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Alfred TIITS, Sofia VILLEMSON

VIRUS RESISTANCE CONNECTED WITH TOLERANCE IN TOMATO PLANTS

Alfred TIITS, Sofia VILLEMSON. TOLERANTSUSEGA SEOTUD VIIRUSRESISTENTSUS TOMATITAIMEDEL

Альфред ТИЙТС, София ВИЛЛЕМСОН. О ВЗАИМОСВЯЗИ РЕЗИСТЕНТНОСТИ И ТОЛЕРАНТНОСТИ ТОМАТА К ВИРУСУ

Tomato aspermy virus (TAV) may cause considerable loss of yield and falling of fruit quality in tomato crops and that is why we have been studying its prevention, including searching for immune or resistant tomato plants during the last years.

On the whole, the tomato varieties are susceptible to TAV, but react differently — from tolerantly to sensitively (Виллемсон, 1985). Besides many susceptible (sensitive and tolerant) plants there has been found one resistant plant among F_1 seedlings of the hybrid variety 'Apato'. In the offspring of this single resistant plant there were both, the susceptible and resistant plants (Виллемсон, Тийтс, в печати) but with every generation the number of resistant plants increases. Resistance factor increases in tolerant plants, too, and there seem to be a connection of resistance to tomato aspermy virus and tolerance to aspermy disease. The present investigation characterizes this phenomenon and shows the effectiveness of selection for resistance, too.

Materials and methods

We have been examining seedlings immune to TAV tomato plants N 2, 5, 15 and 19 of more immune or resistant line Aps 6s10 selected by us (see Виллемсон, Тийтс, в печати). Tomato plants were planted in soil mix (1 : 1: :1, peat, sand, field soil) in 10 cm diameter pots in a greenhouse.

The strains of tomato aspermy virus used for all experiments on the resistance of tomato plants to virus were originally isolated from tomato in one of the greenhouses in Tallinn (designated as TAV_T) and in South Estonia (designated as TAV_{SE}) (Виллемсон, 1982). Stock cultures were maintained on plants of *Nicotiana glutinosa* L.

The virus inoculum has been applied with a spatula to a tomato leaf (3) surface dusted with carborundum abrasive. The inoculation was repeated after 10 days.

The appearance of the symptoms of the aspermy disease indicated the sensitive plants. The symptomless plants for distinguishing the tolerant and immune ones were back-inoculated to *Nicotiana glutinosa* plants and/or grafted with a sensitive scion (our TAV-sensitive line Aps 16).

Supplementary virological tests by sap-inoculations to *Nicotiana glutinosa plants* were made after the tomato scion and stock were grown together.

Results and discussion

By an earlier publication (Виллемсон, Тийтс, в печати) it is known that one seedling plant of 'Apato' (designated as Aps) immune to TAV_T and TAV_{SE} contained in the first generation resistant and tolerant plants

Ratio of the resistant and the susceptible plants in offsprings of the best plants selected in the four generations

$$\text{Aps} \rightarrow \frac{47\%\ \text{t} + 6\%\ \text{s}/17\%\ \text{t}+30\%\ \text{s}}{47\%\ /\ 53\%}\ \overline{|6|} \rightarrow \frac{100\%\ /33.3\%}{0\ /66.6\%\ \text{t}}\ \overline{|6\text{s}10|} \rightarrow \frac{78\%\ /100\%}{11\%\ \text{t}+11\%\ \text{s}/\ 0}$$

$$\overline{|6\text{s}10\text{s}19|} \rightarrow \frac{100\%/100\%}{0\ /\ 0}$$

TAV_T / TAV_SE, $\frac{\text{resistant}}{\text{susceptible}}$, t — tolerant, s — sensitive.

in ratio 1 : 1 to TAV_T and 3 : 1 to TAV_SE, in the second generation 1 : 0 and 1 : 3.6, in the third generation 1 : 1.6 and 1 : 1.4, accordingly. Nevertheless, the seeds were taken only from immune plants. If at the beginning there were sensitive plants, too, in the third generation the number of sensitive plants was significantly smaller and only the heredity of resistance and tolerance was parallel. It showed that the resistance and tolerance of tomato plants to TAV can be closely connected.

The change appeared in the fourth generation. The experiments by sap-inoculations and graftings demonstrate that the great majority of seedling tomato plants of Aps 6s10s2, Aps 6s10s5, Aps 6s10s15 and Aps 6s10s19 are immune to TAV_T and TAV_SE. Only in generations of Aps 6s10s2 and of Aps 6s10s5 16% and 7% of plants, respectively, were observed with virus infection. But these virus-susceptible tolerant plants showed weak symptoms of TAV on test plants of *Nicotiana glutinosa* after one month (normally after 5 days). It can be regarded as weak virus concentration and a narrow virus population in tolerant seedlings of Aps 6s10s2 and of Aps 6s10s5, which indicate that tolerant plants are also resistant.

It is in accordance with the point of view of J. I. Cooper and A. T. Jones (1983): "Tolerance is not necessarily, but in some instances is, correlated with virus concentration. The decrease in concentration may be caused by resistance to virus multiplication and/or invasion and, in such instance, plants are both resistant to virus and tolerant to disease".

If weak virus concentration was demonstrated well by the sap-inoculation experiments on the test plants of *Nicotiana glutinosa*, some grafting experiments did not show it so well. The susceptible scion caused a rise in virus concentration in stock plant and the appearance of the symptoms of TAV. It was also shown that the virus concentration did not fall after the removal of the susceptible scion. Evidently the low virus concentration type resistance to TAV of our tolerant tomato plants is unstable. That is why it is very desirable that breeders keep doing careful virological control and not release varieties which carry tolerance and/or changing resistance to viruses. It is necessary to develop the resistance to durable quality (Тийтс, Агур, в печати).

REFERENCES

Cooper J. I., Jones A. T. Responses of plants to viruses: proposals for the use of terms. — Phytopathology, 1983, 73, 127—128.

Виллемсон С. Сравнительное изучение свойств двух штаммов вируса аспермии томата, выделенных в Эстонии. — Изв. АН ЭССР. Биол., 1982, 31, 219—225.

Виллемсон С. В. Реакция сортов на штаммы вируса аспермии томата. — Плодоовощное хозяйство, 1985, № 9, 18—19.

Виллемсон С. В., Тийтс А. А. Селекция томата на устойчивость к вирусу аспермии томата. — С.-х. биол. (в печати).

Тийтс А. А., Агур М. О. О некоторых категориях фитовирусологии, важных для селекции. — С.-х. биол. (в печати).

Academy of Sciences of the Estonian SSR,
Institute of Experimental Biology

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