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Yellow disease in Scilla tubergeniana and related bulbs caused by Xanthomonas campestris pv. hyacinthi

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In 1971 Kamerman noted the isolation of a bacterium from *Scilla tubergeniana* Hoog which could produce yellow disease in hyacinths. The bacterium was therefore considered to be *Xanthomonas campestris* pv. *hyacinthi* (syn. *X. hyacinthi).* More recently numbers of *S. tubergeniana* bulbs were examined and found to show glassy, yellow and brown necrotic discoloration in the scales and base of the bulbs (Janse, 1983). The purpose of this paper is to confirm Kamerman's initial findings.

The bacteria found in yellowish slime produced by the infected bulbs of *S. tubergeniana* were identified according to their phenotypic (Dye, 1960, 1962) and serological characteristics as *Xanthomonas campestris pv. hyacinthi.* Isolates from *S. tubergeniana* (PD 280 and PD 281) were also compared with two isolates of *X. campestris* pv. *hyacinthi* from *Hyacinthus orientalis* L. (NCPPB 599 and PD 205). There were no significant differences between the isolates tested. Positive characters found were: strictly aerobic metabolism; one polar flagellum; yellow non-diffusable pigment; growth at 35°C; gelatin, casein, esculin and starch hydrolysis; lipolytic activity; H_2S, oxidase and catalase production; acid production from L(+)arabinose, cellobiose, D(+)galactose, glycerol, maltose, (D+)mannose and sucrose. Negative characters found were: reaction to Gram-stain; nitrate reduction; production of urease; hypersensitive reaction in tobacco; utilization of L(+)tartrate and lactate; pectolytic activity; acid production from dulcitol, inositol, lactose, D(−)mannitol, L(+)rhamnose, D(−)ribose, salicin and D(−)sorbitol.

In a greenhouse experiment *S. tubergeniana* and *H. orientalis* cv. Pink Pearl were infected with isolates of pv. *hyacinthi* PD 205, PD 280 and PD 281 in order to assess pathogenicity. Per isolate ten bulbs of each species were inoculated in their base and scales and four out of these ten in the sprouts just before planting. This was done with a hypodermic needle, using a suspension of c. 10^6 cells per ml sterile physiological saline (PS) from 36-h nutrient agar (NA) cultures. Observations were made during a two-months period. The results of this experiment are presented in Table 1. Symptoms produced in *S. tubergeniana* were similar to those observed under natural conditions (Janse, 1983). Disease progression, especially in the leaves, was found to be much slower than in hyacinth. Leaf symptoms consisted of brown necrotic spots with a white papery centre and a narrow yellow halo from which dark, glassy to brown stripes sometimes developed down the leaf. Symptoms in hyacinth were similar to those previously described by Beyer (1972). All control plants remained healthy.

Table 1. Results of pathogenicity tests in a greenhouse with *Scilla tubergeniana* and *Hyacinthus orientalis* 'Pink Pearl'.

Isolate pv. *hyacinthi*	Number of bulbs with internal symptoms		Number of plants with leaf symptoms		Symptom expression (leaf and bulb)	
	Scilla	hyacinth	*Scilla*	hyacinth	*Scilla*	hyacinth
PD 205	6/10	8/10	3/4	4/4	+ +[1]	+ + +
PD 280	8/10	10/10	1/4	4/4	+	+
PD 281	9/10	10/10	3/4	4/4	+ +	+ + +

[1] + = weak; + + = moderate; + + + = severe

Tabel 1. Resultaten van pathogeniteitstoetsen in de kas met Scilla tubergeniana en Hyacinthus orientalis 'Pink Pearl'.

A field experiment was set up to see if other bulbaceous Liliaceae are also susceptible to pv. *hyacinthi*. Series of ten plants each of *Galtonia candicans* (Bak.) Dene, *Muscari armeniacum* Bak., *Scilla bifolia* L., *S. hispanica* Mill. (= *S. campanulata* Ait.), *S. siberica* Andr. and *S. tubergeniana* Hoog were inoculated with isolate PD 205 in one series and with PD 281 in another series. The leaves were inoculated by injection as described above, but were also dusted with 500 mesh carborundum powder and rubbed with the bacterial suspension. The experimental plot was covered with an insectproof netting. Observations were made from early May 1982 until natural decay of the leaves occurred about two months later. During this period leaves were collected

Table 2. Results of pathogenicity tests in a field experiment with several bulbaceous Liliaceae.

Plant species	Strain PD 205			Strain PD 281		
	leaf symptoms	bulb symptoms	reisolation[1]	leaf symptoms	bulb symptoms	reisolation[1]
Galtonia candicans	–	–	–	–	–	–
Muscari armeniacum	+	–	+	+	–	+
Scilla bifolia	±	–	+	–	–	n.t.[2]
Scilla hispanica	+	–	+	+	–	+
Scilla siberica	–	–	–	–	–	n.t.
Scilla tubergeniana	+	+	+[3]	+	+	+[3]

[1] Reisolated from leaves 2 months after inoculation.
[2] n.t. = not tested.
[3] Also reisolated from diseased bulbs.

Tabel 2. Resultaten van pathogeniteitstoetsen in een veldexperiment met enkele bolvormende Liliaceae.

Fig. 1. Leaf of *Scilla hispanica* showing water-soaked spots and streaks three weeks after inoculation with isolate PD 205 from hyacinth.

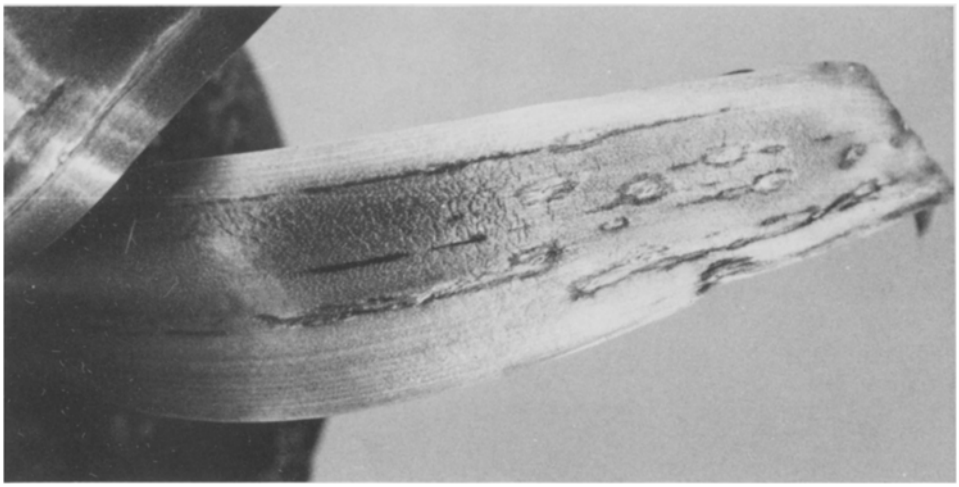

Fig. 1. Blad van Scilla hispanica met natte vlekken en strepen drie weken na inoculatie met isolaat PD 205 uit hyacinth.

for examination and in July 1982 the bulbs were harvested and examined for the presence of internal symptoms (Table 2).

Under our climatic conditions, leaves of *S. hispanica* proved to be very sensitive. Rapidly growing, water-soaked leaf spots (Fig. 1) were formed from which glassy streaks, up to 3 mm wide developed down the leaves. However, no bulb symptoms were found. On *M. armeniacum* pv. *hyacinthi* only produced small, slowly growing leaf spots and on *S. bifolia* no clear symptoms were found. *G. candicans* dit not show any symptoms perhaps due to a later inoculation date. Beyer (1972) was able to obtain infection in *G. candicans* following artificial inoculation. From three of the 20 *S. tubergeniana* bulbs, progression of the disease from leaves into the bulbs was observed. All control plants remained healthy.

It appears therefore, that *S. tubergeniana* is a natural host for *X. campestris* pv. *hyacinthi*. There are several possible reasons for the late findings of pv. *hyacinthi* in this species. *S. tubergeniana* was first introduced into the Netherlands in 1931 and is only cultivated on a small scale, usually in other areas than hyacinths. As the disease progression seems to be slow, it is possible that the bacteria have difficulty in reaching the bulb. *S. hispanica* and *M. armeniacum* have until now shown susceptibility for pv. *hyacinthi* only under artificial circumstances.

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Samenvatting

Geelziek in Scilla tubergeniana en verwante bolgewassen veroorzaakt door Xanthomonas campestris pv. hyacinthi

Uit bollen van *Scilla tubergeniana* met geelzieksymptomen werd de bacterie *Xanthomonas campestris* pv. *hyacinthi* verschillende malen geïsoleerd. Met isolaten uit *S. tubergeniana* en *Hyacinthus orientalis* werd een kruisinfectie uitgevoerd. Beide gewassen bleken waardplanten te zijn voor isolaten uit beide plantesoorten.

In infectieproeven op het blad met *Galtonia candicans, Muscari armeniacum, Scilla bifolia, S. hispanica* en *S. siberica* bleken alleen *S. hispanica* en *M. armeniacum* vatbaar te zijn voor pv. *hyacinthi* na kunstmatige inoculatie.

References

Beyer, J.J., 1972. Het verloop van de geelziekaantasting door *Xanthomonas hyacinthi* (Wakker) Dowson in blad en bol van de hyacinth. Meded. LandbHoogesch. Wageningen 30: 1-52.

Dye, D.W., 1960. Pectolytic activity in *Xanthomonas.* N.Z. Jl Sci. 3: 61-69.

Dye, D.W., 1962. The inadequacy of the usual determinative tests for the identification of *Xanthomonas* spp. N.Z. Jl Sci. 5: 393-416.

Janse, J.D., 1983. *Xanthomonas campestris* pv. *hyacinthi* (geelziek) bij *Scilla tubergeniana.* Versl. Meded. plziektenk. Dienst 159 (Jaarboek 1982): 29-30.

Kamerman, W., 1971. Het geelziek van hyacinth *(Xanthomonas hyacinthi).* Jversl. Lab. BloembollOnderz. Lisse 1970/71: 37.