RESEARCHES CONCERNING THE INFECTION DEGREE WITH VIRUSES PVS AND PVX, AS A CONSEQUENCE OF THE TECHNOLOGICAL MEASURES INFLUENCE AT THE SEED POTATOES

CERCETĂRI PRIVIND GRADUL DE INFECȚIE CU VIRUSURILE PVS ŞI PVX, CA URMARE A INFLUENȚEI UNOR MĂSURI TEHNOLOGICE LA CARTOFUL DE SĂMÂNȚĂ

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Abstract: *Referring to role emphasizing of some technological measures (planting time, the treatments number against aphides and the moment of the vegetation interruption) in producing of the potato planting material, during years 2004-2006 the researches at the semi earlier cultivars (Astral and Rapsodia) were continued. These two cultivars were created at the Agricultural Research and Development Station of Suceava. Multiplication of the planting material, at the cultivar Astral, from the Base category (SE category) until the certified A category, was accompanied by a significant grows of the shrubs infestation level with X viruses. This tendency was presented only in Suceava when the vegetation interruption was realized with 20 days after warning. The obtained results emphasizes that the cultivar Rapsodia presented the biggest rate of the infected plants frequency with viruses S (PVS). This phenomenon was determined by multiplication process of the planting material and by later interruption of the vegetation period.*

Rezumat: *În vederea unei mai ample evidențieri a rolului unor măsuri tehnologice (epoca de plantare, numărul de tratamente împotriva afidelor şi momentul întreruperii vegetației) în producerea materialului de plantat la cartof, au fost continuate cercetările în perioada 2004 – 2006 la unele soiuri semitimpurii (Astral şi Rapsodia) create la Stațiunea de Cercetare Dezvoltare Agricolă Suceava. Multiplicarea materialului de plantat de la categoria Bază (Clasa SE) până la Certificată A, a fost însoțită de o creştere semnificativă a infestării tufelor cu virusul X la soiul Astral. Această tendință a fost mai pregnantă numai la Suceava şi în mod deosebit când întreruperea vegetației s-a realizat cu o întârziere de 20 zile de la data avertizării. Sinteza datelor, relevă că cele mai mari rate ale creşterii frecvenței plantelor infectate cu virusul S (PVS) la soiul Rapsodia, s-au datorat parcurgerii procesului de înmulțire a materialului de plantat şi întreruperii întârziate a vegetației.*

Key words: seed potatoes, viruses, technological measures

Virosis diseases are produced by viruses which are entities without own metabolism. The propagation of the viruses depends by metabolism of the host organism. The agriculture lost because of plants infection with viruses could be very high. In the last years a lot of virosis at plants were registered. The fluency of the vegetal material transport and the vectors presence have been determined the virosis outspread in all over the world.

Table 1

The yield lost because of viruses
[*Cojocaru N., 1995; Iacob Viorica 2002; Pop V.I., 1986*]

Plant	Pathogen agent	The yield lost (%)
Wheat	1.Wheat streak mosaic virus	50 – 80
Barley	1.Barley yellow dwarf virus	20
	2.Barley yellow mosaic virus	50
Maize	1. European maize mosaic virus	40 - 44
Potato	1. Potato leaf roll virus	10 - 95
	2. Potato virus Y	10 - 80
	3. Potato virus X	10 - 20
Tomatoes	1. Tobacco mosaic virus in tomato	100
Grapevine	1. Grapevine mosaic	100

Easy virosis (or mosaics) are determined by infection one of the viruses: X, S. M and A. These viruses produce the easy symptoms on leafs mosaics, affecting the leaf size and plants high [BOȚOMAN Ghe., 2005]. The typical symptom of the infection with virus S is considered the easy recession of the veins from the superior part of the leaflets, in the same time, producing an easy rugosity of the leaf surface. At the secondary infection (when the plants derived from the infected tubers) the shrubs are tenuous, have a scattered grows, the leafs are down curved. Sometimes on the superior part of the leafs could appear the necrotic spots [IANOŞI S., 2005].

The virus X (PVX) is considered the most outspread virus because we meet him in all areas where grow potato. The main infection source is represented by infected tubers, therefore the disease is transmitted year by year. During vegetation period this virus is transmitted through directly touch between sick and health plants. The main agent is the wind, but indirectly can be the men and machines who pass through the potato land. The virus X has a lot host species of weeds such as: *Amaranthus sp.* and *Chenopodium album*. In the dissemination of this virus the species of aphides and the other insects have a small role.Having their importance, all yield factors are considered the links of the technological chain which can not be substituited. In this context for a better emphasizing of the technological measures role (planting time, the treatments number against aphides and the moment of the vegetation interruption), the researches for producing of the potato planting material, during period 2004-2006, for new created cultivars, were continued at the ARDS Suceava.

MATERIAL AND RESEARCH METHOD

The experiments on type 2x2x2x2 , in four replications, were placed in field, after subdivided plots method, (ARDS of Suceava and Experimental Center of Lucina) taking into consideration the following factors:

- A factor - the cultivar: a_1 – cultivar Astral (earlier cultivar); a_2 – cultivar Rapsodia (semi earlier cultivar);
- B factor – planting time: b_1 – the earlier spring; b_2 – after 30 days;
- C factor – vectors destruction: c_1 – with three treatments; c_2 – with five treatments;

■ D factor – vegetation interruption: d_1 – at warning; d_2 – after 20 days;

The complex effect of all studied factors was researched and interpreted in all experimental years at those two cultivars, going to basis (SE class), prebasis (E class) and certified A biological categories, for the following aspects:

- the infestation degree, with X virus, of the potato shrubs which belong of the cultivar Astral;
- the infestation degree, with S virus, of the potato shrubs which belong of the cultivar Rapsodia

In order to accomplish these determinations it used the E.L.I.S.A. equipment (Enzyme – Linked – Immune – Sorbet – Assay) which permitted us, the rapidly detection of the viruses, in the leaflets of the potato plant. In order to detect these viroses we collected the leafs samples from the potato plant, during the flowering period.

Fertilization of the potato plots with N:P:K, 100:100:100 kg s.a /ha, in a balanced rapport, was accomplished, in a proper manner so that the viruses infection symptoms could not be masked. The tubers were planted mechanically at a distance on 21,5 cm between tubers and 70 cm between rows, using the fraction on 30-45 mm. For destruction of the aphides it used the insecticide Actara 25 WG (thiametoxam 25 %) in doses on 0,08 kg /ha, the spell between two treatments was 12 days. In order to destroy of the potato herbage the first treatment was made mechanically, at warning – after 70 days from the plant sprouting. The second treatment was made with Diquat (Reglone forte) 5 l /ha. After three weeks from the vegetation interruption, the harvesting of the tubers was accomplished.

RESULTS AND DISSCUSIONS

The date from the table 2, emphasizes that at the cultivar Astral, the annual values of the infected shrubs frequency with virus X were not influenced by the place of the experiment or by the technological interventions graduations (planting time, treatment types and stage of the vegetation interruption).

We could notice that the only significant differences at the Basis (SE class – 2004), and bases (E class -2004) categories were registered at Suceava, when the vegetation interruption was made 20 days later against the warning time.

If the infestation level with viruses at the bases (E calss) and certified A categories did not register the significant differences, instead, the multiplication of the planting material from the basis category (SE class) to certified A category, was accompanied by a significant grows of the shrubs infestation level with viroses (X virus). This tendency was stronger at Suceava when the vegetation interruption was made 20 days later from the warning time.

The data from the table 3, emphasize that the most significant inductions upon the infections frequency with X virus (*PVX*), is due to utilization of the biological category *certified A*, environmental conditions and the stage of the vegetation interruption (table 4)

Thus in comparison with basis category – class SE at the basis category class E and certified A category the infection frequency amplification rate was at Lucina 2,2 and respectively 4,1, but in Suceava the infection frequency amplification rate was 4,1 and respectively 7,5 (tab. 4)

Table 2

The infected plants frequency with X virus –PVX - the cultivar ASTRAL, 2004 –2006

SPECIFICATION			YEARS			Differences against 2004	
Planting Time	**Treatment Numbers**	**Vegetation Interruption**	**2004**	**2005**	**2006**	**2005**	**2006**
S U C E A V A %							
Earlier	3	*At warning*	0,00	0,30	0,44	0,30	0,44
	5		0,00	0,13	0,30	0,13	0,30
	3	*After 20 days from the warning*	0,13	0,74	1,23	0,61 x	1,10 xx
	5		0,12	0,74	1,22	0,62 x	1,10 xx
*After 30 days**	3	*At warning*	0,18	0,48	0,92	0,30	0,74 x
	5		0,18	0,45	1,08	0,27	0,90 x
	3	*After 20 days from the warning*	0,35	0,97	1,63	0,62 x	1,28 xx
	5		0,23	0,77	1,65	0,54 x	1,42 xxx
DL 5 %			0,40	0,69	1,04	0,52	0,71
DL 1 %			0,54	0,93	1,42	0,73	0,97
DL 0,1 %			0,73	1,26	1,91	1,00	1,32
L U C I N A %							
Earlier	3	*At warning*	0,00	0,12	0,29	0,12	0,29
	5		0,00	0,00	0,27	0,00	0,27
	3	*After 20 days from the warning*	0,11	0,26	0,45	0,15	0,34
	5		0,11	0,24	0,61	0,13	0,50
*After 30 days**	3	*At warning*	0,13	0,30	0,57	0,17	0,44
	5		0,12	0,17	0,43	0,05	0,31
	3	*After 20 days from the warning*	0,30	0,49	0,35	0,19	0,05
	5		0,17	0,33	0,68	0,16	0,51
DL 5 %			0,33	0,52	0,71	0,42	0,52
DL 1 %			0,45	0,71	0,96	0,58	0,71
DL 0,1 %			0,61	0,96	1,30	0,80	0,96

* - from the earlier planting

Table 3

The frequency dependence of the infested shrubs with X virus, by effect of the technological measures - cultivar ASTRAL

SPECIFICĂTION		infected plants (%)	Differences	Significance
Location	SUCEAVA	0,59	0,29	**X**
	LUCINA	0,30	Standard	
Biological category	Basis(SE class)	0,13	Standard	
	Basis (E class)	0,41	0,28	**X**
	Certified A	0,78	0,65	**Xxx**
Planting time	Earlier	0,36	Standard	
	After 30 days *	0,52	0,16	
Treatment numbers	Three	0,47	0,05	
	Five	0,42	Standard	
Vegetation interruption	At warning	0,30	Standard	
	After 20 days **	0,59	0,29	**X**

DL 5 % 0,21
1 % 0,30
0,1 % 0,41

* - from the earlier planting
** - from the warning

Table 4

The amplification rates variation of the infections frequency with X virus, because of the main actions

S P E C I F I C A T I O N		S U C E A V A	L U C I N A
Biological category	Basis (SE class) - 1997	standard	Standard
	Basis (E class) - 1998	4,1	2,2
	certified A - 1999	7,6	4,1
Vegetation interruption	At warning	standard	Standard
	After 20 days *	2,0	1,7

* at warning

Table 5

The infected plants frequency with S virus - the cultivar RAPSODIA, 2004-2006

S P E C I F I C A T I O N			Y E A R S			Differences against 2004	
Planting Time	**Treatment numbers**	**Vegetation interruption**	**2004**	**2005**	**2006**	**2005**	**2006**
S U C E A V A %							
Earlier	3	*At warning*	1,41	2,50	4,69	1,09 ^{x}	3,28 ^{xx}
	5		1,10	1,88	4,69	0,78	3,59 ^{xxx}
	3	*After 20 days from warning*	2,50	4,85	7,04	2,48 ^{xxx}	4,54 ^{xxx}
	5		2,50	4,85	7,19	2,35 ^{xxx}	4,69 ^{xxx}
*After 30 days**	3	*At warning*	2,04	3,91	6,72	1,87 ^{xxx}	4,68 ^{xxx}
	5		1,57	2,97	6,41	1,40 ^{xx}	4,84 ^{xxx}
	3	*After 20 days from warning*	2.03	5,63	8,29	3,60 ^{xxx}	6,26 ^{xxx}
	5		2,35	5,63	7,97	3,28 ^{xxx}	5,62 ^{xxx}
DL 5 %			1,31	0,50	2,52	0,88	1,89
DL 1 %			1,78	0,68	3,42	1,17	2,54
DL 0,1 %			2,41	0,92	4,62	1,60	3,40
L U C I N A %							
Earlier	3	*At warning*	0,94	1,57	3,28	0,63	2,34 ^{xxx}
	5		0,94	1,57	3,28	0,63	2,34 ^{xxx}
	3	*After 20 days from warning*	2,19	3,44	5,32	1,25 ^{xx}	3,13 ^{xxx}
	5		1,72	3,28	5,47	1,56 ^{xx}	3,75 ^{xxx}
*After 30 days**	3	*At warning*	1,10	3,13	4,22	2,03 ^{xxx}	3,12 ^{xxx}
	5		0,94	2,82	4,07	1,88 ^{xx}	3,13 ^{xxx}
	3	*After 20 days from warning*	2,25	4,53	5,78	2,28 ^{xxx}	3,53 ^{xxx}
	5		2,66	4,07	5,94	1,41 ^{xx}	3,28 ^{xxx}
DL 5 %			0,83	1,39	1,12	1,01	0,92
DL 1 %			1,13	1,90	1,53	1,41	1,23
DL 0,1 %			1,53	2,56	2,06	1,94	1,70

- \- from the earlier planting

From the table 5, it observed that the biggest rates of the infected plants frequency grows with S virus (PVS) it registered at cultivar Rapsodia, because of multiplication of planting material and vegetation interruption 20 days later.

Thus, in comparison with basis category (SE class) the infection frequency with this virus grew on 2,2 times, after one year (at class E), and grew on 3,21 times (certified A), after two years (tab. 6).

Table 6

The infected plants frequency dependence with S virus, by the average action of the technological measures – cultivar Rapsodia, years 2004-2006

S P E C I F I C Ă T I O N		Infected plants (%)	Differences	Significance
Place	SUCEAVA	4,20	1,10	Xxx
	LUCINA	3,10	Standard	
Biological category	Basis (SE class)	1,76	Standard	
	Basis (E class)	3,55	1,79	Xxx
	Certified A	5,65	3,89	Xxx
Planting time	Earlier	3,26	Standard	
	After 30 days *	4,04	0,78	Xx
Treatment numbers	Three	3,73	Standard	
	Five	3,58	- 0,15	
Vegetation interruption	At warning	2,82	Standard	
	After 20 days **	4,48	1,66	Xxx

DL 5 % 0,71
1 % 0,98
0,1 % 1,37

* from the earlier planting
** from the warning

Also, it is noticed that the growing of the treatment numbers (from three to five), against aphides, did not influenced the evolution of the infection level with S virus (table 6).

CONCLUSIONS

The planting and interruption vegetation delaying did not determine the significant modification of the degeneration viruses capacity in comparison with estimated rates when we realized an early planting and the vegetation interruption was made at the warning moment;

Concerning the infection level with X virus, it observed that because of multiplication of the planting material, the biggest amplification capacity was at cultivar Astral;

Concerning the infection level with S virus (cultivar Rapsodia), it observed that the biggest amplification capacity both Lucina and Suceava, is due planting and interruption vegetation delaying.

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