Natural rezervators of solanaceae viruses in South Kazakhstan

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Abstract: The aim of this study is to develop ecologically safe and economically beneficial measures against the carriers of Solanaceae viruses. This aim determined the following tasks: to study kinds of harmful and useful insects on the Solanaceae bally crops; to investigate particularities of biology, ecology and dynamics of the number of key carriers of Solanaceae viruses; to study kinds of weeds - reservators of Solanaceae viruses. The results of study of 26 kinds of weeds have shown that 10 kinds do not have viruses: great bur, wild marigold, bachelor's-button, common St. John's wort, capsella, meadow pine, elf dock, tormentil, common dandelion, origanum; 16 kinds of weeds have viruses X, S, M, 8 kinds of them - all 3 viruses: corn lily, Canada thistle, dindle, sharp dock; 5 kinds - milk-witch gowan, old-mans pepper, wormwood, quick grass, common orache – X, S-viruses, and 3 kinds - caper spurge, yellow rocket, creeping alfalfa - only X-virus.
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Introduction

Potato and tomato are the key vegetable cultures in Kazakhstan, they stand for almost 1/3 of gross harvest of vegetables. Nutrition value, high productivity, taste have made these cultures popular in all regions of the Republic.

The key reason for worsened productivity and inferior quality of potato tubers, tomatos is injury with virus deceases which are well-spread and very harmful [1-3].

The particularities of virus deceases of Solanaceae is that they are passed from one plant to another producing mass affection in very short time [4, 5].

Origination and development of virus deceases of Solanaceae is determined both by environmental conditions and the virus carriers and availability of weeds on the plot of land.

That is why identification of deceases of Solanaceae, study of kinds of insects-carriers, knowledge of their biology and ecology, natural reservators of viruses, and formation of entomo-complexes on the fields are very difficult tasks for agrarians. However, if life cycle of the pathogen and the symptoms of the deceases, centers of virus infection and intermediary hosts of insects-carriers of viruses are known it is possible to take pro-active measures and prevent or significantly reduce the risk of many virus deceases.

Methods

We have investigated 26 weeds which are most common in the fields of the South Kazakhstan under the crops of potato and tomato, the road-sides, on the vegetable fields taken out of crop rotation.

We used serologic assays for identification of Solanaceae viruses and the weeds. Serologic assays were made by filter-paper method (M. Dunin, E. Kubshinova). Diagnostic serums against viruses X, S, M were used. Serologic were made on the flow line PVL1.

Main part

Performed by us serologic assays showed that potato plants with the symptoms of different virus deceases contain viruses X ,S, Y, M, A, L. Viruses X, S are most frequent, Y, M – less frequent (Table 1). Rugose mosaic results in swelling of leaf plate between capillaries, the leafs shrinkage because of slow growth of capilliaries. Leafs and stems become fragile, the plants slow down their growth and die. Early-ripe *Tamasha* and medium-ripe *Akkol* kinds of potato with the symptoms of rugose mosaic at the worsened stage revealed X+S+Y complex, if the decease is not so serious - X+S.

Streak mosaics is manifested in necrosis of leaf ribs (streaks of dead tissue of brown colour visible on the lower surface of the leaf), grafts and stems. Later on the leafs brown stains can be found, necrosis goes to other areas of leafs, stems. The leafs of lower and, later, middle tiers dry out and hang on thin long grafts.

In the South Kazakhstan Y-virus produces early streak mosaic. In combination with Y+X+S: Y+S – rugose and streak mosaic.

Table 1. Expansion and degree of harmfulness of virus deceases of potato in the South Kazakhstan

Deceases	Weight of tubers of one plant, g (average for 3 years.)	Coefficient of harmfulness	% of expansion of the decease in the region	% of reduction of productivity after affection
Tamasha				
Leaf roll	338,0	74,6	5,0	3,74
Rugose mosaic	425,0	69,0	3,5	2,48
Streak mosaic	274,0	79,6	2,0	1,59
Control – healthy plants	1325,0	-	-	-
$HCP_{0,05}$=126		$HCP_{0,99}$=281		
Akkol				
Streak mosaic	265,0	82,0	3,0	2,69
Aucuba mosaic	719,5	47,7	1,0	0,48
Gothics	715,0	49,8	5,0	2,49
Control – healthy plants				
$HCP_{0,05}$= 455		$HCP_{0,99}$=985		
Total			19,5	13,47

Note: total percent of virus deceases of potato is 19,5% at average, reduction of productivity - 13,47%.

Leaf roll virus - L - causes different degrees of plant deceases: in the mild form – small retardation of growth; upper part is more chlorotic; twisting is observed with the very low leafs; medium form - short plants, the leafs of all the plant are rolled; strong form - dwarfism, small number of stems, the leafs are rolled and pressed to the stem at sharp angle, light-yellow colour. Mosaic roll of leafs is characterized by weak mosaics and rolling of the very young upper leafs. The pathogen is M-virus.

In the Southern region of the Republic virus X+S can be found on the potato and tomato plants.

Leaf curl (striate mosaic). The main signs are mottling, small swelling of leaf plate, wave-pattern of the edges of leaf segments. In the South Kazakhstan it is caused by virus complexes: A+M; A+X; A+S+Y [8].

In order to develop ecologically safe and economically beneficial measures against carriers of Solanaceae viruses we decided to study kinds of weeds - reservators of Solanaceae viruses in the South Kazakhstan.

Weeds are not only reservators of many viruses and the focuses of virus deceases, the also act as intermediary host for insects-carriers.

U.Mariappan proved that Solanum nigrum L is reservator of Y-virus of potato carried with the aid of cucumber and peach aphids. Solanum nigrum L is also reservator of M-virus (U. Kaczmarek), (D. Ksiazek). Besides that U. Kaczmarek found M-virus in Fumaria officinalis L, and S-virus – in Geranium dissectum L .

In CIS-countries this problem was in the focus of many scientists. For example, O. Kapitsa, Z. Andreeva, I. Ambrosova, S. Grebenshchikova, Yu. Vlasov, A. Abdukarimov and others identified natural reservators X, S, M -viruses of potato in weed and wild plants [9].

We have investigated 26 weeds which are most common in the fields of the South Kazakhstan under the crops of potato and tomato, the road-sides, on the vegetable fields taken out of potato and tomato crop rotation. The results are shown in Table 2.

Table 2. Weeds-reservators of viruses of potato and tomato in the South Kazakhstan

№	Plant kind	% of plants containing viruses		
		X	S	M
1	Corn lily	6 8	72	47
2	Canada thistle	42	26	15
3	Field milk thistle	54	32	8
4	Sharp dock	87	91	42
5	Milk-witch gowan	36	59	0
6	Fire-leaves	72	85	4
7	Wormwood	1 0	5	0
8	Old-mans pepper	1 5	24	0
9	Frost-blite	1 0	9	14
10	Quick grass	2	8	0
11	Solanum nigrum	25	25	5
12	Pigweed	1 7	1 0	18
13	Common orach	6	1 2	0
14	Yellow rocket	19	0 -	0
15	Creeping alfalfa	32	0	0
16	Great bur	0	0	0
17	Wild marigold	0	0	0
18	Bachelor's button	0	0	0
19	Common St. John's wort	0	0	0
20	Capsella	0	0	0
21	Meadow pine	0	0	0
22	Elf dock	0	0	0
23	Caper spurge	24	0	0
24	Tormentil	0	0	0
25	Common dandelion	0	0	0
26	Origanum	0	0	0

The table shows that 16 weed kinds contain viruses X, S, M, and 8 of them contain all 3 viruses; 5 kinds – X, S viruses and 3 kinds - only virus X.

Inference

Performed by us studies have shown that total percent of virus deceases of potato is 19,5% at average, reduction of productivity - 13,47%. X and S-viruses are most common. Potato plant is infected with 2, in most cases - with 3-4 viruses in different combinations, percent of infected with viruses is 50,3%, including viruses: X - 41,9%, Y-14,5%, S-31,7%, M-8,5%.

Mosaic reduces tomato productivity by 8-14%, streak -by 25%.

We also investigated the weed in the South Kazakhstan, spread mainly on potato and tomato fields, on the adjacent territories, the road-sides, on the former vegetable fields.

The results of this investigation showed that from 26 kinds of weeds 16 weed kinds contain viruses X, S, M, and 8 of them contain all 3 viruses; 5 kinds – X, S viruses and 3 kinds - only virus X.

The materials of studies are the basis for development of recommendations "Protection systems for vegetable cultures from virus deceases in conditions of the South Kazakhstan" which will allow to reduce affection degree of potato and tomato plants with virus deceases; the materials can be also used in phyto-sanitary monitoring of Solanaceae.

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References

1. Bell, A.G, 1985. Aphids in potato stores, 1985. Seed Potato, 1(25): 19-22.
2. Bishop, G.W., 1967. A leaf virus control program in Idaho seed potato areas. American Potato J, 44: 305-308.
3. Foster, G.N. and I.A. Woodford, 1987. Effects of different potato insectidal spray programmes on aphid control and the selection of resistant Myzus persicae, Ann. Appl.Biol, 110: 26—27.
4. Kostiw, M., 1979. Transmission of potato virus Y by Propalosiphum padi L., 3(22): 237-238.
5. Wensler, R. J., 1962. Mode of host selection by on aphid, 195: 830-831.
6. Bobryshev, F., V. Chmulev and A. Zubov, 1972. Plants-reservators of viruses. Popato and vegetables, 11: 36-37.
7. Vlasov, Yu. and A. Abukarimova, 1968. Expansion of X-virus among weeds. Popato and vegetables, 8: 20-21.
8. Ospanova, G., 2010. Measures against carriers f virus potato deceases. Vestnik of agricultural science of Kazakhstan, 6: 57-59.
9. Ospanova, G. and D. Kulmuratova, 2012. Solanaceae virus deceases in the South Kazakhstan. Research and practical workshop "Theoretic-aplied aspects of teaching biology and modern technlogies", pp: 91-92.
10. Ospanova, G., 2012. Natural reservators of virus deceases of Solanaceae. Protection of plants against pests and deceases, 10: 41-43.

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