Short communication

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Begonia bertinii, a new host of Erwinia chrysanthemi

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In the Netherlands, *Begonia bertinii* has been used for many years as an ornamental plant. The tuber is lifted in the autumn, stored under cool conditions, and replanted in the spring. The plant reproduces vegetatively, by developing small tubers along the stem. These tubers require a second year of growth to reach a size suitable for the market. Vegetative propagation of the crop can also be obtained artificially by cutting the tubers.

In two commercial nurseries, about 30 per cent of the plants showed disease symptoms during the summer of 1969 (Fig.1). The diseased plants were stunted and had darker leaves than normal plants. Severely stunted plants often dropped their leaves during the growing season. The tubers of such plants had brown, soft areas, and the decay-free parts showed short brownish streaks (Fig.2). Heavy symptoms were less frequent in the field, where a high percentage of the diseased plants showed dark leaves and, according to the severity of the disease, some stunting.

Tubers of such plants generally showed no rotting, but carried brownish streaks lacking in tubers of healthy plants. In cross-section, diseased plants invariably showed brown xylem vessels in the stem (Fig.3). The number of discoloured vessels seemed to increase with disease severity; plants with slight symptoms had only a few discoloured vessels.

From stems of diseased plants, bacteria were isolated. In a serological precipitation test, these bacteria reacted positively with antiserum against *E. chrysanthemi* (prepared with heat-killed bacteria as antigen). The bacterial suspension did not react with antiserum against *E. carotovora* (Sa 312 Harpenden and an isolate from hyacinth). *Erwinia aroidea* (Harp., Sa 1274) and *E. atroseptica* (Harp., Sa 549) did not react with antiserum against *E. chrysanthemi* (Table 1). These findings indicate that the bacteria isolated from begonia are closely related to *Erwinia chrysanthemi*. This relationship was confirmed by the similarity of characters of dahlia and begonia isolates on different media (Saaltink and Maas Geesteranus, 1964). The begonia isolate also possesses peritrichous flagella.

On the basis of the serological test and conversions in different media, it may be concluded that the isolated bacteria belong to the species *E. chrysanthemi* Burkholder et al. The occurrence of this bacterial disease in begonia was not previously known; although it has been reported for *Chrysanthemum* (Burkholder et al., 1963), *Dianthus*

Fig. 1. Left: diseased plant of *Begonia bertinii*; note dark colour and stunting. Right: plant with healthy appearance.

Fig. 1. Links: een aangetaste plant van Begonia bertinii met donker loof en geremde groei. Rechts: een gezond uitziende plant.

Fig. 2. Different stages of internal decay. Right: brownish streaks.

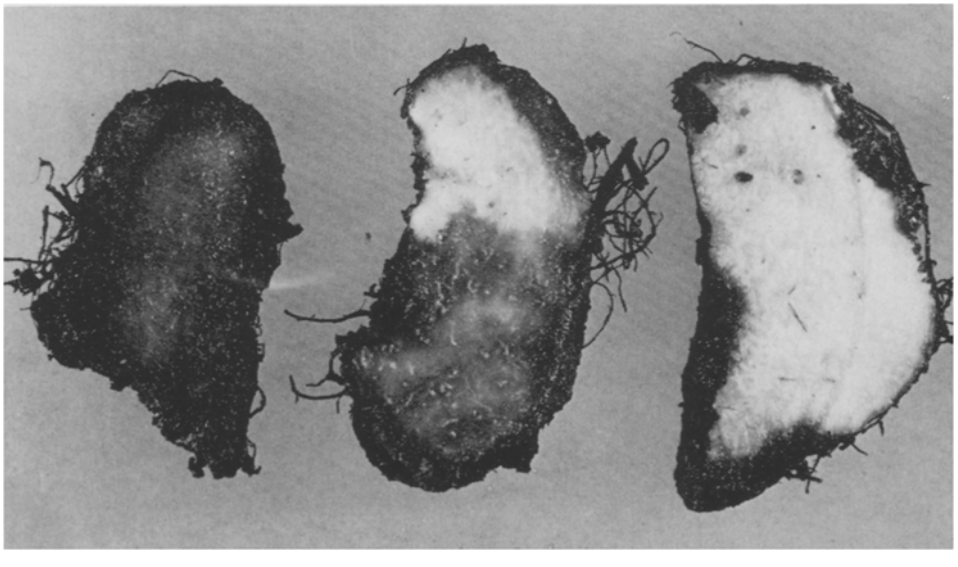

Fig. 2. Verschillende stadia van aantasting in de knollen. Rechts: veel bruine streepjes.

Fig. 3. Left: stem of apparently healthy plant. Right: stem of diseased plant with discoloured vessels.

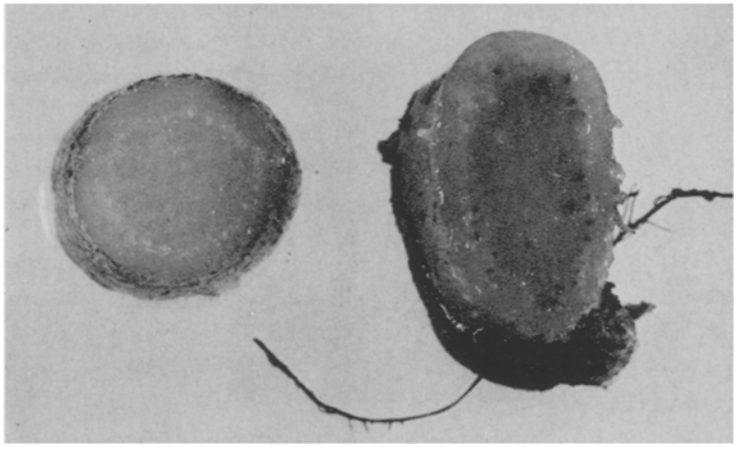

Fig. 3. Links: stengel van gezond uitziende plant. Rechts: stengel van zieke plant met bruine vaten.

(Bakker and Scholten, 1955; Lelliott, 1956), *Dieffenbachia* (McFadden, 1961), *Philodendron* (Miller and McFadden, 1961), *Dahlia* (Saaltink and Maas Geesteranus, 1964), and *Aglaonema* (McFadden, 1969).

At the end of the growing season, 65 stems belonging to 25 healthy begonia plants were inoculated by injection of 0.01 ml bacterial suspension into an internode. After 4 weeks a severe infection was observed at the inoculated internode of 27 stems. The adjacent nodal parts were heavily attacked, and the xylem vessels were discoloured.

Table 1. Precipitation reactions of isolates of *Erwinia chrysanthemi* from dahlia and begonia.

Antigen	Antiserum		
	E. chrysanthemi from Dahlia	*E. carotovora* (Harpenden Sa 312)	*E. carotovora* from Hyacinth
E. chrysanthemi from Begonia	+	—	—
E. chrysanthemi from Begonia	+	—	—
E. chrysanthemi from Dahlia	+	—	—
E. aroidea (Harpenden Sa 1274)	—		
E. atroseptica (Harpenden Sa 549)	—		
E. carotovora (Harpenden a 438)	—	+	+
E. carotovora (Harpenden Sa 312)	—	+	+

Tabel 1. Serologische verwantschap tussen Erwinia chrysanthem uit dahlia en begonia.

Fig. 4. Left: after tuber-division with a contaminated knife, all plants diseased. Right: no disease after cutting with a clean knife.

Fig. 4. Links: 100% aangetaste planten na snijden van de knollen met een besmet mes. Rechts: gezonde planten na snijden met een schoon mes.

In 65 stems injected with water this reaction did not occur. The bacterium was reisolated from the diseased plant parts.

A comparable experiment was done in the greenhouse with plants from healthy tubers. Similar results were obtained. Moreover, in this experiment begonia plants became also attacked by a dahlia isolate.

The intensified spread of the disease in some stocks has presumably been promoted by the practice of cutting tubers with a contaminated knife. Support for this assumption was provided by the occurrence of fewer diseased plants in a stock grown from naturally formed tubers, and confirmation by the results of cutting healthy tubers with clean and contaminated knives. All the former tubers gave rise to healthy plants, all the latter to stunted plants with discoloured vessels, some of which died too early (Fig. 4).

Spread of the disease in a begonia stock can probably be counteracted by hygienic measures. Selection of plants without discoloured xylem vessels is expected to give good results on the basis of the experience obtained with this method for control of the same disease in dahlia (Saaltink, 1969).

Samenvatting

Begonia bertinii, een nieuwe gastheer van Erwinia chrysanthemi

In 1969 werd in *Begonia bertinii* een onbekende ziekte waargenomen waarbij aangetaste planten sterk geremd waren in groei, verwelkten en afstierven. Er werd vastgesteld dat deze ziekte wordt veroorzaakt door *E. chrysanthemi*, in ons land bekend als parasiet van anjer, chrysant en dahlia.

De ziekte kan gemakkelijk worden overgebracht door de knollen met een besmet mes in delen te splitsen, een methode die bij de vermeerdering van knollen wordt toegepast.

Door hygiënische maatregelen wordt besmetting tegengegaan. Gezonde planten kunnen uit een zieke partij worden geselecteerd door op de kleur van de houtvaten te letten na afsnijden van de stengel.

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