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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

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NOTE ON DISEASE RESISTANCE AND RESISTANCE TESTING IN VEGETABLE SPECIES

Document prepared by experts from the Netherlands

4003V

NOTE ON DISEASE RESISTANCE AND RESISTANCE TESTING IN VEGETABLE SPECIES

During the TWV meeting at Menstrup Kro, Denmark in July 1993 it appeared useful to the working party to prepare a note on the subject of disease resistance and resistance testing.

Definitions:

Resistance: the complex of characters of a host which slows down the development of the pathogen or parasite (including the multiplication of the virus).
The opposite of resistance is **susceptibility**. Both are considered as gradual, because they rely on the interaction of the resistance genes in the host and the virulence genes in the pathogen.
In resistance breeding however resistance is considered gradual and susceptibility is considered as absolute.

Susceptibility: the opposite of resistance; the inability of the host to hamper the development of the pathogen in the host tissues.

Tolerance: the phenomenon that a host does not show or hardly shows any damage from the pathogen developing inside the host.
The opposite of tolerance is **sensitivity**. Again both concepts are considered as gradual, but in resistance breeding tolerance is used as a gradual concept and sensitivity as absolute.

Sensitivity: the opposite of tolerance; the ability of the host to react relatively strongly to the pathogen or parasite, which results in the expression of symptoms.

For detailed information on terminology of disease resistance and related matters the literature references should be consulted.

Expression of disease resistance under artificial testing conditions:

For twenty years disease resistance characteristics have been used for plant variety description, because disease resistances are the main breeding goal in many vegetable species.
The most important restriction for inclusion of resistance characters always was that a reproduceable testing method should be available, mostly under fully controlled conditions. The reaction patterns of the varieties in these initial tests were mainly black and white or susceptible and resistant.

Gradually also more complicated disease resistance characters had to be applied in many crops and resistance testing became the work of specialists. The reactions of the host plants to the artificial inoculation showed some variation in the expression of symptoms and were scored in a number of symptom-classes which had to be related to susceptible and resistant standard varieties or in some cases host differentials, e.g.: Colletotrichum lindemuthianum in French bean (char. 44). Here according to the symptoms the damage is scored in four groups I to IV; I and II being resistant and III and IV susceptible. This conclusion of the disease test result is related to the behaviour of reliable resistant and susceptible standards.

Specialists in DUS testing could have problems with this variation in expression of symptoms, but this variability can be classified into resistant and susceptible classes based on the expression of the standards or the host differentials. Under these circumstances all plants of the tested variety should either be classified as resistant or susceptible. This means that the test result is translated by an independend expert in disease testing who also gives his judgement about the uniformity of the material under test.
If not, a number of disease resistances can not be used for variety distinction because they hardly would fit to the homogeneity requirement, although all plants of the varieties behave either as resistant or susceptible under normal growing conditions in the field or the glasshouse.

We should be aware that a resistance testing method is based on artificial inoculation under controlled conditions in which we try to achieve a clear distinction between resistant and susceptible. It is always a simulation of the situation that could occur under natural conditions, where we also observe a variation in the strength of the symptoms. The method for resistance testing has to cope with this problem.

In DUS testing such a variation in expression of symptoms could in our opinion be accepted if all or nearly all plants either fit into the susceptible or in the resistant class.

'Resistance' or 'tolerance':

The distinction between 'resistance' and 'tolerance' is not always clear even from a scientific point of view. The definitions are clear but the practical situation is not always. Under these circumstances breeders and applicants stick to the terminology that is used most frequently in literature even if wrong. UPOV should be aware of these problems in its recommendations. If possible the scientific correct terminology should be adopted.

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