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PHENOTYPIC VARIABILITY OF *PSEUDOMONAS*  
*SYRINGAE* PATHOVAR *PISI*, AND DIFFERENTIAL  
IDENTIFICATION TOWARDS OTHER PEA  
PSEUDOMONADS.

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Routine identification of the pathovars of *P. syringae* remains problematic unless pathogenicity is checked on the host. The ability of different related Pseudomonads to live altogether on plants increases the difficulty. The interest for diagnosis of the O-serogroups defined within the species (Samson and Saunier, 1987) needed to be evaluated. Pea blight spreading over France gave us the opportunity to study pv. *pisi* identification.

1. Materials and methods

More than 2,500 isolates of *P. s. pv. pisi* have being studied for a two-year period (1989 and 1990) during experimentations and surveys in the French production of combining pea (*Pisum sativum*). Additionnal *P. syringae* strains (about 2,000), that were not pathogenic to pea were also regularly isolated from pea plants. Physiological characters, serogrouping and pathogenicity tests (on Kelvedon Wonder pea cultivar susceptible to all races) were performed on every strain. Any strain giving watersoaked

lesions after injection of  $10^6$  organisms/ml suspension into the pea stem was designated as pv. *pisi*. The non-pea pathogenic isolates (inducing either hypersensitivity or no reaction) were arbitrarily named as *P. s. pv. syringae*.

## 2. Results

Some of the main classical physiological tests of *pisi* strains presented a wide variability : fluorescence + 93%, esculin - 86%, homoserine + 75%, erythritol + 70%, D(-)tartrate - 96%, L(+)-tartrate - 91%, DL-lactate - 85%. That diversity appeared rather unusual compared to the other pathovars.

As for their O-serogroups, pv. *pisi* strains were classified in APT-PIS (88.1 %), HEL2 (11.8 %) and RIB (0.1 %).

Nine patterns could be established when combining fluorescence, esculin response and O-serogroup. The frequency of them was measured. The pattern 1 (fluorescence +, esculin -, APT-PIS) harboured 73 % of the total *pisi* isolates. Not one *syringae* isolate (out of 2,067) fell into the pattern 1. Therefore, one can avoid pea inoculation for diagnosis when pattern 1 is obtained. Out of the pattern 1, pathogenicity tests remain necessary. For instance, patterns 2 and 4 harboured respectively 9.8 % and 9.5 % of the *syringae* isolates ; and 7.7 % and 0.5 % of the *pisi* isolates. Summing up, the *pisi* and the *syringae* isolates presented the same pattern during the two year-experimentation, 12.8 % of them needed inoculation test to avoid false positive identifications of pea blight organism.

## 3. Conclusion

The physiological variability of pv. *pisi* was already noticed (Lelliott *et al.*, 1966 ; Young and Dye, 1970 ; Taylor, 1972 ;

Hildebrand, 1973). Serology is more constant (serogroup APT-PIS) although not absolute since another serogroup HEL2 may occur. Nevertheless, serology can only be applied to cultured isolates. Direct serological detection methods cannot be used in the case of pea blight. If it is true that many pv. *syringae* strains belong to a different serogroup (Mazarei and Kerr, 1990) that is PER-SAV-TOM (Samson and Saunier, 1987) the presence on peas of *P. s. pv. syringae* and *P. viridiflava* strains that may share (even at a low percentage of the isolates) the same LPS with pv. *pisi*, gives up false positive detections. Other kinds of specific antigens are needed to achieve a serological detection of pea blight. Other technics, such as isozyme profiles and RFLP, could give some help in the differentiation of the related pathovars.

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