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Dodder Transmission and Microscopic Observations of Red-bird Cactus Witches' Broom Disease[1]

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Abstract : The red-bird cactus witches' broom (RbWB) was transmitted from infected red-bird cactus to periwinkle by the dodder *Cuscuta chinensis* Lam. Free hand sections of RbWB infected periwinkle and red-bird cactus showed specific blue staining of Phloem cells with Dienes' stain under a light microscope, and specific bright fluorescence of phloem tissues under a reflecting fluorescence microscope. Similar sections from healthy plants gave no reaction, which indicated the presence or infections of mycoplasma-like organisms in the phloem tissues of infected plants. On periwinkle, red-bird cactus witches' broom induced a mild degree of bushy growth.

Introduction

Red-bird cactus witches' broom (RbWB) disease was recently found on red-bird cactus (*Pedilanthus tithymaloides* Poit.) in Taiwan [5] (Fig. 1). Electron microscopic studies provided evidence indicating a mycoplasmal etiology for the disease [5]. No other plants have been tested as possible new host. The periwinkle (*Vinca rosea* L.) seems worthy of such test for it has been shown susceptible to many plant mycoplasma-like organisms (MLOs) causing witches' broom symptoms [2,4,6,8,9]. The symptoms on periwinkle differed among the sources of withes' broom disease [9]. This study was attempted to see whether RbWB could be transmitted to periwinkle. The parasitic dodder plant, *Cuscuta chinensis* Lam., previously demonstrated to be capable of transmitting other witches' broom diseases , was used as vector [6,8,9]. We also made light and fluorescence microscopic observations for evidence of the presence of MLOs in the inoculated plant tissues [1,3,7,8].

Materials and Methods

Healthy red-bird cactus seedlings were raised in pots and were grafted with RbWB diseased scions for symptoms. Healthy dodder seedlings were established on healthy

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periwinkle plants and the branches of established dodder were later connected to RbWB diseased red-bird cactus. After two months , the connection was cut off. The periwinkle plants with dodder were maintained in green-house for one year, during which observations were made for RbWB symptoms [6,8,9]. Besides, free hand sections of stems and leaf veins of red-bird cactus and periwinkle were made of both RbWB diseased and healthy plants and observed under light microscope after treating with Dienes' stain [1,7,8], similar sections were also observed under refrecting fluorescence microscope (RFM, Zeiss Standard XBO-75W) after the method of Namba *et al.* (1981) [3].

Results and Discussion

The transmission test results showed that RbWB could be transmitted from a diseased red-bird cactus to a healthy periwinkle by dodder. Twenty-one out of 50 periwinkle plants bridged to diseased red-bird cactus by dodder developed RbWB symptoms (Table 1). The symptoms consisted mainly of a mild case of witches' broom appearance (Fig. 2).

Table 1. Transmission of red-bird cactus witches' broom from red-bird cactus to periwinkle by dodder.

Disease source	No. periwinkle plants tested	No. plants with disease	Days for disease development	
			Range	Av.
Diseased red-bird cactus	50	21	52—92	72
Healthy red-bird cactus	20	0		

The stem and leaf sections of the RbWB infected plants showed specific blue reaction with Dienes' stain in the phloem cells under a light microscope (Fig. 3), and specific yellow fluorescence in the phloem tissues under a reflecting fluorescence microscope (Fig. 4). No such reaction was observed in those of healthy plants. This indicated the presence of MLOs in the infected plants [1,3].

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Explanation of plates

Fig. 1. The witches' broom-diseased plant of red-bird cactus showing bushy little leaves (A), and the healthy plant (B).

Fig. 2. The periwinkle infected with red-bird cactus witches' broom by dodder vector induced mild witches' broom symptom (A), and the healthy plant (B).

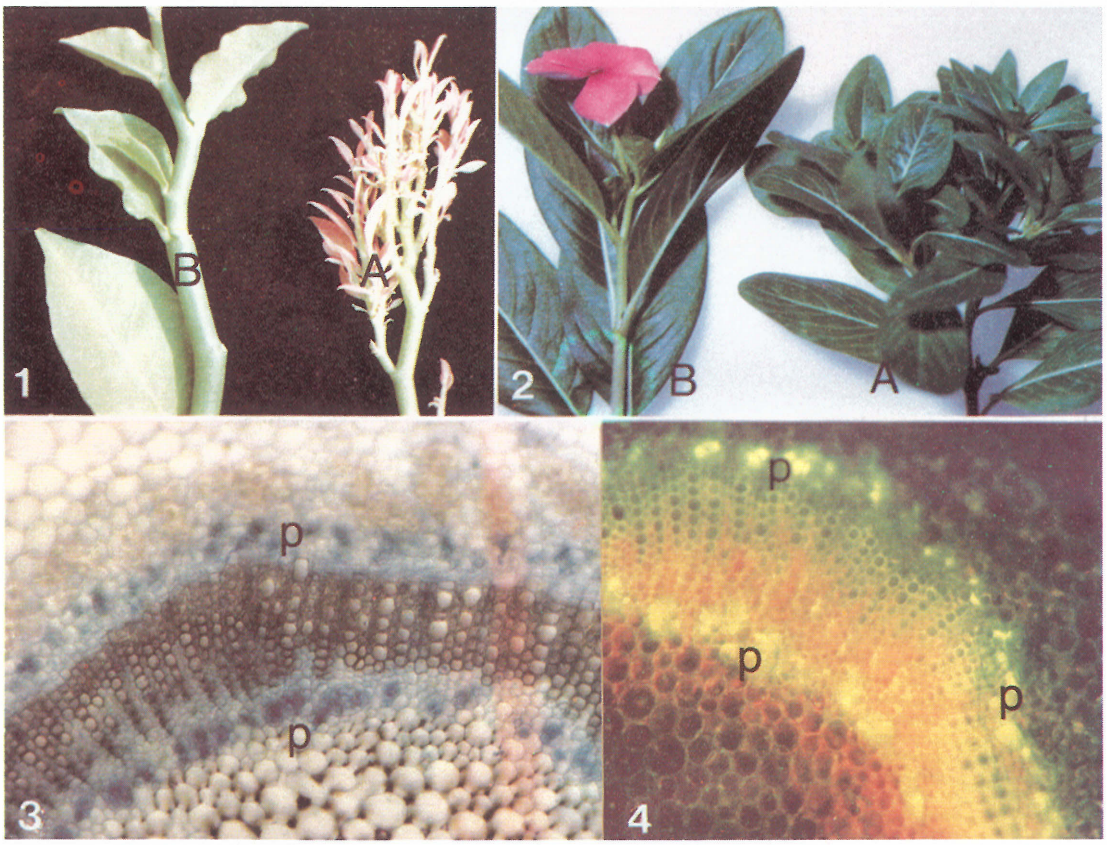

Fig. 3. Light micrograph of transverse section of witches' broom-diseased periwinkle stem treated with Dienes' stain, in which the phloem cells (p) stain distinctly blue.

Fig. 4. Fluorescence micrograph of transverse section of witches' broom-diseased periwinkle stem, in which the phloem tissue (p) show specific yollow fluorescence.

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青龍簇葉病之菟絲媒介傳染與顯微鏡觀察[1]

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摘 要

青龍簇葉病（Red-bird cactus witches' broom）可經菟絲（*Cuscuta chinensis* Lam.）媒介傳染而使長春草（*Vinca rosea* L.）感染罹病顯現葉化花之輕型叢生病徵。感染青龍簇葉病之長春草及青龍之病株切片，分別以經 Dienes' stain 處理後光學顯微鏡觀察及直接以反射型螢光顯微鏡觀察之結果，在其病組織篩管細胞分別顯現專一性藍色反應及特殊黃色螢光反應，對照健株則無此項反應，此項反應表示病株篩管組織中擬菌質病原之存在。

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