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ANTAGONISTIC ACTIVITY OF BIOLOGICAL PREPARATION TRICHODERMINE AGAINST DISEASES OF BEETROOT WHILE VEGETATION AND STORAGE

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Aim of the research is to study the protective effect of biological preparation Trichodermine against diseases of beetroot during vegetation and storage. It was established species composition of beetroot diseases in all phases of development and storage. It was studied the antagonistic activity of fungal biopreparation Trichodermine based on isolates: T. lingorum, TD – 91, T. harzianum 8995, Glicocladium sp. It was established that biopreparation Trichodermine based on isolate (T. lignorum TD – 91) provides the highest efficiency against beetroot diseases while storage, and for the protection of plant during vegetation it is reasonable to use preparation based on isolate T. Glicocladium sp.

Beetroot is a valuable vegetable crop because of its dietary components. In Ukraine among root vegetables it takes leading position, its areas of growing are 40 – 45 thousand of ha. One of the important reserves of production increase is prevention of losses for efficient disease control that leads not only to death of young plants but also to decrease of quality harvest. Root feeder cause the biggest harvest losses on different phases of the development, Cercosporella – during vegetation, rots prevail on root vegetables.

It is known that use of chemicals is forbidden as on sowings same as for treatment of root vegetables like beetroot before putting on storage. Thus one of the effective measures for the suppression of disease is the use of biological preparations and search of new isolates antagonists. Aim of our research was to study the protective effect of biopreparation Trichodermine on the basis of different isolates of fungus of Trichoderma family against development of beetroot diseases.

Fungi of Trichoderma family are used as biological agents to control plant pathogens. In the process of development fungus synthesizes a wide range of antibiotics, among them are gliotoxin, viridine, trichodermine etc. that ruin the cell walls of pathogens. There are different species of the genus Trichoderma are able to produce plant hormones (auxin, ethylen, cytokinin) and show a stimulating effect on plant growth. Such influence of fungi of Trichoderma family on plants development is very important for the use in agriculture [1, 2].

Biopreparation Trichodermine based on fungi is widely used for vegetable crops in greenhouses for pre-sowing treatment of seeds and spraying of plants during vegetation against root rot, white and gray rot, fusarium and wilt fading.

But less studied the efficiency of fungi of Trichoderma family against beetroot diseases during vegetables and root vegetables, especially while storage. That loss in storage of vegetables against diseases remain significant, thus play an important role in changing the biology of pathogens which are expressed in increasing their resistance, plasticity, adaptability and pathogenicity. That is why our research was aimed at the study of antagonistic activity of biological preparation Trichodermine against beetroot diseases during vegetation and storage.

Mehodology of the research. The research was made on beetroot plantations of “Delikatesnyi” variety in 2010 – 2012 in the economy “Lad”, Kiev region, by conventional methods [3]. They used fungal biological preparation Trichodermine based on different fungal isolates of Trichoderma family – T. lingorum, isolate TD – 91, T. harzianum 8995, Glicocladium sp. (titre 1,0×108 KUO/cm³). The sample was bacterial drug Fitotsyd-R based on the bacteria Bacillus subtilis, the titer of 1,0 × 109 CFU / cc.

Results of the study. On the basis of conducted research it was established that on the beginning of vegetation plantation of beetroot were damaged by root feeder up to 2,8 %, during growing season – by cercosporella from 14,1 %, at the beginning of root vegetables formation about 42%. While determination of antagonistic activity of different types of fungi of Trichoderma family against beetroot diseases, it was established that biological preparation Trichodermine based on three isolates has controlled damage of plants by pathogens. According to the data given in the table 1, at the seed treatment the infestation of beetroot crops by root feeder in 2nd – 3rd phase of leaves was the lowest (0,3 i 0,4%) in variants of T. lignorum, isolate TD – 91, Glicocladium sp. 2146. In the variant where was used Trichodermine preparation based on T. harzianum 8995 was damaged 0,6% of plants, when under control damage of plants reached 2,8 %. Complex implementation of different types of fungi Trichoderma (seed treatment and three times spraying of crops during vegetation) reduced damage of plants by cercosporella to 15-17 days.

The damage by Cercosporella was the smallest in all phases of the development of beetroot for treatment Glicocladium sp. 2146 – 10,0 - 20,5%. Infestation of plants with the use Trichoderma was 10,8 – 22,3%. The highest degree of damage (11,7 - 26,7%) by Cercosporella was in the variant of T. harzianum 8995 versus 14,1 – 42,0% in the control. Infestation of root crops at harvest diseases in experimental variants were 2.2 - 2.7 times lower than under control. Biological bacterial drug Phytocide – P inferior biological preparation Trichodermine by all indicators. With the use of Phytocide – P the damage of plants by root feeder was 0,8%, by Cercosporella during vegetation from 12,7% to 28,8%, root crops while harvest 3,6%. Different types of Trichoderma fungi showed high efficiency at pre-sowing treatment of beetroot seeds stimulating the energy of seeds growing and increasing field resemblance on 8,8 – 13,3%, it speed up the beginning of germination on 4 -7 days. It had positive effect on crop formation. Trading harvest of beetroot in experimental variants was 90,5 – 95,0 % versus 84,5 % under control, it allowed to get extra 4.0 – 4.4 tons per ha of root crops. On the basis of phytopathological studies found that the major

pathogens that damaged beet roots during storage were mixed rots (pathogens Botrytis cinerea Pers., Fusarium spp. Li : Fr., Rhizopus nigricans Ehrenb.).

Table 1. *The influence of biological preparation Trichodermine on beetroot disease prevelence (Delicatesnyi variety, "Lad" economy, Kyiv region 2010 – 2012)*

Options	Field similarity, %	Germination (per day)	The affected plant by diseases in phases of development, %				damaged root by diseases whileharvest, %	crop capacity, tonn per ha
			root fedder	Cercosporella				
			2 – 3 true leaves	start of the root formation	intense growth of roots	while harvesting		
(*Trichoderma lignorum* TD-91)	94,2	10,0	0,4	10,8	20,7	22,3	2,6	36,8
Glicocladium sp.	91,1	9,0	0,6	10,0	16,8	20,5	2,0	37,2
T.harzianum 8995	96,5	7,0	0,3	11,7	22,1	26,7	2,9	34,6
(Bacillus subtilis) (	92,5	8,0	0,8	12,7	23,0	28,8	3,6	33,4
Control	83,2	14,0	2,8	14,1	28,1	42,0	4,5	32,8
HIP 05								1,1

Due to our data at the treatment by suspension based on isolates of fungi of Trichoderma family was noticed disease retention by 2.1 – 2.9 times compared with the control (Table 2). On the effectiveness of biological products are not inferior to standard Phytocide – P. After 2 months of storage the slowest disease development 5.2% was in the variant where isolate T. harzianum 8995 was used. While treatment of root crops T. Lignorum i T. Glicocladium sp. the damage by rots was 6,5 i 7,1% (under control 15,1%). But after 5 months of storage the lowest disease development (10.3) was noticed while treatment by (Trichoderma lignorum TD-91) contrary 14,3 i 15,2% in variants T. Glicocladium sp. i T. harzianum 8995. Under control the damage of crops reached 35%. Thus, the isolate TD – 91 Trichoderma lignorum has prolonging effect, detaining the development of diseases of roots in long-term storage. The conducted researche indicate the possibility of using bio-agents to protect root crop from phyto pathogens during the growing season and during storage. Biopreparation Trichodermine (based on Trichoderma lignorum ТД-91) showed the highest efficiency against widespread diseases of root crops while storage. For the protection of plants during vegetation it is reasonable to use Trichodermine based on isolate T. Glicocladium sp. The results of the research show high economic efficiency for integrated use of different types and isolates of the fungus of Trichoderma family during vegetation and storage.

Table 2. *– The effect of biological preparation Trichodermine on the development of beetroot diseases while storage (average in 2011 – 2012)*

Variants	Disease development, % after ……..months of storage		Technical efficiency,% after ……..months of storage	
	2	5	2	5
Water (Control)	15,1 ± 1,7	35,0 ± 1,2	Water (Control)	15,1 ± 1,7
Phytocide – P (standard)	9,8 ± 2,5	18,1 ± 1,1	Phytocide – P (standard)	9,8 ± 2,5
Trichoderma lignorum TD-91	6,5 ± 1,1	10,3 ± 1,2	*Trichoderma lignorum* TD-91	6,5 ± 1,1
Trichoderma Glicocladium sp.	7,1 ± 1,0	14,3 ± 2,5	*Trichoderma Glicocladium sp*.	7,1 ± 1,0
Trichoderma T. harzianum 8995	5,2 ± 1,4	15,2 ± 2,3	*Trichoderma T. harzianum* 8995	5,2 ± 1,4

Technical efficiency of Trichodermine on crops of beetroot against root feeder is 80 – 83,5%, the damage of crops by Cercosporella decreases on 63,7 – 66,7 %, and root feeder by diseases while collecting decrease by 2 – 2.3 times. Infestation of beetroot decreases by 53,0 – 65,6% after 2 months of storage and treatment by biopreparation Trichodermine. After 5 months of storage in Trichoderma lignorum ТД-91 variant, technical efficiency was 70,6%. The efficiency of isolates T. harzianum 8995 і Glicocladium sp.. was lower 56,6 і 59,1%.

Conclusions. It was estimated the antagonostic activity of different isolates of fungus of Trichoderma family against beetroot diseases while vegetation and storage. Technical efficiency of Trichodermine on crops of beetroot against root feeder was 80 – 83,5%, Cercosporella 63,7 – 66,7 %. The infestation of root crops decreases to 53,0 – 65,6% after 2 months of storage by treatment of Trichodermine biopreparation.

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