EESTI NSV TEADUSTE AKADEEMIA TOIMETISED. 19. KÖIDE
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A. TIITS

STUDIES ON THE ETIOLOGY AND PATHOLOGY OF THE BLACK-CURRANT REVERSION

III. Further information on the reactions of currant species to the pathogen of reversion

A. TIITS. UURIMISI MUSTASÕSTRAREVERSIOONI ETIOLOOGIA JA PATOLOOGIA ALALT. III. Uusi andmeid sõstraliikide reageeringutest reversiooni põhjustajale

А. ТИЙТС. ИЗУЧЕНИЕ ЭТИОЛОГИИ И ПАТОЛОГИИ РЕВЕРСИИ ЧЕРНОЙ СМОРОДИНЫ. III. Новые данные о реакции видов смородины на патогенез реверсии

The black-currant reversion pathogen is supposed to be strictly confined to a single host species, which could be a very favourable situation for breeding resistant varieties for disease control. But there are conflicting or unclear data as to which of the currant and gooseberry species can be infected latent-systemically and which really have a resistance factor. On account of that fact, in 1965, corresponding investigations were taken up again, after some pause, at the Institute of Experimental Biology of the Academy of Sciences of the Estonian SSR. On the basis of new experiments, some further data have been obtained on the reactions of currant and gooseberry species to the pathogen of reversion, in addition to the previously published ones (Тийтс, 1964).

Material and method

Various species of the genera *Ribes* L. and *Grossularia* Mill. were collected for this study (in the case of crop plants, the primary species are preferred as well). The plants (seedlings) were subjected to experiments after propagation vegetatively, for the formation of an "absolute comparison (control) set". The parallel material formed in this way was inoculated with the reversion pathogen (from reverted 'Boskoop Giant' or 'Goliath' black currants) by the ablactation method. If no disease symptoms appeared in the inoculated plant, it was grafted with healthy black-currant indicator variety 'Boskoop Giant' for obtaining clarity if the pathogen in latent form or the plant was immune.

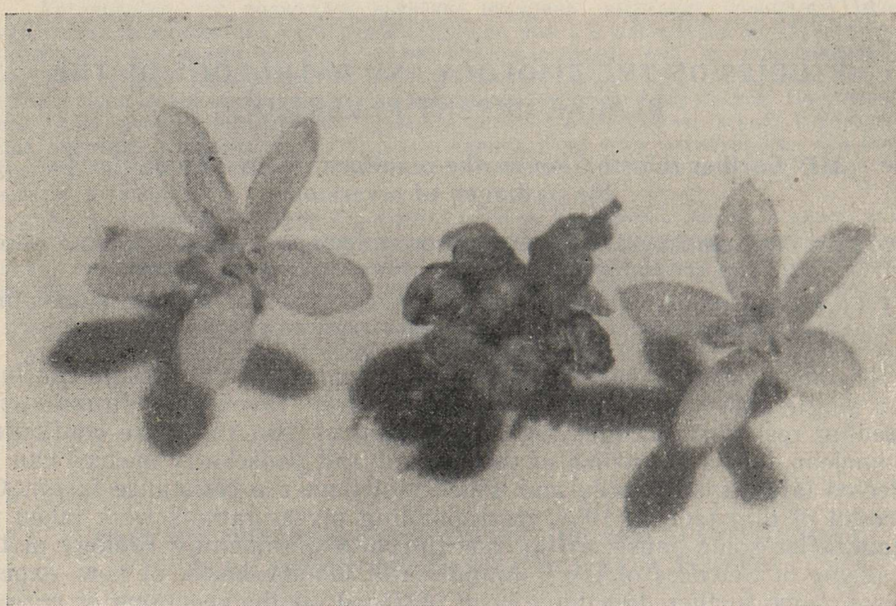
Results and discussion

Experiments indicate that all the black currant-type plants (*Ribes nigrum* L. *europeum* Pavl. and subsp. *sibiricum* (E. Wolf) Pavl., *R. dikuscha* Fisch, *R. pauciflorum* Turcz.[1] and mutual hybrids)[2] occurring in the experiment were more or less susceptible to the reversion pathogen.

[1] Synonyms: *R. ussuriensis* Jancz., *R. nigrum praecox* E. Wolf.

[2] The greater part of the material was from Krasnoyarsk and Altaian (Barnaul) Exp. Stations, grateful acknowledgement to whose workers is made by the author.

In most cases, the *R. glutinosum* Pursh. was susceptible and had similar symptoms, as well. Only, an interesting symptomatic fact ought to be mentioned. If the reverted black currant flower leaves can have axilarly bud-like formations, in some cases (Tiits, 1969) those little buds of *R. glutinosum* could form secondary axilar reverted flowers in primary flowers (Fig.). The axis of the primary flower made up a small formation resembling a cauliflower. Both the "normal" (primary) reverted flowers and the secondary ones were sterile, in most cases.



These three are the identical level flowers of *Ribes glutinosum*. The both outer flowers are normal, but the middle one, that of an infected plant, has axilarly seven secondary reverted flowers and apically a formation which resembles a cauliflower.

Susceptible species were observed in gooseberries, as well. The pathogen was transmitted succesfully to the *Grossularia pulchellum* (Turcz.)[3] (from Tashkent Bot. G.). Persistent vein pattern type symptoms, with some tendency to develop into vein-banding on some leaves, occurred on this species[4]. Some disease symptoms were observed on the *G. lacustre*[5] lately, but they require further observations.

The following forms of the resistance of the genera *Ribes* and *Grossularia* to the pathogen/disease discussed have been observed: the ordinary minor receptivity to the pathogen (resistance to infection, immunity); a restricted spreading of the pathogen in the plant (resistance to the transit of the pathogen); the low sensitivity to infection (tolerance). In the latter two forms, a slow (minor) multiplication of the pathogen (resistance to the augmentation of the pathogen) was observed, as well.

1. Species immune or resistant to infection. Experiments with various red currant-type species (*Ribes vulgare* Lam.[6] — Lug-

[3] Syn. *R. pulchellum* Turcz.
[4] In some cases, the vein pattern and/or vein-banding symptoms occur as preliminary symptoms on black currants, as well.
[5] Syn. *R. lacustre* (Pers.) Poir..
[6] Syn. *R. sativum* Syme, *R. sylvestre* Mert. et Koch.

duno-Batavus Bot. G., *R. rubrum* L. — Ottawa Bot. G., *R. petraeum* Wulf and *R. multiflorum* Kit. — Stockholm Bot. G.) indicate that all the red currants could probably belong to this group[7]. My attempts to infect these species by grafts have failed (analogous observations were made by J. M. Thresh (personal communication).

The main progenitors of gooseberry varieties, *Grossularia reclinata* (L.) Mill., *G. Uva-crispa* (L.) Mill., and *G. hirtella* Michx.[8] — Kopenhagen Bot. G. and Vácrátót Bot. G., did not show any disease symptoms, either.

It seems that a part of the species *Ribes aureum* Pursh. obviously belong here (used as a decorative plant in Estonia).

2. Species resistant to transit of pathogen. This type of resistance was observed by the author in *Ribes fasciculatum* S. et Z.[9] (Vácrátót Bot. G.) and in *R. sanguineum albidum* hort. (St. Andrews Bot. G.) and in some material of *R. nigrum* subsp. *sibiricum*. The plants of these species showed symptoms of hypersensitivity on the branch inoculated with a reversion-diseased black-currant graft. About 2 cm below the district of inoculation, i.e. under the area where the grafted branches had grown together, the cambial and the phloem tissues were swelled, hyperplastic and hypertrophic, and the conducting elements filled with callose. The inoculated branches wilted and died slowly during the vegetation period. Although there is evidence that the changes of the phloem do not allow the sap to penetrate downwards, it is not yet clear if, in all the plants investigated, these changes represent a complete obstruction of the pathogen invasion, or if the pathogen can transit systemically in some cases[10]. So far, all the bushes having resistance of this kind grow normally, without any systemic symptoms of either the plants or indicator grafts.

3. Species with a low sensitivity (tolerant) to infection. Some forms of black currants and golden currant (*R. aureum*) belong to this group. According to the information of J. M. Thresh, some forms of *R. sanguineum* may belong here, as well.

4. Since the reversion has developed on inoculated plants and also on the indicator grafts grafted on the inoculated plants, in a very long period after inoculation, in some cases, it may be supposed that a resistance to the augmentation of this pathogen can occur, aswell.

Consequently the both berry-plant genera, *Ribes* and *Grossularia* have hosts for the black-currant reversion pathogen It is auspicious for control that the pathogen has manyfold relationships to these genera. One or two fit types of resistance reactions and the good crossing ability between species of the both genera show prospects for breeding black currant-type plants resistant to reversion. The latter can be planted with success after experiments of the kind discussed here, with interspecific and intergeneric hybrids, so as to clarify the genetic determination of various resistance forms, which are in progress.

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[7] A question could be raised concerning the resistance of the variety 'Blanche de Versailles' (from the Vitena Exp. Stat. in Lithuania), although the attempts to find the pathogen in it have failed during the eight years of experiment. The plants of this variety had a portion of reverted flowers very similar to black-currant reverted ones, every year.

[8] Syn. *R. oxyacanthoides* L.

[9] Syn. *R. japonicum* Carr., *R. alpinum japonicum* Nichols.

[10] The earlier brief observations of another material of *Ribes fasciculatum* (from Paris Bot. G.) indicated that the pathogen could invade the whole system, i.e. the plant, as a result of which the whole plant died. Because those plants died rapidly, they could also be considered as resistant to the transit of the pathogen (to the transit in the population of plants, but not to the transit in the one plant).

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О. ПРИЙЛИНН, В. ТАЛИ

СОДЕРЖАНИЕ БЕЛКА И ЕГО АМИНОКИСЛОТНЫЙ СОСТАВ У МУТАНТОВ ЯРОВОЙ ПШЕНИЦЫ

O. PRIILINN, V. TALI. SUVINISU MUTANTIDE VALGUSISALDUS JA SELLE AMINOHAPPELINE KOOSTIS

O. PRIILINN, V. TALI. PROTEIN CONTENT AND ITS AMINO ACID COMPOSITION IN THE MUTANT FORMS OF SUMMER WHEAT

Установлено, что содержание белка в зерне пшеницы зависит от места ее выращивания. Процент белка повышается соответственно продвижению места выращивания с запада и северо-запада на юг и юго-восток. Эстонская ССР принадлежит к числу районов, где выращивается пшеница с низким процентом белка, поэтому при выведении новых сортов селекция на качество зерна является одной из основных задач наших селекционеров. Однако общеизвестно, что получить сочетание хорошего качества с высокой продуктивностью у пшеницы очень сложно; качество пшеничного зерна определяется многими технологическими и биохимическими показателями. Существует закономерность: чем выше продуктивность растений, тем труднее добиться хорошего качества зерна.

В Институте экспериментальной биологии Академии наук Эстонской ССР в последние годы ведутся работы по изучению действия химических мутагенов на наследственную изменчивость у яровой пшеницы (Прийлинн, 1968а, 1968б; Priilinn, 1968). К настоящему времени уже сформировались некоторые константные линии мутантов, полученные с помощью химических мутагенов *N*-нитрозоэтилмочевины и *N*-нитрозометилмочевины у яровой пшеницы сорта 'Норрэна'. Они представляют интерес для анализа и оценки. В наших исследованиях, кроме всего прочего, обращается внимание на выяснение возможностей повышения содержания белка в зерне мутантов, полученных при химическом воздействии, и улучшения его аминокислотного состава

Первые определения содержания белка в зерне мутантов, отличающихся несколько измененными морфологическими признаками, проводились у второго поколения (M_2) в 1967 г., а затем у третьего (M_3) в 1968 г. Данные представлены в табл. 1, откуда видно, что у плотноколосой и остистой линий содержание белка в зерне в M_2 выше, чем у контроля, а в M_3 несколько отстает. У компактоидов процент белка по сравнению с исходным сортом выше в обоих поколениях: в M_2 на 4,7%, а в M_3 на 1,44%. Повышенные показатели белка у всех образцов