T. Pl.ziekten 62 (1956): 76–79

A NEW METHOD SUGGESTED FOR BREEDING FRUIT TREES RESISTANT TO VIRUS DISEASES

BY

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Contemporary science has not yet given reliable means of curing virus diseases, which seriously menace some fruit species, especially the stone and citrus fruit trees. And when it is a question of plant viruses which have vectors, the usual preventive measures are very difficult to carry out. That is the reason why the growing of fruit trees which are resistant to the virus diseases is very important.

However, the breeding in this direction does not give satisfactory and reliable results. The main reasons are: 1) it is difficult to find the fruit varieties, which are both entirely resistant to viruses and have good quality fruits; 2) there is no certainty in combining, through hybridization, the resistance of one parent and the quality of fruits of another parent; 3) there is no certainty in obtaining the variety which will remain resistant long enough or even tolerant, as shown by the exemple of the virus tolerant strawberry varieties (DARROW, GOHEEN et al (12)).

Let us pay attention to the Yugoslav prunes menaced by the virus disease Sarka (JOSIFOVIC (27)). In spite of some opinions about the existance of varieties resistant to that virus (HRISTOV (24), POBEGAJLO (42)), the Sarka is apparently manifested on many plum and prune varieties grown in Yugoslavia, and even on the nearly wild plum tree *Prunus myrobolana* (STANCEVIC and PAVICEVIC (48), STANKOVIC, PAVICEVIC and BEBIC (47)). Could we speak at all about the prune varieties really resistant to the Sarka disease? If we cannot find these varieties, then it is not advisable even to try breeding in this direction.

Nevertheless, it is very necessary to make efforts in breeding, in order to obtain the fruit varieties which are completely or practically resistant to virus diseases. But, for a successful work we are obliged to search for better methods, to improve the usual varieties and to find out new ones.

In the author's opinion, it is necessary first of all, to develop and apply precisely the method for effecting the influence of nucleic acids, in order to form the resistance of fruit trees to the virus diseases, using the extremely important role of these substances for the manifestation and transmission of the inherited characteristics of all live beings (BRACHET (9 and 10), KHOUVINE, MORTREUIL et al (29), PEREY, MANDEL et al (41), RATH (43), BERNSTEIN (6), ROWLANDS (44), MARSAK and MARSHAK (36), LANCE (31), KHOUVINE and WEISMANN (30), MULLER (38), CAMEFORT (13), SCHWABITZ (45), BACQ and ALEXANDER (4), BUTENANT (11), KANAZIR (28)). Although there has been no sure proof so far as to the influence of the nucleic acids upon the formation of resistance of fruit trees to virus diseases, this possibility cannot be excluded. We have some facts showing these possibilities: 1) with micro-organisms one can safely obtain adequate changes of inherited nature, and the corresponding changes of the morphological and physiological characteristics, under the in-

fluence of appropriate nucleic acids added to the nutritional media, in which the above mentioned micro-organisms have been grown (GRIFFITH (20 and 21), AVERY, MACLEON et al (3), BOIVIN, DELANNOY et al (7), BOIVIN (8), TAYLOR (50), ALEXANDER and LEIDY (1), ALEXANDER (2), HOTCHKISS (22 and 23), ZAMENHOF (54), SCHWANITZ (45), KANAZIR (28)); 2) in F_1 and F_2 generation of tomato grafted on eggplant has been noticed a more vigorous growth, and in leaves and young branches considerably more nucleic acid was found than in the corresponding organs of the new grafted rootstock and scions of plants (SEMENENKO and TIMASOVA (46)); 3) by growing young embryo culture of lemon in appropriate solution to which has been added an extract of cotyledons of some other citrus, and then followed by grafting the obtained shoot on a suitable rootstock, a favourable inherited change may be obtained on the seedling (ZDRUJOVSKAJA (57)); by appropriate rootstock and grafting, especially under the extreme ecological conditions of the USSR, various inheritable changes have been effected, which may be explained by the changed conditions of the formation and the metabolism of nucleic acids, as well as by other similar influences of biochemical nature, through these substances (BAZAVLUK (5), GORSKOVA (19), CERNENKO (13), ISAIEV (25 and 26), MICURIN (39), MARKOV (35), TURBIN and HABAROVA (53), GLAVINIC (18), ZORIN (58 and 59), TAVCAR (49), MAMONTOVA (34), TERNOVSKI (51), MEDINEC (37), MACLAREN and MICHIE (33)).

Judging by the results obtained up to now, the author considers that it would be expedient to improve the method of ZDRUJOVSKAJA (56) applying the nucleic acids to the selected fruit tree varieties, in order to influence the sexual cells, both male and female, before their fusion during the fecondation, then on young embryo, and finally on the young fruit tree. To make it more clear, the author suggests the following procedure:

To inject the extracted nucleic acids from cotyledons of specially selected fruit trees just before the meiosis of sexual cells and by this means affecting the embryo sac and pollen cells during their formation. Instead of the injection one can try to wet the flower buds in order to get the same effect. In the same way it is necessary to affect the first phases of embryo development. Then as early as possible one must isolate the embryo to be developed and to germinate in artificial media which is quite possible (TUKEY (52), GILMORE (17), NICKELL (40), DANIELSSON (14), ZDRUJOVSKAJA (55, 56 and 57), LOUIS and SHOPFER (32)). For this artificial culture of the isolated embryo one must apply not just the ordinary extract of cotyledons but the extract of nucleic acids from the cotyledons. Finally, the quite young seedling must be, as soon as possible, grafted on developed trees, which is safely possible (ZDRUJOVSKAJA (56), LOUIS and SCHOPFER (32), EVANS and DENWARD (16)). It is quite obvious that in this succession it is necessary to use the same influence, i.e. the nucleic of the same previously selected fruit trees, the influence of which we have to use in order to obtain, in this case, the resistance to virus diseases. It would be very important and useful to combine those methods by the application of different radiation/x-rays, gamma rays from CO_{60} and so on.

The author supposes that those methods will give us the possibility to influence the biochemical processes of cells, responsible for the inheritable changes.

That is the reason why the author thinks that it is very necessary, for a

successful work, to combine the efforts of the specialists in fruit breeding, phytopathology and biochemistry.

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DISCUSSION

THUNG: In what way do they consider nucleic acids and what kind of nucleic acids are meant? Will they be taken up by the embryo?

Answer: The nucleic acids are the main factors of heredity. All the nucleic acid is extracted. This is very difficult. The different nucleic acids can not be separated so all nucleic acids are extracted. Sometimes the embryo will assimilate these, or select some of them.

BAUMANN: Was the sap of the frost resistant Crassulacae sprayed over the seedlings or injected in them?

Answer: The extracted sap was used in two ways: by spraying the leaves of cabbage and by adding it to the media for germination of cabbage seeds.

THUNG: From the data mentioned it is not sure that there is any basis for the suggestion that nucleic acids can be applied to and will influence virus diseased plants.

Answer: We are not sure too but it can be tried. According to the mentioned results realised up to now, we can expect some very important success in this direction.

T. Pl.ziekten 62 (1956): 79–82

FIELD INSPECTION ON VIRUS DISEASES IN ARBORICULTURE IN THE NETHERLANDS

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For a considerable time the importance of a direct application of the results of scientific research in practice is recognized in the Netherlands. That is why a close cooperation exists between the Institute for Phytopathological Research, the Plant Protection Service and the Field Inspection Boards; also between research, practical application and regulation and the performance of the inspection. I should like to tell you something about this, because this cooperation forms the base of the work done in practice.

First a few words about the actual field inspection. As more and more countries require field inspection as regards the state of health, we see this work as a necessary and important part of the whole export inspection. Field inspection is carried out by the General Inspection Board for Arboriculture of which Mr ERKELENS is the director.

The General Inspection Board for Arboriculture (N.A.K.-B.) endeavours