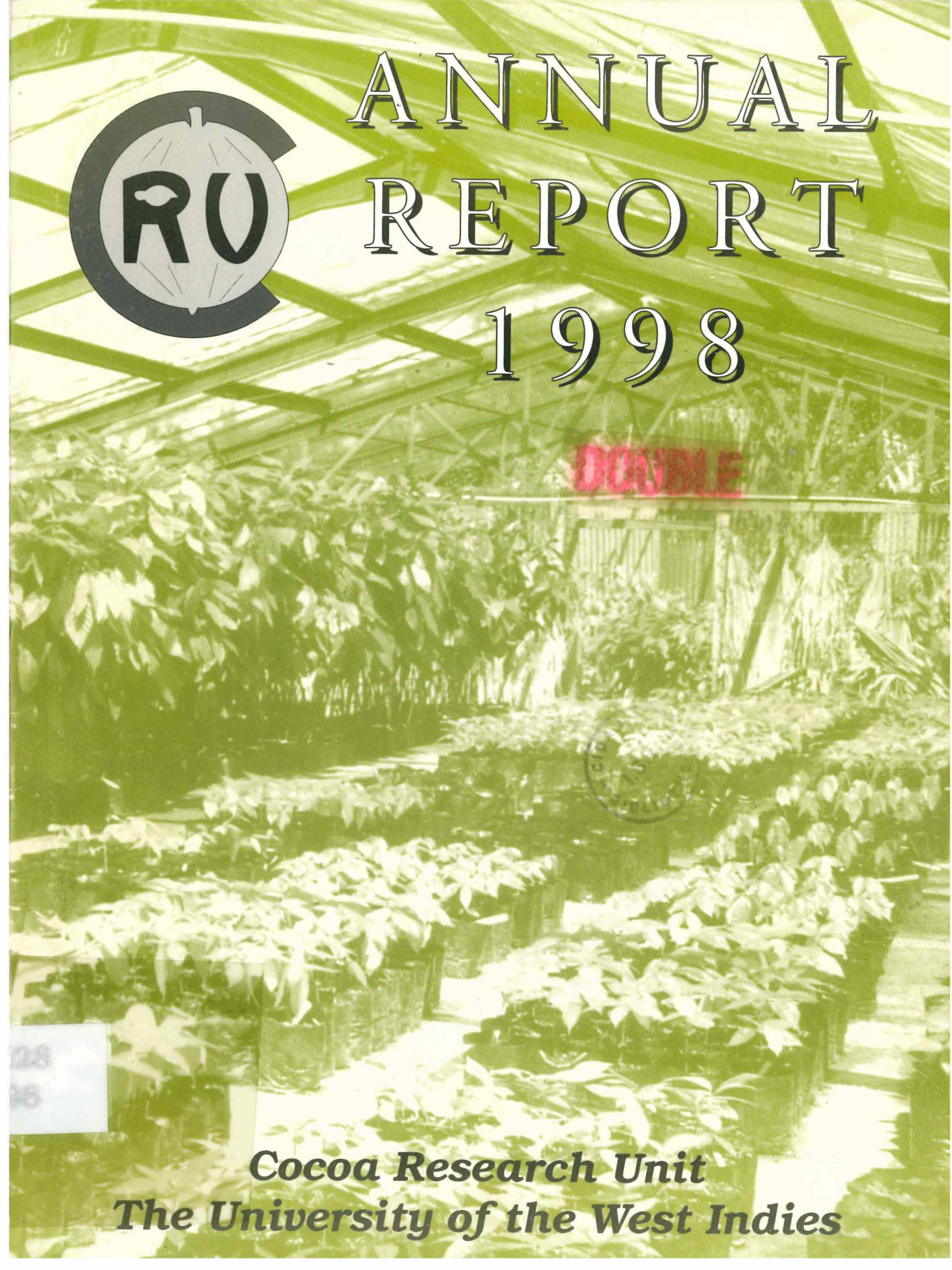

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Cover photograph. Cacao seedlings in the germplasm enhancement programme.

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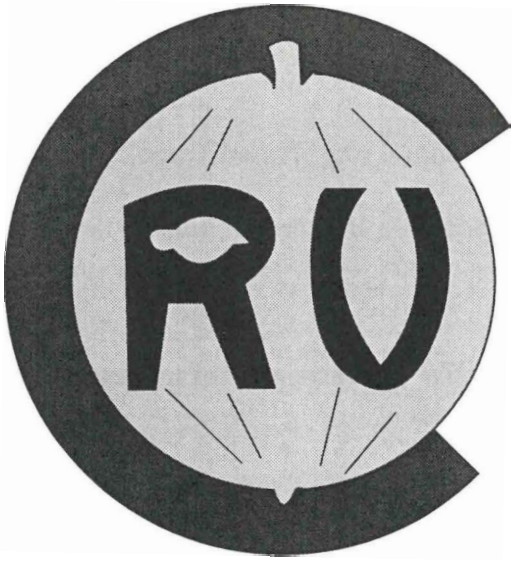

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Genetic Basis of Resistance of Cacao to *Phytophthora*

J-M. Thévenin, L.A. Motilal, and M. Howell

This research, which started in June 1995, is part of the CAOBISCO project on genome mapping and molecular markers linked to resistance to *Phytophthora*. The objectives are to map the cacao genome and search for molecular markers linked to *Phytophthora* resistance, and to accumulate alleles conferring resistance to *Phytophthora* diseases.

Evaluation of the progeny of the cross IMC 57 × CATONGO for markers linked to resistance to *P. palmivora*

Two leaves (Interflush 2, as described in Greathouse *et al.*,1971) were sampled from each of 222 seedlings and *Phytophthora* resistance was assessed by the leaf disc bioassay method (Thévenin and Motilal, 1998). Each tray represented one replication and contained three discs from each seedling, together with three discs from each parent. There were five replications. Assessments were made 3 and 6 days after inoculation.

From a total of 222 progeny seedlings, 203 were evaluated between one and three times depending on the availability of satisfactory leaves at the time of sampling. The distribution of the ranked classes of progeny is shown in Table 1. The 6th day score was used in the Score Index calculation to obtain resistance classes (Thévenin and Motilal, 1998). It should be noted that these results are intermediate results and further evaluations will be made on these plants.

Table 1. Seedling reaction to *P. palmivora* from a cross IMC 57 × CATONGO

Cross	Seedlings evaluated	Resistance classes[1]				
		VR 0-1	R 1-2	M 2-3	S 3-4	VS 4-5
IMC 57 × CATONGO	203	0	40	125	36	2

1. VR = very resistant, R = resistant, M = moderately resistant, S = susceptible, VS = very susceptible

Mean scores 6 days after inoculation :

IMC 57 = 2.08
CATONGO = 3.36
Progeny = 2.50

51 plants had a lower score than IMC 57.

Phytophthora pre-breeding activities

Pre-breeding activities for *Phytophthora* continued using both new crosses and those from 1997. The method was the same as in 1997: each tray represented a single replication and contained two discs from each plant, together with two discs from each available parent

and/or control clones, but the number of replications was reduced from ten to five. Two experiments were conducted every week necessitating assessments 3, 5, and 7 days after inoculation, or 3 and 6 days after inoculation depending on the experiment (the same cross always being collected on the same day of the week).

The distribution of the resistance classes in the progeny is shown in Table 2 and the Score Index of the parents and control clones in Table 3. Values used to calculate the individual Score Index and to give classes of resistance were recorded 5 or 6 days after inoculation. These tables represent data for all studied crosses, each plant being evaluated once or twice. The reproducibility of the test will be studied, and the final analysis carried out when at least three evaluations per plant have been completed.

Table 2. Progeny from various crosses classified by their seedling resistance to *P. palmivora*

Cross	Evaluations	Seedlings Evaluated	Progeny mean	Resistance classes[1]				
				VR 0 - 1	R 1 - 2	M 2 - 3	S 3 - 4	VS 4 - 5
PA 300 × JA 525	1	59	2.40	0	21	22	15	1
EET 162 × IMC 105	1	66	1.96	0	42	20	4	0
NA 286 × IMC 105	2	42	2.31	1	15	23	3	0
SCA 6 × ICS 45	2	88	2.35	3	19	55	11	0
GU 175 × CATONGO	2	50	2.62	0	9	25	14	2
SCA 6 × CATONGO	2	79	2.38	1	24	38	15	1
SCA 6 × GU 175	2	91	2.78	1	12	44	30	4
IMC 57 × TSH 1077	2	106	2.52	5	20	51	29	1
EET 162 × NA 26	2	86	2.51	2	10	63	9	2
EET 162 × SPEC 194 /103	2	93	2.46	3	13	63	13	1
IMC 65 × SPEC 194/103	2	87	2.99	1	7	35	41	3
ICS 84 × TSH 1077	2	86	3.21	0	4	24	54	4
UF 11 × SCA 9	2	91	2.67	3	14	49	21	4
B 721 × IMC 103	2	85	2.42	2	21	51	8	3
NA 45 × B 721	2	100	2.59	0	15	62	21	2
NA 45 × GU 175	2	65	2.63	1	12	35	12	5
NA 45 × IMC 57	1	92	2.41	2	24	49	17	3
ICS 1 × IMC 67	1	17	2.75	2	3	4	6	2
ICS 1 × GU 175	1	24	3.49	0	0	7	12	5
IMC 67 × ICS 1	1	46	2.75	0	4	27	15	0
IMC 67 × GU 353	1	67	2.66	0	8	40	19	0
IMC 67 × GU 175	1	88	2.27	2	35	33	17	1
SCA 6 × GU 353	1	16	2.79	0	2	8	6	0
SCA 6 × GU 286	1	28	2.46	0	12	8	7	1
IMC 67 × GU 286	1	43	2.85	0	2	24	17	0
SCA 6 × IMC 67	1	46	2.73	0	2	32	12	0
SCA 6 × ICS 1	1	43	2.96	0	2	16	24	1

1. VR = very resistant, R = resistant, M = moderately resistant, S = susceptible, VS = very susceptible

Table 3. Means of score index for parents and control clones assessed for their resistance to *P. palmivora*

Clone	Mean	Clone	Mean
IMC 57	2.1	CATONGO	3.2
AMELONADO	2.4	IMC 67	3.4
IMC 103	2.4	ICS 1	3.4
GU 175	2.5	TSH 1077	3.5
B 721	2.6	ICS 84	3.7
SCA 6	2.8	UF 11	3.7
NA 45	2.9	ICS 95	4.8
GU 353	3.0		

There were few very resistant plants, but plants classified as resistant were well represented (Table 2). These provide a better resistance level than the most resistant parents and will be of value in further breeding programmes. However, it is necessary to further evaluate all crosses to confirm the result for each individual plant and to check the stability of the test over time. Final analysis will only be possible when at least three evaluations per plant have been completed.

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Thévenin, J-M. and Motilal, L.A. (1998) Genetic basis of resistance of cocoa to *Phytophthora*. Pages 30-34 *in*: *Annual Report 1997*. St. Augustine , Trinidad: Cocoa Research Unit, The University of the West Indies.