# INVESTIGATION OF THE VIRUS STATUS OF THE POTATOES IN SOME REGIONS PRODUCING HIGH QUALITY SEED POTATOES IN BULGARIA

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## ABSTRACT

*It was investigated the status of viruses in the most popular sorts of potatoes in Bulgaria, in some of the regions producing high quality seed potatoes: the region of Beglicka and Momchilovtzy. It was established that in the investigated areas the flight of greenflies was minimal and in the combination with the appropriate altitude 1400-1600m., this furthers the production and supporting high quality seed potatoes. In the investigations were included the basic potato viruses: PVX, PVY, PVS, PVM, PLRV.*

## Introduction

One of the most harmful virus diseases, spread through agricultural crops, are these affecting potatoes. The Economic significance of viruses is fixed by their negative influence on the infected plants and also concerns their ability of virus transferring by planting material. The losses due to viruses are usually quantitative but some cause qualitative losses as well (5).

The yield losses due to one or more viruses infecting potatoes vary from low to very high. Infections of PVY and PLRV have the potential to reduce yields up to 80%, while mild viruses, such as PVX, PVS, and PVM also depress yields by as much as 30% in infected plants. It's provided that in Bulgaria, the losses of some sorts of potatoes caused by PVY in heterogeneous infection, with other mosaic viruses increase to 56.4-64.4%; in monoinfection of the most widespread potatoes' viruses losses vary between 10-50% (1, 8).

The aim of this research is to find spreading of some potatoes' virus diseases in basic seed derivative areas in Bulgaria.

## Materials and Methods

In the area of high belt region of the Middle Rhodope Mountains at the potato cultivar maintaining bases (Beglicka, Momchilovtsy) has been developed investigation on diffusion and contamination with PVY, PVX, PVS, PVM, and PLRV in the including sort maintaining selection of the early sorts of "CONCORDE", "TRESOR", the middle early sorts "ARINDA", "SANTE", the middle late - "AGRIA".

The analyses for researching of the infected clones and plants in posterity have been done upon mass factual material of initial plants team; out of clones of individual team in 2 year-old testing in posterity. The level of infection is measured visually at the time of vegetation in summer, and in vegetation house during autumn-winter period and by testing with ELISA method (3, 7).

## Results and Discussion

The spreading of pvx, PVY, PVS, PVM, and PLRV in primary process of sorts maintaining of "CONCORDE", "TRESOR",

TABLE 1

**Contamination on potato viruses in the brunch selection in Beglicka seed production region - 2001**

| Sort | Propagation | PVX | PVY | PVS | PVM | PLRV | Heterogenous | Visual damaged | Total |
|---|---|---|---|---|---|---|---|---|---|
| Concorde | SIP | 3.40 | 1.40 | 1.40 | 1.20 | 1.00 | 5.20 | 2.60 | 16.20 |
| | ST I | 2.14 | 0.48 | 2.14 | 0.48 | 1.19 | 7.14 | 3.57 | 17.14 |
| | ST II | 0.38 | 0.90 | 0.51 | 1.28 | 0.77 | 2.43 | 0.00 | 6.27 |
| Agria | SIP | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ST I | 2.22 | 2.22 | 0.56 | 0.00 | 1.11 | 6.11 | 3.33 | 15.56 |
| | ST II | 0.00 | 0.00 | 0.00 | 0.81 | 0.00 | 0.00 | 0.00 | 0.81 |
| Tresor | SIP | 0.67 | 0.60 | 0.47 | 0.20 | 1.07 | 2.40 | 1.20 | 6.60 |
| | ST I | 1.88 | 1.67 | 1.04 | 0.63 | 0.83 | 3.13 | 3.54 | 12.71 |
| | ST II | 0.00 | 0.00 | 0.00 | 0.47 | 0.47 | 2.82 | 0.00 | 3.76 |

TABLE 2

**Contamination on potato viruses in the brunch selection in Beglicka seed production region - 2002**

| Sort | Propagation | PVX | PVY | PVS | PVM | PLRV | | Heterogenous | Visual damaged | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Concorde | SIP | 1 | 3.33 | 4.00 | 1.33 | 0.67 | 0.67 | 6.67 | 10.67 | 27.33 |
| | ST I | 2 | 1.28 | 1.03 | 0.26 | 0.26 | 0.51 | 1.54 | 4.62 | 9.49 |
| | ST II | 3 | 0.53 | 0.26 | 0.00 | 0.00 | 0.00 | 0.26 | 0.00 | 1.05 |
| Agria | SIP | 4 | 1.20 | 0.80 | 1.20 | 1.20 | 2.40 | 3.20 | 6.40 | 16.40 |
| | ST I | 5 | 0.29 | 0.29 | 0.29 | 0.29 | 0.57 | 0.57 | 1.14 | 3.43 |
| | ST II | 6 | 0.00 | 0.00 | 0.00 | 0.26 | 0.26 | 0.51 | 0.00 | 1.03 |
| Tresor | SIP | 7 | 1.00 | 0.67 | 0.67 | 0.33 | 1.33 | 2.33 | 5.67 | 12.00 |
| | ST I | 8 | 0.50 | 0.75 | 0.50 | 0.25 | 1.00 | 1.50 | 2.50 | 7.00 |
| | ST II | 9 | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.28 | 0.00 | 0.56 |

TABLE 3

**Contamination on potato viruses in the brunch selection in Beglicka seed production region - 2003**

| Sort | Propagation | PVX | PVY | PVS | PVM | PLRV | Heterogenous | Visual damaged | Total | Sort |
|---|---|---|---|---|---|---|---|---|---|---|
| Concorde | ST I | 1 | 2.86 | 1.07 | 0.36 | 0.00 | 0.36 | 3.57 | 5.71 | 13.93 |
| | ST II | 2 | 1.59 | 0.63 | 0.00 | 0.32 | 0.00 | 1.90 | 0.00 | 4.44 |
| | SIP | 3 | 2.25 | 1.00 | 1.25 | 0.75 | 2.00 | 5.75 | 2.25 | 15.25 |
| Agria | ST I | 4 | 1.43 | 0.29 | 0.57 | 0.00 | 1.71 | 2.29 | 1.71 | 8.00 |
| | ST II | 5 | 0.95 | 0.00 | 0.00 | 0.00 | 1.43 | 1.90 | 0.00 | 4.29 |
| | SIP | 6 | 1.00 | 0.40 | 0.60 | 0.80 | 2.00 | 3.00 | 3.20 | 11.00 |
| Tresor | ST I | 7 | 0.71 | 2.14 | 0.36 | 0.00 | 2.14 | 4.29 | 7.86 | 17.50 |
| | ST II | 8 | 0.00 | 0.00 | 0.00 | 0.00 | 1.14 | 1.14 | 0.00 | 2.29 |

"SANTE", "ARINDA", "AGRIA" sorts is shown in **Table 1- 6**.

Data shows that these sorts are harmed in different level by virus diseases and quantity of the whole infection during separated years varies from 3.5 to 17.4% damaged plants of "CONCORDE" sort, "AGRIA" - from 0.81 to 28%, "ARINDA" has the highest level of contamination - from 3.92 to 50%, "TRESOR" - from 0.56 to 12.71; and "SANTE" - from 3.77 to 6.85. "CONCORDE" is much more damaged by

TABLE 4

**Contamination on potato viruses in the brunch selection in Momchilovtsy seed production region - 2001**

| Sort | Propagation | PVX | PVY | PVS | PVM | PLRV | Heterogenous | Visual damaged | Total | Sort |
|---|---|---|---|---|---|---|---|---|---|---|
| Concorde | SIP | 1 | 1.20 | 0.80 | 0.60 | 0.40 | 3.40 | 0.00 | 0.00 | 6.40 |
| | ST I | 2 | 1.12 | 0.84 | 0.56 | 0.28 | 6.74 | 1.12 | 1.12 | 11.80 |
| | ST II | 3 | 0.92 | 0.13 | 0.13 | 0.13 | 2.24 | 0.00 | 0.00 | 3.56 |
| Agria | SIP | 4 | 0.20 | 0.50 | 0.80 | 1.70 | 3.60 | 0.60 | 0.60 | 8.00 |
| | ST I | 5 | 0.58 | 0.38 | 0.38 | 1.15 | 7.49 | 1.34 | 1.34 | 12.67 |
| | ST II | 6 | 1.10 | 0.00 | 0.37 | 1.47 | 3.68 | 0.00 | 0.00 | 6.62 |
| Arinda | SIP | 7 | 1.10 | 0.90 | 0.80 | 1.00 | 4.10 | 1.60 | 1.60 | 11.1 O |
| Sante | ST I | 8 | 1.21 | 0.00 | 0.00 | 0.81 | 0.81 | 2.02 | 2.02 | 6.85 |
| | ST II | 9 | 0.00 | 0.24 | 0.00 | 0.94 | 2.59 | 0.00 | 0.00 | 3.77 |

TABLE 5

**Contamination on potato viruses in the brunch selection in Momchilovtsy seed production region-2002**

| Sort | Propagation | PVX | PVY | PVS | PVM | PLRV | Heterogenous | Visual damaged | Total | Sort |
|---|---|---|---|---|---|---|---|---|---|---|
| Concorde | ST I | 1 | 1.12 | 0.56 | 0.56 | 0.00 | 3.37 | 8.99 | 8.99 | 23.60 |
| Agria | SIP | 2 | 0.13 | 0.13 | 0.13 | 0.27 | 0.93 | 1.73 | 1.73 | 5.07 |
| | ST I | 3 | 0.69 | 0.17 | 0.69 | 1.21 | 2.07 | 3.28 | 3.28 | 11.38 |
| | STII | 4 | 0.00 | 0.00 | 0.00 | 0.00 | 0.65 | 0.00 | 0.00 | 0.65 |
| Arinda | SIP | 5 | 0.13 | 0.40 | 0.00 | 0.27 | 1.33 | 2.40 | 2.40 | 6.93 |
| | STI | 6 | 0.88 | 0.15 | 0.15 | 0.88 | 2.35 | 2.35 | 2.35 | 9.12 |
| Sante | STII | 7 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 2.00 |

TABLE 6

**Contamination on potato viruses in the brunch selection in Momchilovtsy seed production region -2003**

| Sort | Propagation | PVX | PVY | PVS | PVM | PLRV | Heterogenous | Visual damaged | Total | Sort |
|---|---|---|---|---|---|---|---|---|---|---|
| Concorde | ST I | 1 | 2.00 | 0.50 | 0.00 | 0.00 | 3.00 | 4.50 | 4.50 | 14.50 |
| Agria | SIP | 2 | 1.33 | 0.67 | 0.67 | 6.00 | 6.00 | 6.67 | 6.67 | 28.00 |
| | ST I | 3 | 0.97 | 0.32 | 0.65 | 3.23 | 2.90 | 2.90 | 2.90 | 13.87 |
| | ST II | 4 | 0.27 | 0.27 | 0.00 | 0.54 | 1.89 | 0.00 | 0.00 | 2.97 |
| Arinda | SIP | 5 | 4.67 | 2.00 | 0.00 | 4.67 | 8.00 | 1.33 | 1.33 | 50.00 |
| | ST I | 6 | 1.28 | 1.28 | 1.28 | 2.58 | 1.61 | 3.23 | 3.23 | 14.52 |
| | ST II | 7 | 0.26 | 0.26 | 0.00 | 1.83 | 1.57 | 0.00 | 0.00 | 3.92 |

PLRV - 6.74% (Sort Testing 1-sh year (ST1) 2001), "AGRIA" - by PVM 6% (Selection of Initial Plants (SIP) - 2003), "ARINDA" - PLRV 8% (SIP 2003). When we compare clonal selection of "CONCORDE" sort in two seed producing areas - Beglicka and Momchilovtsy, we notice increasing values of virus infection in the area of Beglicka (**Fig. 1**).

Primary links of all sorts' clonal selection (SIP and ST1) have significantly high heterogeneous virus infection from 3.43 to 50% (**Fig. 2**). Potato plants that are visually infected with typical symptoms of mosaic, chlorosis, curliness, necrosis upon nervation of leaves and necrosis strains are insignificant - from 0 to 15.33% in comparison with plants in latent infection (Table 1-6).

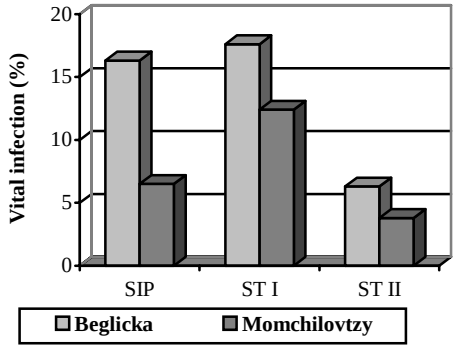


**Fig. 1.** The comparison of viral infection of "CONCORDE" sort in clonal selection in both seed production regions - 2001.

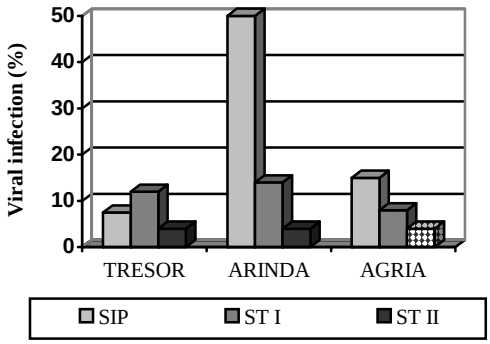


**Fig. 2.** Comparison of viral infection in clonal selection of "TRESOR", "ARINDA", "AGRIA" sorts of potatoes.

Predominating of latent form of infection is less-harmful, gives possibility for sort maintaining of those pointed sorts and provides the crop of healthy high-quality, super elite and elite seedling material.

## Conclusions

In the separate seed producing areas of high belt region of the Middle Rhodope Mountains "CONCORDE", "TRESOR", "SANTE", "ARINDA", "AGRIA" sorts are attacked by virus diseases in different level.

Researching results confirm the preliminary data that early sorts are strongly damaged by virus contamination, followed by middleearly sorts and less-damaged middle-late sorts.

All sorts in primary link of clonal selection have significantly high mixed virus infection.

The appearance of dormant infection in recent years could by explained by insufficiently accuracy of practiced diagnostic methods. They don't measure low concentration of virus infection and the presence of complicated infection fund during separated years in circumstances of high belt region of the Middle Rhodope Mountains.

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