Research Note

ANGULAR LEAF SPOT OF SOME CUCURBITS IN PUERTO RICO[1]

Angular leaf spot of cucurbits, caused by *Pseudomonas syringae* pv. *lachrymans* (E. F. Smith and Bryan 1915; Carsner 1918), has been noted in Puerto Rico on squash, (*Cucurbita moschata* Duch.) Duchesne & Poir; chayote (*Sechium edule* Jacq.) Swartz and honeydew melons (*Cucumis melo* L.) plantings in Puerto Rico. Foliage infection is the most noticeable damage under field conditions. It is characterized by small water-soaked spots on the upper surface of the leaves. As the spots enlarge they become dry and tan. Eventually the necrotic tissue falls out, giving the leaves a ragged appearance (fig. 1). Diseased petioles and stem present dry brownish epidermal tissue. Affected fruits of honeydew melons exhibit small initial spots, sunken and tan to brown. Spots enlarge gradually and crack (fig. 2). During periods of high humidity there is a

Fig. 1.—Spots on chayote leaf caused by *Pseudomonas syringae* pv. *lachrymans*. The margin has turned brown and dry showing a ragged appearance.

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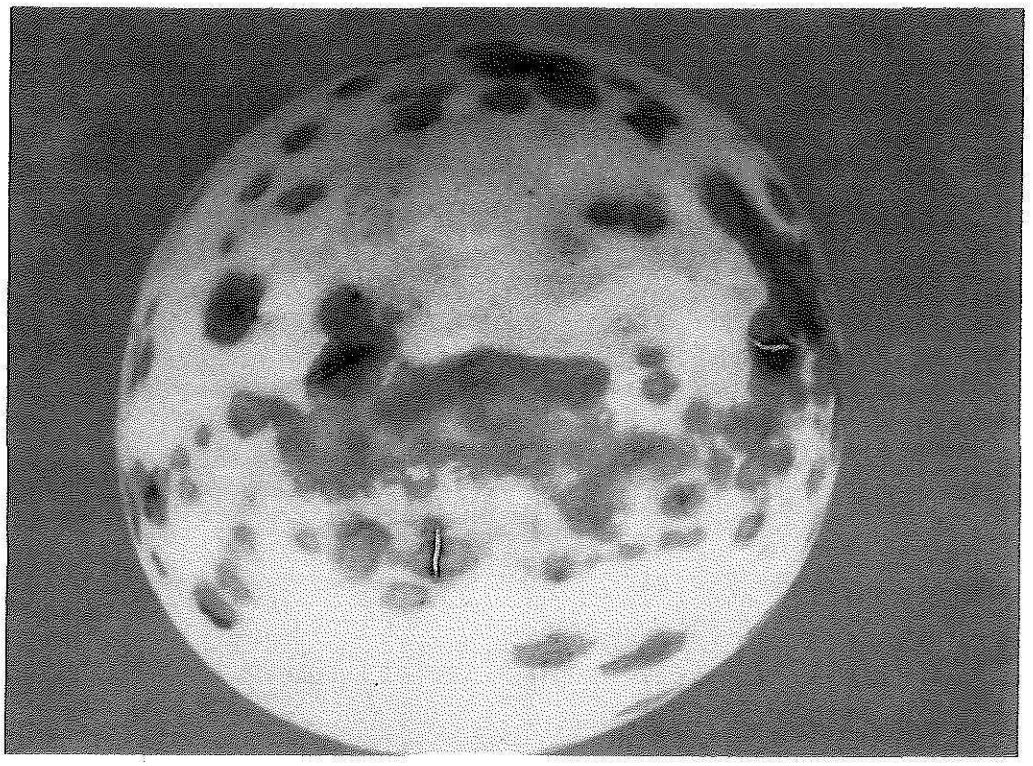

Fig. 2.—Water soaked lesions caused by *Pseudomonas syringae* pv. *lachrymans* on honeydew melon. Natural infection.

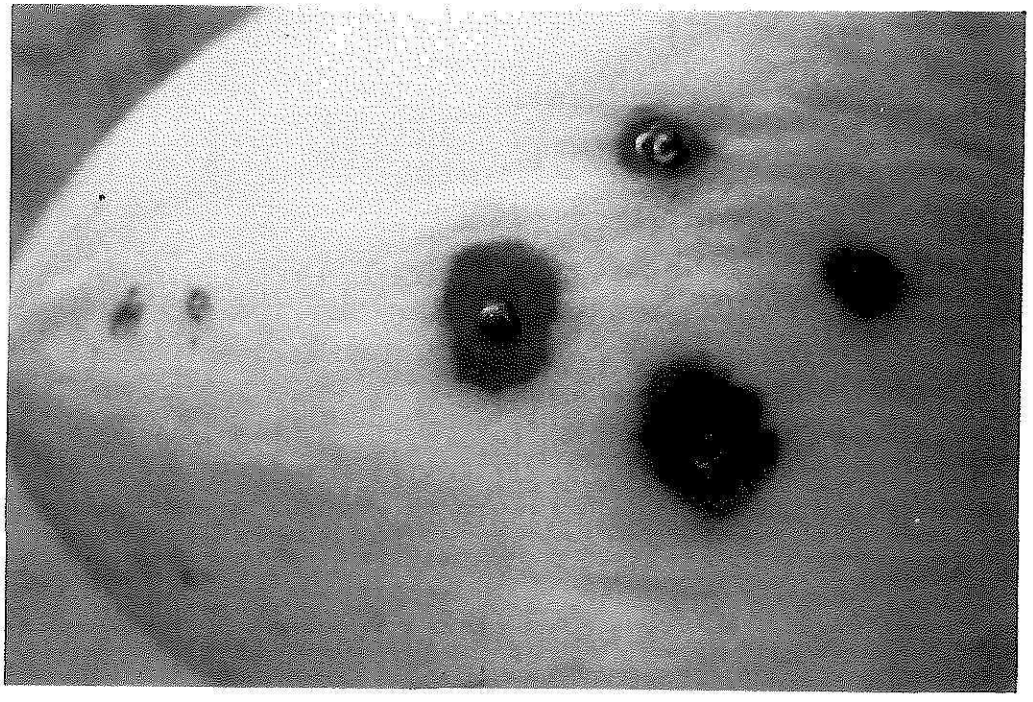

Fig. 3.—Close-up of an inoculated honeydew melon showing brown tissue with drop of exudate emerging.

TABLE 1.—*Phenotypic characteristics of* Pseudomonas syringae *pv.* lachrymans, *causal agent of angular leaf spot of honeydew melon in Puerto Rico*

Test	Reaction
1. Gram stain and morphology	Negative bacillus
2. Motility	Motile
3. Pigment	Green, Fluorescent (UV light)
4. Colony appearance (TGA)	Grayish, smooth, mucoid and raised
5. Arginine dihydrolase	Negative
6. Ammonia (from peptone)	Positive
7. Methyl-Red test (MR)	Negative
8. Voges-Proskauer reaction (VP)	Negative
9. Citrate utilization	Positive
10. Malonate utilization	Positive
11. Nitrate	Slightly reduced
12. Hydrogen sulfide production (H_2S)	Negative
13. Action on litmus milk	Clear, alkaline
14. Liquefaction of gelatin	Positive
15. Liquefaction of pectate	Negative
16. Starch hydrolysis	Negative
17. Esculin hydrolysis	Negative
18. Lypolysis	Slight hydrolysis
19. Salt tolerance: 1% - 5% concentration	3-4%
20. Oxidase	Negative
21. Catalase	Positive
22. Action on carbohydrates:	
Lactose	Negative
Glucose	Positive
Sucrose	Positive
Maltose	Negative
Salicin	Negative
Sorbitol	Negative
Xylose	Positive

tear-drop exudation from the lesions. Under less humid conditions the exudate dries out, leaving a whitish crusty residue. When the bacteria penetrate the mesocarp or fleshy portion, a soft rot develops, and eventually seeds are contaminated. We have not observed fruits of squash and chayote to be affected by the disease in Puerto Rico.

Pseudomonas syringae pv. *lachrymans* was consistently isolated from lesions on diseased squash and chayote leaves presenting scattered, small, light brown necrotic spots with a yellow halo and broken necrotic margin. Isolates were also obtained from honeydew melons presenting numerous irregular tan to brown water-soaked lesions, a few of which were cracked.

The organism is an aerobic gram negative rod. Colonies, on tryptone glucose agar (TGA), are grayish-white, slightly opaque, smooth, raised, mucoid and levan-producing. A blue-green pigmentation was observed in King's medium B (KB) producing fluorescence under UV light. Reactions obtained from morphological and biochemical tests performed with the three isolates were similar. Table 1 presents those obtained from honeydew melon isolates. Pathogenicity tests *in vitro* were also performed with the bacterium isolated from affected honeydew melons. Two days after the healthy fruit were inoculated with the bacterial suspension, a 1-cm diameter brownish spot appeared. In 7 days, the le-

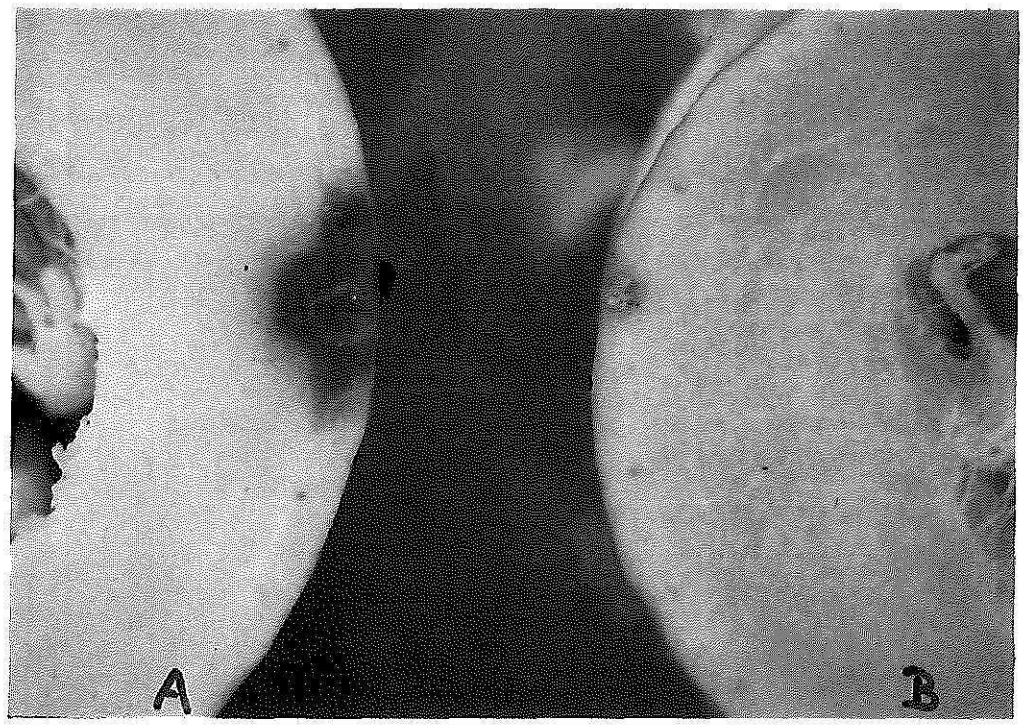

Fig. 4.—A. Cut section of inoculated honeydew melon showing invasion of the mesocarp. B. Water inoculated honeydew melon.

sions enlarged with a tear drop exudation (fig. 3). After sectioning the brown soft rot tissue, we observed that the mesocarp or fleshy portion of the fruit was invaded by the bacteria. No damage was present beyond the inoculation point in the water-inoculated spots (fig. 4). No symptoms were observed in potato and carrot slices inoculated with the same isolate.

The disease has been reported in the United States as a severe problem in cucumbers and is widely spread in other regions of the world.[2] In Puerto Rico Cook reported that this disease was affecting cucumbers in 1935-36.[3] Although the disease is considered of minor importance locally, it could be a future threat on vegetable and fruit farms

According to Bradbury[4] the pathogen is seed-borne and winters in soil for a few years. It is spread from plant to plant by rain splash, insects and laborers. Control includes seed treatment with mercuric chloride (1:1000 dil), insect control, use of resistant or tolerant varieties, use of ground water for irrigation and crop rotation for at least 2 years with non-cucurbits.

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[2]Fahy, P. C. and G. J. Persley, 1983. Plant Bacterial Diseases: A diagnotic guide. Academic Press, Australia, p. 393.

[3]Cook, M. T., 1939. Enfermedades de las plantas económicas en las Antillas. Monografía de la Univ. de P. R.; Serie B, Núm. 4.

[4]Bradbury, J. F., 1967. *Pseudomonas lachrymans*. CMI Descriptions of Pathogenic Fungi and Bacteria No. 124, Commonwealth Mycological Institute, Kew, England.