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APPLYING OF MICROELEMENTS AND FUNGICIDES DURING THE GROWING SEASON AND THEIR INFLUENCE ON STORAGE OF ROOTS IN CLAMPS

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The estimation of treatment influence of micronutrients and fungicides during the growing season on development of gray rot and quality of roots during storage. Was found that the use of microelements and fungicides decreased the development and dissemination of gray rot. However, during the application of micronutrients Polycom 'Beet' the tendency to deterioration of technological qualities are observed. Application of fungicides, both in pure form and in admixture with micronutrients provided a high quality roots during the storage.

Introduction. In the occurrence and development of root gray rot the complex of fungi and bacteria (over 150 species) is involved. The main value is in fungi, the bacteria are less active and act as secondary pathogens [1, 2].

During the defeat by gray rot, rotted roots or their parts lose sugar, hereupon it becomes unusable for production. However, the harmfulness of gray rot has indirect losses. So the rotten mass of roots contains the decomposition products of carbohydrates, protein, pectin, which interfere the normal process of sugaring, increasing the sugar losses during the processing [2].

Research methods. At RUE 'Experimental Research Station of sugar beet' in 2010-2011, the researches on estimation of influence of the application of micronutrients Polycom 'Beet' and fungicide Rex DUO, 47.9% SK during the growing season on the quality of the roots storage in clamps were conducted.

The soil is sod-podzolized heavy loamy, underlain by loam. The preceded crop is winter triticale. The preparation of the soil is common, according to sectoral regulations. After the harvest of preceded crop (chopped straw), the application of fertilizers $P_{90}K_{150}$ (double superphosphate and potassium chloride) is conducted. During the perennial weeds regrowth, the herbicide Roundup, 36% 6 l/ha is used. In October – plowing. In spring – mulching (KPSH -6), the application of nitrogen fertilizers N_{120} (CAS), pre-sowing cultivation (AKSH-6.0). Herbicides: Betanal Ekspert + Goltiks 1.0 + 1.2 l/ha on sprouts in three times. Seeding using the sowing machine Monosem 'Mega-3', the seed rate – 1.3 s.o./ha. The micronutrients application was conducted twice – in the phase of leaves closing, and 30 days after the first, the fungicide – at first signs of the disease. The norm of liquid flow rate is 350 l/ha.

Laying in storage – in four replications of 20 roots, in clamps of long-term storage. The retention period is up to 90 days [2]. The degree of development of gray rot of roots was considered according to the following scale [3]:

0 – healthy roots;

1 point – the affected tissue covers up to 15% of the mass of root;

2 points – affected from 15 to 30% of root tissue;

3 points – affected from 30 to 50% of root tissue;

4 points – affected more than 50% of root tissue.

The spreading of the disease was determined:

$$P = \frac{n}{N} \times 100, \text{ where}$$

P – the spreading of the disease,%

n – number of infected plants in a sample,

N – total number of plants in the sample.

Progression of the disease is determined by:

P = (100 * Ap) / n, where

P – the average percentage of the disease progress;

Ap – average point of destruction;

n – the highest point of plants destruction in the scale of disease account.

The technological qualities of roots were determined by the method of RRIHCS for automatic line 'Venem'.

Table 1. **Spreading and development of sugar beet gray rot depending on methods of its cultivation during the growing season**

Year	Development, %	Spreading, %	The species composition of gray rot pathogens, %				
			spp. Fusarium	Rhizoctonia solani	spp. Penicillium	Botritis cinerea pers	Bacteriosis *
control							
2010	6,7	26,7	25,6	18,0	3,0	49,5	13,9
2011	24,0	56,5	12,8	46,0	43,7	39,2	
Average	15,4	41,6	19,2	32,0	23,4	44,4	13,9
Polycom 'Beet' + Polibor							
2010	5,7	22,8	30,4	18,8	4,4	44,9	2,3
2011	18,1	46,9	11,2	46,0	52,7	35,7	
Average	11,9	34,9	20,8	32,4	28,6	40,3	2,3
Rex DUO, KS							
2010	6,0	23,9	20,6	13,9	13,9	47,1	4,6
2011	21,3	56,1	4,2	38,6	48,3	30,4	
Average	13,7	40,0	12,4	26,3	31,1	38,8	4,6
Rex DUO, KS + Polycom 'Beet' + Polibor							
2010	4,8	19,1	32,0	22,0	0	45,9	3,1
2011	22,3	57,5	6,6	36,7	44,6	36,0	
Average	13,6	38,3	19,3	29,4	22,3	41,0	3,1

* In 2011, the bacteriosis accounting was not conducted

Results and discussion. The species composition of gray rot pathogens was typical for the conditions of Belarus. Prevailed *Botritis cinerea pers*. – 44,4%; spp. *Fusarium* – 19,2%; *Rhizoctonia solani Kuhn*. – 32.0%, from saprophytes – spp. *Penicillium* – 23,3%, and bacterial diseases – 6.0%. The species composition of

pathogens changed over the years. So in 2010, *Botritis cinerea pers*. and *spp. Fusarium* are dominated, brown rot and bacterial diseases were met very often. In 2011, *Botritis cinerea pers*. and *Rhizoctonia solani Kuhn*. are dominated, among saprophytes *spp. Penicillium* can be mentioned, the number of roots affected by *spp. Fusarium* was low.

On average, over two years of research was found that the use of microelements in the growing season reduced the spreading of gray rot by 16.1%, and its development by 22.7%. The influence of microelements on the species composition of pathogens of fungal origin was not identified, except of *Botritis cinerea pers*. In 2010, in the variant with the microelements the high effectiveness against bacterial diseases was found.

The fungicide application was also tended to decrease gray rot, but the effectiveness of this method was lower than from microelements. So the number of diseased roots decreased by 3.8%, and the disease progress by 9.1%. During the application of fungicide was a tendency in the reduction of Fusarium, brown and gray rot and bacteriosis. The growth of saprophytic microflora (*spp. Penicillium; Aspergilius, etc.*) is noted.

Table 2. **Technological quality of roots during the storage**

Year	Sugar content, %	Content, mmol/kg			Sugar yield. %	Extraction ratio	Losses of sugar in molasses, %	DB-juice
		K	Na	amN				
control								
2010	17,0	63,7	5,0	19,7	14,6	86,0	1,8	91,2
2011	19,3	60,4	2,3	12,4	17,1	88,9	1,5	93,8
Average	18,2	62,1	3,7	16,1	15,6	87,5	1,7	92,9
Polycom ‘Beet’ + Polibor								
2010	16,5	61,7	5,6	21,1	14,1	85,5	1,8	91,7
2011	18,8	63,8	2,7	13,7	16,6	88,3	1,6	93,3
Average	17,7	62,8	4,2	17,4	15,4	86,9	1,7	92,5
Rex DUO, KS								
2010	17,2	65,7	4,7	19,0	14,8	86,1	1,8	91,9
2011	19,7	59,0	2,2	10,3	17,6	89,5	1,5	94,2
Average	18,5	62,4	3,5	14,7	16,2	87,8	1,7	93,1
Rex DUO, KS + Polycom ‘Beet’ + Polibor								
2010	18,0	61,8	4,6	18,9	15,7	87,1	1,7	92,6
2011	19,0	58,2	2,5	10,4	16,9	89,1	1,5	94,0
Average	18,5	60,0	3,6	14,7	16,3	88,1	1,6	93,3

The combined usage of fungicides and microelements allowed to reduce the spreading of disease by 7.9%, progress by 11.6%, and in 2010 when the epiphytoties

of cercosporosis was noted, the efficiency was much higher (27.5% and 28.3%, respectively).

During application of microelements and fungicides the reduction of the spreading of gray and brown rot and bacterial blight was found.

Evaluation of the influence of microelements and fungicides on technological quality of roots was conducted.

It is found that in 2010 by the time of processing, roots processed during the growing season by the micronutrients had a lower sugar content and high alpha-amino nitrogen content. The treatment with fungicides during the growing season in pure form and together with microelements provided higher sugar content in the roots and lower alpha-amino nitrogen content. The impact on other indicators was not identified.

In 2011during the usage of microelements in the growing season, roots taken on the storage had a lower sugar content, high potassium, sodium and alpha-amino nitrogen content. Using fungicides in its pure form and fungicides together with microelements provided the higher sugar content in the roots, lower content of potassium, sodium, and alpha-amino nitrogen, improves the good indicators of the purified juice.

Conclusions.

1. The application of microelements and fungicides during the growing season, especially in the years of cercosporosis epiphytotics is an effective prophylactic control of roots gray rot.

2. During the storage of the processed roots with microelements Polycom ‘Beet’ in the growing period there was a tendency in reduction of sugar content, increasing of sodium and alpha-amino nitrogen content.

3. The application of fungicides during the growing season provided high technological qualities of roots during the storage, increasing the goodness of purified juice, and recoverability of sugar from the roots, as well as reducing the loss of sugar in the molasses.

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