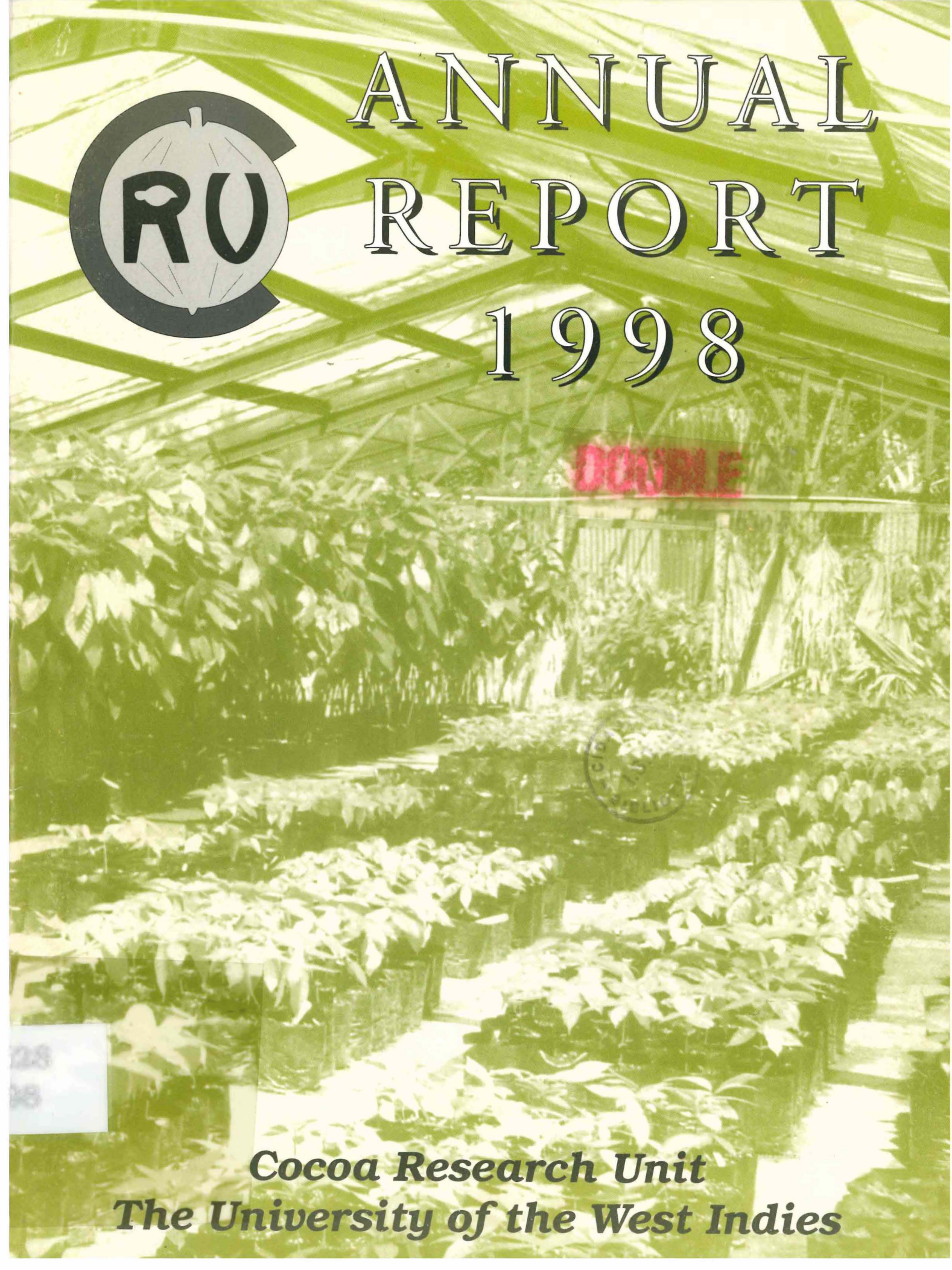

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Cover photograph. Cacao seedlings in the germplasm enhancement programme.

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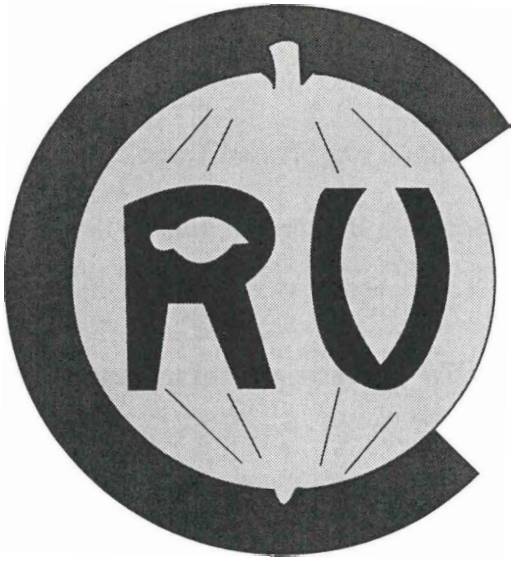

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Evaluation of Cacao Germplasm for Resistance to Witches' Broom Disease

R. Umaharan, J-M. Thévenin, S. Surujdeo-Maharaj, and B. Latchman

Introduction

Witches' Broom disease of cacao is endemic to the forest of the Amazon basin and is now reported in most cocoa-producing countries of Latin America and the Caribbean. The disease manifests itself as hypertrophy of young meristematic tissues, flower cushions, and pods. It can severely affect cocoa yield by direct infection of pods and beans or indirectly by affecting the photosynthetic process.

Ever since the first official report of Witches' Broom disease in Surinam in 1895 it has been the focus of many research projects aimed at its control and eradication (Wheeler and Mepsted, 1988). Phytosanitation and chemical control have provided limited success in their management of the disease, so it would appear that exploitation of available genetic resistance is the most feasible long-term solution.

Early observations of genetic resistance to the Witches' Broom pathogen in the upper Amazon had prompted extensive collection of germplasm from South America and its establishment in Trinidad (Pound, 1938). This and other collections that were subsequently made (Baker *et al.*, 1953; Allen, 1987) are being consolidated and included in the ICG,T.

The search for resistance to Witches' Broom disease in Bahia, Brazil and in Ecuador has resulted in the identification of promising sources (Purdy and Schmidt, 1996) and it is hoped that a search in the ICG,T will yield similar results. This information will be used to select material for the pre-breeding programme for disease resistance being conducted at CRU.

To this end CRU has initiated a 5-year project with financial support from the ACRI, to mass screen accessions held in the ICG,T for resistance to Witches' Broom disease, to confirm and quantify other known sources of field resistance, and to conduct confirmatory tests on promising clones identified through mass-screening.

Comparison of Pathotypes

Experiments conducted by Wheeler and Mepsted (1988) indicated that isolates of the pathogen *C. perniciosa*, can be placed into two broad groups, designated A and B. Group A comprises isolates from Ecuador, Bolivia, and most isolates from Colombia, while group B comprises isolates from Brazil, Trinidad and Venezuela. There are however variations within each group, therefore, in addition to screening in Trinidad and Tobago, selections of germplasm will also be screened in Brazil and/or Ecuador to facilitate comparative studies of pathogen variation. The same clones will be used for experiments conducted at all three locations.

It is proposed that as many accessions from the ICG,T as possible be screened for Witches' Broom disease. Clonal material will be propagated by grafting budwood onto rootstocks. Grafted clones will then be inoculated with *C. perniciosa* using five plants per clone, with an aim to complete 40 accessions, including the controls each month. Priority is being given initially to those accessions known to show field resistance to Witches' Broom disease and to those with

resistance to Black Pod disease, low pod indices, low shelling percentage or high butterfat content.

Once a sufficient number of accessions have been identified by mass-screening as having some degree of resistance, complementary inoculations will be undertaken to confirm and quantify this resistance.

Methodology

Several methods for evaluating material for resistance to Witches' Broom disease have been developed (Holliday, 1955; Evans, 1978; Evans and Bastos, 1980; Frias and Purdy, 1995)

For this project, the method being used has been adapted from the spray inoculation system developed by Frias and Purdy (1995) at the University of Florida, Gainsville, USA for large-scale screening. This is an automated system, that involves pumping inoculum suspension at a constant rate through atomizing spray nozzles so that a controlled quantity of basdiospores is applied to each plant.

After inoculation, plants will be incubated at 25°C and high humidity for 2 days. Observations of symptom expression will be carried out at fortnightly intervals over a 4-month period.

Work on this project was initiated in July 1998, and grafting of budwood onto rootstocks started in October 1998. Inoculations are scheduled to begin early in 1999.

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