

## THE OCCURRENCE OF BACTERIAL BLIGHT OF PEAS IN ISRAEL

Y. BASHAN and R. KENNETH\*

Bacterial blight of peas was found for the first time in Israel, so far in two different regions. It was identified according to pathogenicity tests, appearance of symptoms, and physiological characteristics of the bacteria.

**KEY WORDS:** *Pseudomonas syringae* pv. *pisi*; *Pisum sativum* L.

Peas (*Pisum sativum* L.) are grown at present in Israel on a limited scale, with approximately 1,500 ha, principally for the frozen food industry, under cultivation. Seven leaf diseases of peas are known here, all caused by fungi (5). However, the most common worldwide bacterial blight disease, caused by *Pseudomonas syringae* pv. *pisi* [Sackett 1916] Young, Dye and Wilkie 1978 (6), had not previously been identified in Israel (5, 9). *P. syringae* pv. *pisi* is recorded as of only minor importance in Lebanon (7).

In the spring of 1980, a number of pea plants which showed bacterial blight symptoms were found in a high school demonstration plot in Rehovot. The initial symptoms were very small, water-soaked lesions on the pods, stems and leaves. The lesions later became enlarged, and the tissue turned brown and papery in texture. Finally, the leaflets, stems and eventually the whole plant wilted and died.

Bacteria isolated from the diseased plants were aerobic, Gram-negative, motile and produced diffusible, green fluorescent pigment on King-B medium. A second isolation of the pathogen was carried out in spring 1981 on pea debris from a commercial field in the northern Negev.

Bacteria were isolated on King-B medium supplemented with 9 mg/l basic fuchsin, and 140 mg/l triphenyl tetrazolium chloride. Pathogenicity tests were done on pea plants cv. 'Scout' on 25 seedlings (two true leaves) by spraying a suspension containing  $10^5$  colony-forming units (CFU)/ml on the leaf surfaces. Plants were then transferred for 8 days to partial mist conditions (5 sec mist every 30 min), in a greenhouse at  $25 \pm 2^\circ\text{C}$ , under natural daylight conditions (1,4). Symptom appearance on inoculated pea plants was similar to that on naturally infected peas (Fig. 1).

Laboratory identification was made according to the Commonwealth Mycological Institute's "Descriptions of Pathogenic Fungi and Bacteria" (3) and to Sands *et al.* (8). The following tests were made, all with positive results: Production of levan on yeast-peptone agar supplemented with 5% sucrose, gelatine liquefaction, production of nitrite from nitrate, ammonia production from nutrient broth medium or from synthetic medium (2) supplemented with glutamine and asparagine as nitrogen sources, catalase and protease activity, bacterial motility, fluorescent pigment on King-B medium, utilization of sorbitol, sucrose,

Received Jan. 13, 1983; received in final form April 10, 1983.

\* Dept. of Plant Pathology and Microbiology, The Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot.



Fig. 1. Bacterial blight symptoms on inoculated pea plants. n = necrosis.

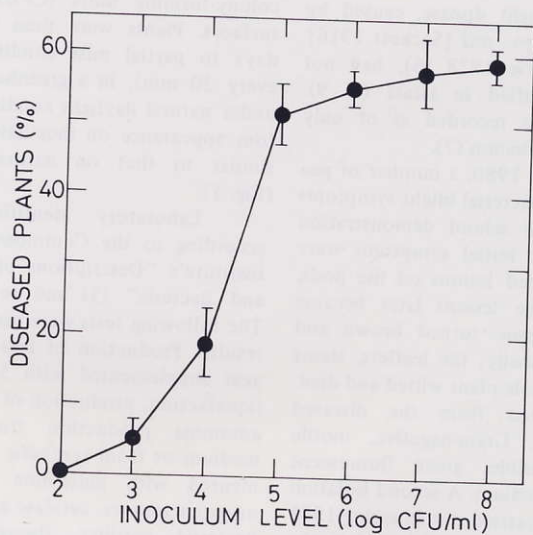


Fig. 2. Development of diseased seedlings from pea seeds artificially infested with *Pseudomonas syringae* pv. *pisii*. Disease was recorded 9 days after transferring seedlings to mist conditions. Bars represent standard error.

mannitol, inositol and homoserine. The pathogen caused a hypersensitive reaction on pepper and tomato plants (4-6 true leaves), which were injected at an inoculum concentration of  $10^{10}$  CFU/ml and incubated for 4 days under partial mist conditions as described above. When tested for starch hydrolysis,  $H_2S$  or indole production, oxidase, arginine hydrolase, nitrate to  $N_2$ , growth at  $41^\circ$ , utilization of benzoate, cellobiose, trehalose, L-tartrate, D-tartrate, D-arabinose, L-lactate, L-valine, L-isoleucine and 2-ketogluconate, results were negative, as in the pathogen descriptions (3,8).

Transfer of bacteria from seeds to seedlings was effected by infestation of seeds at various concentrations ( $10^2$  -  $10^8$  CFU/ml), followed by sowing (20 replicates, five seedlings per replicate) in an autoclaved (Tyndallization) tuff growth medium. After emergence, seedlings were subjected to partial mist. An equal

number of control plants was sprayed with sterile water and incubated under the same conditions. It was found (Fig. 2) that  $10^3$  CFU/ml (original concentration) on the seeds was sufficient to initiate the disease, which appeared first within 5 days under misting as localized lesions on inoculated plants only, similar to those obtained on artificially inoculated pea plants. The disease developed quickly to epidemic proportions and 62% of the plants died after 2 weeks of incubation. The control plants were neither diseased nor did they die.

From the above evidence, it is not clear whether the pathogen is indigenous or had been introduced from abroad years ago or only lately. However, careful monitoring of the disease in commercial fields should be initiated to prevent further spread of the pathogen, which is known to be seed-transmitted (3).

#### REFERENCES

1. Bashan, Y., Okon, Y. and Henis, Y. (1978) Infection studies of *Pseudomonas tomato*, causal agent of bacterial speck of tomato. *Phytoparasitica* 6: 135-143.
2. Bashan, Y., Okon, Y. and Henis, Y. (1982) A note on a new defined medium for '*Pseudomonas tomato*'. *J. appl. Bact.* 52: 297-298.
3. C.M.I. (1967) Descriptions of Pathogenic Fungi and Bacteria. *Pseudomonas pisi*. No. 126, Commonwealth Mycological Institute, Kew.
4. Devash, Y., Okon, Y. and Henis, Y. (1980) Survival of *Pseudomonas tomato* in soil and seeds. *Phytopath. Z.* 99: 175-185.
5. Kenneth, R., Palti, J., Frank, Z.R., Anikster, Y. and Cohen, R. (1975) A Revised Checklist of Fungal and Bacterial Diseases of Field and Forage Crops in Israel. *Spec. Publ. Agric. Res. Orgn, Bet Dagan* 36.
6. Miller, P.R. and Pollard, H.L. (1976) Multilingual Compendium of Plant Diseases. p. 199. The American Phytopathological Society, St. Paul, MN.
7. Saad, A.T. and Nienhaus, F. (1969) Plant diseases in Lebanon. *Z. PflKrankh. PflSchutz* 76: 537-551.
8. Sands, D.C., Schroth, M.N. and Hildebrand, D.C. (1980) *Pseudomonas*. in: Schaad, N.W. [Ed.] Laboratory Guide for Identification of Plant Pathogenic Bacteria. pp. 36-44. The American Phytopathological Society, St. Paul, MN.
9. Volcani, Z. (1976) [Bacterial diseases of plants.] in [Encyclopaedia of Agriculture] 3: 658-692. The Encyclopaedia of Agriculture Press, Tel Aviv. (in Hebrew)