5
		1, 2	7.0	6.0	1.7	4.0
	0.75	1	7.0	6.0	1.7	4.0
		1, 2	6.0	5.0	1.5	3.2
	1.0	1	6.0	5.0	1.5	3.7
		1, 2	5.2	5.0	1.3	3.2
Amistar	0.5	1	15.0	10.0	3.7	10.0
		1, 2	6.5	7.0	1.6	4.2
	0.75	1	6.5	7.0	1.6	5.2
		1, 2	6.0	6.0	1.5	4.0
	1.0	1	6.0	6.0	1.5	4.0
		1, 2	5.6	6.0	1.4	3.5

* Note: 1 – Germination of the winter rapeseed shoots in the spring (shooting stage);
2 – 25 days after the first treatment (end of budding – beginning of blossoming)

A close negative correlation between the seed yield of the winter rapeseed and spreading of the *Phoma* (r= -0.532) and *Sclerotinia* (r= -0.480), as well as the degree of affection by the *Phoma* (r= -0.530) and *Sclerotinia* (r= -0.588).

The greatest productivity of seeds of winter rapeseed is received in variants with application of fertilizer N_{120} in two terms and spraying of plants by fungicide in two terms – 2.78 t/ha, and the least on the control (without fertilizer and fungicide application) – 1.41 t/ha (table 2).

Application of fertilizer N_{60} before the beginning of vegetation or two weeks after its renewal without application of fungicide didn't promote the significant increase of the crop yield. Increase after the application of fertilizer either separately, or in both terms by the use of fungicides with different application rates was significant. However, the best effect of fertilizers was observed in variants when they were applied in two terms, at the same time having the growth-stimulating effect on the winter rapeseed plants.

Table 2 Seed yield of the winter rapeseed depending on the terms of application

of fertilizer and fungicides (2009-2010)

Variant			Fertilizer, terms of application*				Average
Preparation	Consumption rate	Terms of application*	Control, without fertilizers	N_{60}, 3	N_{60}, 4	N_{60} + N_{60}, 3+4	
Control, without treatment			1.41	1.47	1.44	1.53	**1.46**
Kolosal	0.5	1	2.09	2.20	2.36	2.20	**2.21**
		1, 2	2.12	2.33	2.39	2.41	**2.31**
	0.75	1	2.04	2.14	2.33	2.39	**2.23**
		1, 2	2.07	2.20	2.34	2.44	**2.26**
	1.0	1	2.18	2.37	2.43	2.63	**2.40**
		1, 2	2.25	2.55	2.55	2.74	**2.52**
Average			**2.13**	**2.30**	**2.40**	**2.47**	-
Folikur	0.5	1	2.13	2.24	2.40	2.24	**2.25**
		1, 2	2.18	2.37	2.43	2.45	**2.36**
	0.75	1	2.08	2.18	2.37	2.42	**2.26**
		1, 2	2.08	2.24	2.38	2.47	**2.29**
	1.0	1	2.22	2.41	2.47	2.66	**2.44**
		1, 2	2.31	2.58	2.58	2.78	**2.56**
Average			**2.17**	**2.34**	**2.44**	**2.50**	-
Amistar	0.5	1	2.06	2.16	2.33	2.17	**2.18**
		1, 2	2.10	2.29	2.35	2.38	**2.28**
	0.75	1	2.01	2.10	2.30	2.35	**2.19**
		1, 2	2.07	2.17	2.31	2.40	**2.24**
	1.0	1	2.15	2.33	2.39	2.59	**2.37**
		1, 2	2.18	2.51	2.51	2.71	**2.48**
Average			**2.10**	**2.26**	**2.37**	**2.43**	-
LSD 5%			0.08				

* Note: 1 – Germination of the winter rapeseed shoots in the spring (shooting stage); 2 – 25 days after the first treatment (end of budding – beginning of blossoming); 3 – before the beginning of the spring vegetation; 4 – two weeks after the vegetation renewal

Against the background of fertilizer application the significant effectiveness of the fungicide application (Folikur, Kolosal and Amistar) was reached in variants with the consumption rate 1 l/ha in two terms – beginning of the shoots' growth and after four weeks. The yield level here was up to 2.71-2.78 t/ha.

Conclusion

Thus, in case of damage of an above-ground part of plants of winter rapeseed at a plant density in the spring not less than 20 plants per 1 m^2, crop management consists in stimulation of growth of plants by nitrogenous fertilizer in two terms (N_{60} + N_{60}) and chemical protection against diseases with use of fungicides in doses 1.0 l/ha, applied 2-times with an interval in 25 days. In this case there will be received an economically significant seed yield of winter rapeseed excluding necessity of a replanting of a field by spring crops.