



Intermediate
Cocoa
Quarantine
Newsletter
No. 5 July 1995

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Introduction

Work at the cocoa quarantine facilities has continued over the last year with a large number of clones in quarantine. Our workload has increased with a request by the Malaysian Cocoa Board for a large transfer of cocoa germplasm from the International Cocoa Genebank, Trinidad (ICG,T). The quarantine exercise will hopefully involve the movement of approximately 1500 clones and represents a major commitment for the quarantine facilities over the next few years. This has put additional pressure on space, however, we have been able to take over some additional greenhouse space adjacent to the quarantine facilities as a temporary measure. During the year we have continued to repropagate a large part of our fully quarantined material. During the coming year we will be replacing approximately 70 clones which have been widely distributed with the much smaller repropagated material. We shall be contacting centres that, according to the International Cocoa Germplasm Database (ICGD), do not possess this material to ascertain whether shipment is required.

We have recently re-covered the main greenhouse since the polythene cover was nearing the end of its recommended life-span. We have also had to make some changes to the heating system to ensure that the facilities continue to run reliably. We have replaced our oldest oil-fired heater, which was requiring increased maintenance, with a new, more efficient unit. We have installed a back-up heating system which operates from a separate gas supply. In the event of a failure of one of the main heaters, or in the event of a break in the electricity supply, the back-up heating system cuts in automatically. We are grateful to the Biscuit, Cake, Chocolate and Confectionery Alliance for providing the funding for this upgrading of our facilities.

Viro-Bacterial Agglutination (VBA) Test

As we indicated in our last Newsletter we have been working closely with Dr. Jackie Hughes and the Cocoa Research Institute of Ghana in developing the VBA test as a more sensitive and reliable virus detection method for cocoa quarantine. In September we took delivery of a kit prepared by CRIG, but unfortunately technical problems prevented us from obtaining satisfactory results. We have, however, recently taken delivery of a second test kit which we are currently evaluating. Preliminary work, by Dr. Ann Parker, shows that the test can be successfully used to discriminate between healthy tissue and the virus-infected material that we are holding in isolation at the School of Plant Sciences.

Requests for material to enter intermediate quarantine

We welcome requests for specific germplasm which is not currently in quarantine at Reading. We are collaborating closely with the two international genebanks, ICG,T and CATIE, and would be happy to make a request for material on your behalf and include this in our quarantine schedule. Such requests should be made as early as possible as, with our present quarantine procedures, a two year period is required before the material can pass through our quarantine procedure.

Exchange of Cocoa Germplasm

We are keen to encourage the exchange of cocoa germplasm between producing countries. We are happy to provide clones free of charge if centres receiving this material can exchange this on a clone-for-clone basis with material unavailable elsewhere. If



Dr. Paul Hadley
Mrs. Teresa Wheeler
Dr. Michelle End

anyone is interested in receiving material on an exchange basis, please contact us.

Cocoa Budwood Exports

As we indicated in our last newsletter, if you or your colleagues are visiting the UK, please take the opportunity of returning with cocoa germplasm. This is by far the easiest and most successful means of transporting material from the collection. We can also arrange transport via a courier, however, this costs in the region of £50 and is not always reliable. Please let us know well in advance if you are planning to import germplasm since we now need to provide at least two weeks notice to the Ministry of Agriculture, Fisheries and Food Plant Health Inspectorate before inspection of material for export can take place.

Required Documentation for Exporting Cocoa Germplasm from the UK

We would like to take the opportunity to remind those requesting cocoa germplasm from the quarantine facilities that the following documentation is required before material can be exported.

- * a valid import permit for the destination country
- * a document clearly stating the phytosanitary treatment to be given to the material prior to export from the UK.

International Cocoa Germplasm Database

Version 3 of the International Cocoa Germplasm Database (ICGD) has now been released and has been sent out to everyone who returned a completed application form. This version has been completely revised and, in addition to containing substantially increased data on cocoa germplasm, the database contains a number of new features which greatly simplifies its use and allows more comprehensive searches to be carried out.

If you have not yet applied for the ICGD v.3 but would like to receive a copy, please send details of your computer, including the model, available hard disk space, RAM, and disk drive size to:

Dr. Michelle End,
ICGD Project,
School of Plant Sciences,
Plant Science Laboratories,
University of Reading,
Whiteknights, PO Box 221,
Reading RG6 6AS, UK.

Germplasm Information

If you have any questions relating to cocoa germplasm we will be happy to try to answer them, free of charge, through our cocoa germplasm information service.

We are constantly updating the ICGD based on information we receive from genebank managers. We would welcome any updated information you may have on the accessions in your germplasm collection, including data on their characteristics and performance. Please remember to complete and return the questionnaire we send out with each consignment of budwood. This provides us with useful feedback on your opinion of the quarantine service we provide and helps us monitor our success in distributing germplasm.

Pathology Report

Three sets of plant material were referred to the Pathology Consultant during the year.

1. One plant of NAPO 2, received from ICG,T in December 1987, died during the weekend of 9-11 July, 1993. *Fusarium decemcellulare* Brick, the conidial state of *Nectria rigidiuscula* Berk. & Br (previously assigned to the genus *Calonectria*) was consistently isolated from the stem base and its identity was confirmed by the CAB International Mycological Institute. The dead plant and the potting medium in which it was growing were sterilised before disposal.

2. Plants of different clones were found with leaf symptoms and abnormal development of axillary buds of four types: apical bud dead, shoots developed from axillary buds; no apical die-back but shoots developed from axillary buds; branching at cotyledon node; and poor growth habit. Distorted "strap-like" leaves were common and on a few plants there was vein clearing. All plants with symptoms were isolated and these plants were kept under observation from early July.

No fungus could be detected in stained sections of

shoots arising from a cotyledon node but when surface-sterilised segments were plated on agar they all yielded a *Fusarium* species identified as *Fusarium oxysporum* Schlecht by the CAB International Mycological Institute. However, inoculations of young cocoa seedlings, with or without prior wounding, produced no symptoms and it is unlikely that this fungus was involved in the abnormalities. The strap-like leaves could have been caused by zinc deficiency and a nutrient imbalance seems the most likely explanation for the various symptoms seen.

3. White fungal mycelium was observed growing from the lenticels of some budwood received from CATIE. Cultures established on agar appeared to be identical with those of *Fusarium oxysporum* obtained previously.

Purdy (1989) found that both *Fusarium decemcellulare* and *Fusarium oxysporum* were common on cocoa budwood and may result in failure to propagate the material. These fungi have also been implicated in cocoa dieback, especially *F. decemcellulare* (Turner, 1967). Usually these fungi are only saprophytes and do not induce disease unless the plant or budwood is subjected to some stress which predisposes it to attack. The isolation of these fungi suggests that they were already associated with the cocoa plants in the quarantine facility. *Fusarium oxysporum* is distributed worldwide and occurs chiefly as a soil saprophyte so it could be of local origin. *Fusarium decemcellulare* is more likely to have been introduced on budwood. Presumably it then became established on a budded plant grown-on in a tropical environment but only invaded when the plant was stressed in some way.

All the material investigated was subsequently destroyed.

References:

- Purdy, L.H. (1989). Budwood deterioration and germplasm transfer in *Theobroma cacao*. *Turrialba* 39, 435-440
- Turner, P.D. (1967). Cocoa dieback - a review of present knowledge. *FAO Plant Protection Bulletin* 15, 81-101.

**Description of clones held in the Cocoa Quarantine Collection at Reading University
March 1995**

(Kew, UK)
Royal Botanic Gardens, Kew,
Richmond, Surrey. TW9 3AB.
United Kingdom.

(USDA Miami)
Subtropical Horticultural Research
Station, 13601 Old Cutler Road,
Miami, Florida. 33158.

(BQS)
Barbados Quarantine Station

(CATIE)
Turrialba,
Apdo 25,
Costa Rica.

(CIRAD-CP)
CIRAD-CP,
BP 5035, 34032 Montpellier,
France.

(ICG,T.)
Cocoa Research Unit,
University of the West Indies,
St. Augustine, Trinidad & Tobago,
West Indies.

(CIRAD-GUF)
CIRAD-CP
Kourou
French Guyane.

Clone Name	Reading Code	Availability	Donor Genebank	Origin
AMAZ 3-2	RUQ 91	Available	ICG,T	R. Amazon, Iquitos Island, Peru. Chalmers, 1973
AMAZ 5-2	RUQ 93	Available		
AMAZ 6	RUQ 94	Available		
AMAZ 6-3	RUQ 95	Available		
AMAZ 10-1	RUQ 96	Available		
AMAZ 10-3	RUQ 97	Available		
AMAZ 12	RUQ 334	December 1996		
AMAZ 12-4	RUQ 79	Available		
AMAZ 15	RUQ 99	Available		
AMAZ 15-15	RUQ 1	Available	Kew,UK	
AM 1.8	RUQ 469	1997	ICG,T	Hacienda Amalia, Ecuador. Pound, 1938
AM 1.95	RUQ 472	1997		
AM 3.9	RUQ 521	1997		
AM 5.7	RUQ 522	1997		
AM 243	RUQ 454	1997		
BORNE 7 A2	RUQ 397	1997	CIRAD-GUF	Borne 7, French Guyana. Lachenaud, 1990
BORNE 7 A6	RUQ 398	1997		
BORNE 7 B2	RUQ 399	1997		
BORNE 7 B4	RUQ 401	1997		
BORNE 7 B5	RUQ 402	1997		
B 12-2	RUQ 436	1997	ICG,T	Hacienda Bolivar, Ecuador. Pound, 1937
B 68	RUQ 524	1997		
B 131	RUQ 348	February 1996		
B 137	RUQ 349	February 1996		
BE 2	RUQ 117	Available	CATIE	Belem, Brazil. Vello, 1965
BE 3	RUQ 2	Available	Kew,UK	
BE 10	RUQ 3	Available		
CC 11	RUQ 4	Available	Kew,UK	Cacao Centre, Costa Rica.
CC 38	RUQ 5	Available		UF 676 x MATINA, Costa Rica.
CL 19.21	RUQ 527	1997	ICG,T	Progeny from Hacienda Clementina, Ecuador. Pound, 1937
CL 103	RUQ 528	1997		
CLM 19	RUQ 438	1997		
CLM 90	RUQ 531	1997		
COCA 3370-5	RUQ 137	Available	ICG,T	R. Coca, Ecuador. Chalmers, 1973
CRU 47	RUQ 540	1997	ICG,T	Cocoa Research Unit, Trinidad
CRUZ 7-11	RUQ 315	December 1996	ICG,T	open pollinated seedling from C. Sul, Brazil.

Clone Name	Reading Code	Availability	Donor Genebank	Origin	
DOM 3	RUQ 543	1997	BQS	Dominica. Cassie, 1991	
DOM 4	RUQ 544	1997			
DOM 5	RUQ 545	1997			
DOM 10	RUQ 546	1997			
DOM 14	RUQ 542	1997			
DOM 30	RUQ 549	1997			
EET 58	RUQ 383	1997	ICG,T	Estacion Experimental Tropical, Ecuador.	
EET 95	RUQ 414	1997	CATIE		
EET 162	RUQ 350	December 1996	ICG,T		
EET 272	RUQ 6	Available	Kew,UK		
EQX 69	RUQ 100	Available	ICG,T	Selections from Ecuador	R. San miguel, R. Coca, R. Payamino. Ecuador. Chalmers, 1970
EQX 78	RUQ 83	Available			
EQX 3161	RUQ 139	Available		San Miguel	
EQX 3308-1	RUQ 102	Available		Coca	
EQX 3348-44	RUQ 140	Available		Coca	
EQX 3348-52	RUQ 141	Available		Coca	
EQX 3360-3	RUQ 142	Available		San Miguel	
EQX J5	RUQ 107	Available		San Miguel	
EQX O	RUQ 138	Available		San Miguel	
EQX Z	RUQ 109	Available			
GDL 3	RUQ 553	1997	BQS	Guadeloupe. Cassie, 1991	
GDL 11	RUQ 555	1997			
GU 123 C	RUQ 187	Available	CIRAD-CP	R. Camopi, French Guyana. Sallee, 1987	
GU 125 C	RUQ 188	Available			
GU 133 C	RUQ 190	Available			
GU 136 H	RUQ 221	Available			
GU 144 C	RUQ 191	Available			
GU 147 H	RUQ 222	Available			
GU 154 C	RUQ 192	Available			
GU 168 H	RUQ 223	Available			
GU 171 C	RUQ 195	Available			
GU 183 H	RUQ 224	Available			
GU 207 H	RUQ 225	Available			
GU 221 C	RUQ 200	Available			
GU 221 H	RUQ 226	Available			
GU 239 H	RUQ 227	Available			
GU 249 H	RUQ 228	Available			
GU 259 C	RUQ 203	Available			
GU 290 H	RUQ 229	Available			
GU 296 H	RUQ 230	Available			
GU 341 H	RUQ 231	Available			
ICS 16	RUQ 110	Available	ICG,T	Trinitario	Imperial College Selections, Trinidad.
ICS 27	RUQ 143	Available			
ICS 43	RUQ 144	Available		Nic. Criollo	
ICS 44	RUQ 416	1997	CATIE		

Clone Name	Reading Code	Availability	Donor Genebank	Origin	
ICS 47	RUQ 145	Available	ICG,T	Criollo	
ICS 48	RUQ 146	Available			
ICS 70	RUQ 321	December 1996			
ICS 100	RUQ 111	Available			
IMC 11	RUQ 8	Available	Kew,UK	Nic. Criollo	Iquitos Mixed Calabacillo, Peru. Pound, 1937
IMC 14	RUQ 9	Available			
IMC 20	RUQ 10	Available			
IMC 54	RUQ 11	Available			
IMC 61	RUQ 12	Available			
IMC 67	RUQ 13	Available			
IMC 83	RUQ 15	Available			
IMC 96	RUQ 16	Available			
JA 10.12	RUQ 456	1997	ICG,T	Hacienda Javilla, Ecuador.	
JA 19	RUQ 457	1997			
JA 119	RUQ 352	December 1996			
KER 2-E	RUQ 405	1997	CIRAD-GUF	R. Oyapock, French Guyana. Lachenaud, 1990	
KER 3	RUQ 406	1997			
KER 6	RUQ 408	1997			
KER 7	RUQ 409	1997			
KER 9	RUQ 410	1997			
LAF 1	RUQ 17	Available	Kew,UK	Costa Rica.	
LCT EEN 28/S1	RUQ 67	Available	ICG,T	R. Napo, R. Yacuambi, R. Villano, Ecuador. Allen, 1980 - 1985	
LCT EEN 31	RUQ 441	1997			
LCT EEN 37 A	RUQ 148	Available	USDA MIAMI		
LCT EEN 37 F	RUQ 153	Available			
LCT EEN 37 G	RUQ 154	Available			
LCT EEN 37 I	RUQ 156	Available			
LCT EEN 46	RUQ 19	Available	Kew,UK		
LCT EEN 68	RUQ 442	1997	ICG,T		
LCT EEN 85	RUQ 147	??			
LCT EEN 86	RUQ 443	1997			
LCT EEN 127	RUQ 69	Available			
LCT EEN 162/1010	RUQ 70	Available			
LCT EEN 163 A	RUQ 178	Available	USDA MIAMI		
LCT EEN 163 D	RUQ 180	Available			
LCT EEN 241 on 163 B	RUQ 185	Available			
LP 141	RUQ 353	December 1996	ICG,T	Hacienda La Paz, Ecuador. Pound	
LP 340	RUQ 460	1997			
LP 519	RUQ 461	1997			
LV 20	RUQ 354	December 1996	ICG,T	Limoncillo Selections. Ecuador. Pound.	
LV 28	RUQ 462	1997			
LX 6	RUQ 463	1997			
LX 28	RUQ 355	1997			
MA 12	RUQ 124	Available	CATIE	Manaus, Brazil. Vello, 1965	
MAN 15-2	RUQ 86	Available	ICG,T	open pollinated seedling of MA 15	
MAN 15-60	RUQ 87	Available			

Clone Name	Reading Code	Availability	Donor Genebank	Origin
MAR 9	RUQ 557	1997	BQS	Martinique. Cassie, 1991
MAR 13	RUQ 559	1997		
MO 20	RUQ 233	Available	ICG,T	R. Morona, Peru. Pound, 1937
MO 83	RUQ 449	1997		
MOCORONGO	RUQ 21	Available	Kew,UK	Santarem, Para, Brazil.
MOQ 222	RUQ 453	1997	ICG,T	Hacienda Moquique, Ecuador. Pound, 1937
MXC 67	RUQ 104	??	ICG,T	Chiapas, Mexico.
NA 33	RUQ 114	Available	ICG,T	R. Nanay, Peru. Pound, 1937
NA 756	RUQ 468	1997		
NA 776	RUQ 215	Available		
NA 824	RUQ 218	Available		
PLAYA ALTA 2	RUQ 232	1997		
P 4 A	RUQ 22	Available	Kew,UK	R. Nanay, Peru. Pound, 1942
P 4 B	RUQ 23	Available		
P 7 B	RUQ 24	Available		
P 14 B	RUQ 25	Available		
P 16 A	RUQ 26	Available		
P 19 A	RUQ 27	Available		
P 19 B	RUQ 28	Available		
P 10 (10 P)	RUQ 29	Available	Kew,UK	Tabasco, Mexico.
PA 7	RUQ 113	Available	Kew,UK	Parinari, Peru. Pound, 1937
PA 56	RUQ 32	Available		
PA 70	RUQ 33	Available		
PA 88	RUQ 34	Available		
PA 107	RUQ 35	Available		
PA 137	RUQ 36	Available		
PA 175	RUQ 37	Available		
PINA	RUQ 411	1997	CIRAD-GUF	Pina, French Guyana. Lachenaud, 1990
PUCALA 1	RUQ 39	Available	Kew,UK	Brazil.
R 10 (MEX)	RUQ 484	1997	ICG,T	Rosario Izapa, Mexico. (Mexico number often given before name eg. 10 R)
R 21 (MEX)	RUQ 486	1997		
R 39 (MEX)	RUQ 487	1997		
R.B. 29	RUQ 129	?	CATIE	R. Branco, Brazil. Vello, 1965
R.B. 29	RUQ 419	1997		
R.B. 33/3	RUQ 40	Available	Kew,UK	
R.B. 39	RUQ 131	?	CATIE	
R.B. 41	RUQ 132	?		
R.B. 46	RUQ 134	?		
R.B. 47	RUQ 135	?		
R.B. 49	RUQ 136	?		
RED 127	RUQ 339	December 1996	ICG,T	Red Amelonado from the Amazon Valley.
RIM 189	RUQ 310	1997	CATIE	Chiapas, Mexico. (R 189)
SC 1	RUQ 41	Available	Kew,UK	Seleccion Colombia.
SC 3	RUQ 42	Available		
SC 4	RUQ 43	Available		
SC 9	RUQ 44	Available		
SC 10	RUQ 45	Available		

Clone Name	Reading Code	Availability	Donor Genebank	Origin
SCA 6	RUQ 234	February 1996	ICG,T	Scavina. Brazil. Pound, 1937
SCA 11	RUQ 374	1997		
SCA 19	RUQ 46	Available	Kew,UK	
SCA 23	RUQ 390	1997	ICG,T	
SCA 24	RUQ 357	December 1996	ICG,T	
SIAL 93	RUQ 47	Available	Kew,UK	Brazil.
SIAL 339	RUQ 48	Available		
SIC 5	RUQ 49	1997	Kew,UK	Brazil.
SJ 119	RUQ 358	December 1996	ICG,T	Hacienda San Juan, Ecuador. Pound.
SLC 12	RUQ 539	1997	ICG,T	Hacienda Santa Lucia, Ecuador. Pound.
SPA 4	RUQ 341	December 1996	ICG,T	Progeny of a fruit donated to Columbia by Pound.
SPA 9	RUQ 235	February 1996		
SPEC 54-1	RUQ 50	Available	Kew,UK	R. Papuri, R. Cauca, Colombia. 1952
SPEC 160-9	RUQ 51	Available		
SPEC 184-2	RUQ 323	1997	ICG,T	
SPEC 194-75	RUQ 325	December 1996		
TJ 1	RUQ 52	Available	Kew,UK	Criollo, Honduras.
UF 221	RUQ 54	Available	Kew,UK	United Fruit Company selections from the Atlantic Coast, Costa Rica.
UF 667	RUQ 55	Available		
UF 676	RUQ 56	Available		
UF 677	RUQ 346	1997	ICG,T	
UF 705	RUQ 57	Available	Kew,UK	
UF 705	RUQ 481	1997	ICG,T	