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DISEASE HAZARDS IN POTATO CULTIVATION

II.—Brown Rot or Bacterial Wilt caused by *Pseudomonas Solanacearum*.

By

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INTRODUCTION

BROWN rot or bacterial wilt caused by *Pseudomonas solanacearum* is the most disastrous of all diseases affecting the potato crop in Ceylon. The first systematic survey of the disease was made in 1960 (1). This survey revealed that the disease is more or less the limiting factor in the extension of the crop into existing cultivators' holdings at elevations below 5,000 feet. In the absence of direct methods of combating this disease the importance of obtaining resistant potato varieties was recognised. Most work done in this connection in other countries involved the testing of common varieties and hybrid lines but none of these have shown high resistance or immunity. An attempt has been made herein to analyse the factors which would help in raising successfully both seed and commercial potato crops in Ceylon with a view to combat and avoid the disease.

SYMPTOMS OF DISEASE

THE above ground symptoms characteristic of the disease are wilting, stunting and yellowing of the foliage. The first symptom invariably seen on a warm day is the drooping of tips of one or more lower leaves but this condition may be mistaken for shortage of soil water. The affected leaves may recover their turgidity towards evening but wilting will extend further the following day. A slight yellowing of the lower leaves becomes evident when the leaflets begin to droop; sometimes only one branch on a single potato hill may show symptoms of wilt. In other cases, however, foliage of an entire hill may quickly wilt. (Plate I). Potato tubers from diseased plants may or may not show external symptoms. Brownish discolorations can sometimes be seen through the skin indicating that the disease is well advanced.

Examination of infected tubers usually reveals a distinct brown rot localised in the vascular rings. If a diseased tuber is cut a slight pressure will force the typical greyish white bacterial slime out of the vascular ring. (Plate II). Infected tubers left in the ground continue to decay especially in wet weather. The secondary organisms gain entry and cause the breakdown of the tuber into a slimy mass surrounded by a thin layer of outer tissue.

The Pathogen. Rapid multiplication of *P. solanacerum* occurs at relatively high temperatures; it shows resistance to relatively low temperatures (3). The bacterium is inactivated at pH below 4.0 (2) and rapidly multiplies under alkaline conditions. High soil moisture level resulting from high water table or heavy rainfall usually favours development of bacterial wilt. The bacterium is known to be aerobic and flooding soil as practised in paddy cultivation has harmful effects on its survival. This accounts for the lesser incidence of disease recorded in potato crops raised in rotation with paddy (1).

Investigation on Resistance of Potato Varieties. Reports on the relative susceptibility of potato varieties to this disease are numerous and conflicting. In extensive replicated field experiments potato varieties were planted in heavily infested soil at the Agricultural Research Station, Rahangala. In these experiments the following varieties were rated as susceptible with more than 75 per cent. of plants affected with bacterial wilt. In these tests the percentage of plants wilted was not the only criterion adopted in evaluating resistance. The age of wilting and tuber infection were also considered useful factors. The varieties are Sebago, Up to Date, Green Mountain, Katahdin, Great Scott, Voran, Gineke, Majestic, Arran Banner, Huron 1, British Queen, Phulwa, Hokkai 17, Pungo, Ulster Torch, Rival, King Edward, Dekama, Profijt, Essex, Tedria, Indian seedlings ON 1360 and ON 2236, Kentang, Wulong, Saco, Ambassadeur, Virgil, Courtland, Placid, Poet, Alpha, Cherokee, Noordeling, Arka, Dutch Seedlings GB 5269-22 and GB 5210-5-9, Libertas, Maritta, Pimpernal, Eigenheimer and the local variety *S. tuberosum* sub species *andigenum*. Five potato selections known to show some resistance to bacterial wilt in U. S. A. namely Prisca, 2117-117, 2407-12, 2410-78 and 56C-3 obtained through the courtesy of Prof. Neilson of North Carolina State College were also included in tests for resistance. Figure 1 shows progressive wilting of relatively resistant variety Prisca and a highly susceptible variety Dekama when tested in heavily infested soil. The variety Prisca exhibited fair resistance to bacterial wilt, 72 per cent. of plants wilting as against 95 per cent. of the variety Dekama.

CONTROL

SINCE the pathogen can be disseminated in seed potato tubers emphasis should be given to the use of disease free seed. The main object of such a recommendation is to prevent the introduction of the disease into fields where it is not present. Furthermore, the severity of infection is greatly reduced when plantings are made with disease free seed in fields where infestation is mild or uneven. Planting of disease free seed in infested soil, however, will not necessarily obviate the danger of serious crop losses. The use of disease free seed is of paramount importance in countries where seed potatoes are grown in infested soil. Rigid seed potato selection would therefore be an important means of reducing losses caused by bacterial wilt. Sterilization of the cutting knife with boiling water or by passing through a flame or dipping in mercuric chloride solution when there is a possibility of transmitting the bacterium from infected to healthy tubers is recommended. The control obtained by rotation with a non-susceptible crop has been attributed to starving out the organisms from infected soil.

ACKNOWLEDGMENT

THE authors are thankful to Mr. D. Gunawardena for assisting in these investigations.

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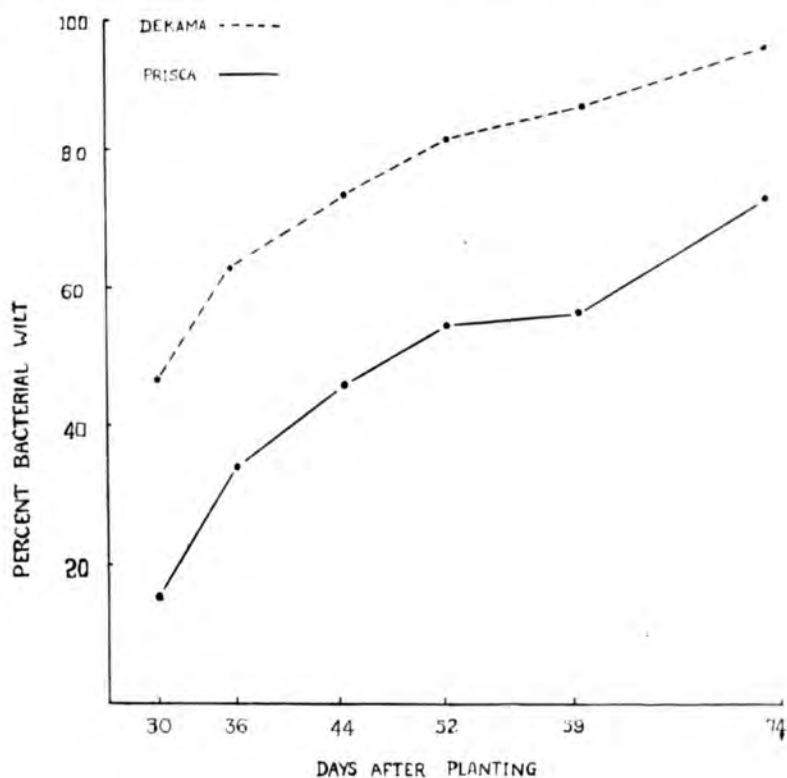


Fig. 1.—Relative susceptibility of the potato varieties Dekama and Prisca to bacterial wilt caused by *P. solanacearum*.



Plate I.—Potato plants affected with bacterial wilt caused by *P. solanacearum*.

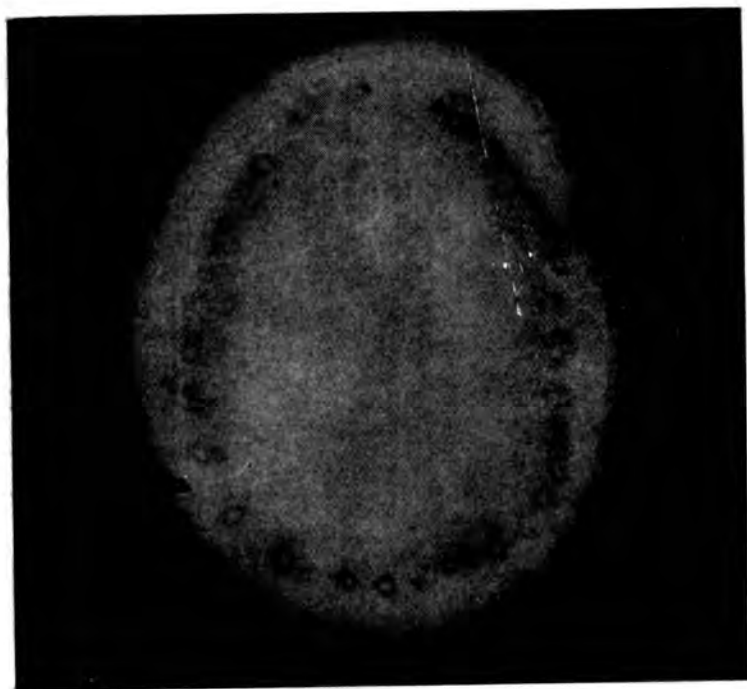


Plate II.—Cross section of an infected potato tuber showing discoloration of the vascular region and bacterial ooze of *P. solanacearum*.