RESISTANCE TO TOP YELLOWS
AND FUSARIUM WILT IN PEAS

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1. INTRODUCTION

Top yellows, a virus disease in peas and broad beans, had been known in Western Europe for at least thirty years as “Fusarium solani foot disease”, but as a result of visiting L. QUANTZ at Braunschweig (Western Germany) in the summer of 1954, the present writer learned the real cause of the disease. In spite of this discovery the Plant Breeding Station of the “Centraal Bureau” at Hoofddorp introduced the resistant pea varieties Rondo and Stijfstro (= Erecta) as long ago as 1943 and 1944 respectively.

Fusarium wilt of peas has been known in the Netherlands for only about ten years, and the first wilt-resistant Dutch pea variety, Vares, bred by the station mentioned above, was introduced in 1953.

Nowadays resistance to top yellows and wilt are the principal breeding objectives of most pea breeders in the Netherlands. In this article the writer describes the diseases concerned, and discusses methods for testing for resistance. In addition many commercial varieties are listed in order to give information on their resistance or susceptibility in so far as these properties are known.

2. TOP YELLOWS

Cause

As long ago as 1948 the writer suspected that the disease was caused by a virus, but he did not succeed in confirming that it could be transmitted via the juice from diseased plants; moreover, preliminary experiments with pea aphids did not support this assumption. It was not until the results of research by QUANTZ and Völk (1954) and DE FLUTTER and HUBBELING (1955), that it was proved that the virus could not be transmitted mechanically via the juice, and that a long feeding period of the aphids was necessary in order to infect the plants.

Since translocation is impeded it is obvious that affected plants are liable to succumb to secondary parasites in the soil, such as Fusarium solani and Fusarium culmorum. Using these fungi, isolated from the roots of infected plants, it would seem that infection cannot be accomplished, in Western Europe at least, without weakening or injuring the plants in some way beforehand. Contrary to European experience, however, is the occurrence of the parasitic Fusarium solani f. pisi (JONES) SNYDER and Hansen in the southern states of North America.

In Germany the disease is called “Blattroll” and, in agreement with the Dutch name, it has been called “Jaunisse du pois” in Belgium (ROLAND, 1955). ROLAND proposes to refer to the virus as Pisum virus 8. Contrary to our experience, however, he has described a yellowing of the leaf edges half-way up infected plants of the variety Kelvedon Wonder; in our field trials this variety has proved to be resistant to top
yellows. At Gembloux (Belgium) the writer observed very heavy damage due to top yellows in many susceptible pea varieties. Varieties known as resistant in the Netherlands remained healthy there, confirming that the symptoms must certainly have been due to top yellows.

Symptoms

Characteristic symptoms of the disease in peas are that growth is inhibited and the stems and leaves turn pale beginning generally in the apical parts where the leaflets often remain narrow and pointed, folded together or heavily curled and pointing upwards. Older leaves assume a twisted and yellowed appearance. All aerial parts of affected plants become rigid and brittle; later the bases of the stems and the roots show a red internal discoloration and ultimately the plants collapse completely. Plants may have become infected long before the discoloration shows. As with sugar beet yellows and potato leafroll, the virus induces phloem necrosis, which obstructs translocation from the leaves to the stems and roots. QUANTZ made this necrosis clearly visible in microscopical preparations by staining with fuchsin.