Genetic Resources Communication

Genetic Resources Communication
No. 16, 1993

The CB *Rhizobium/Bradyrhizobium* strain collection

R.A. Date[1] and R.W. Williams[1]

(This GRC replaces and updates GRC No. 5, 1984)

GRC

AUSTRALIA

ISSN 0159-6071
ISBN 0 643 05332 8

Genetic Resources Communication
No. 16, 1993

The CB *Rhizobium/Bradyrhizobium* strain collection

R.A. Date[1] and R.W. Williams[1]

(This GRC replaces and updates GRC No. 5, 1984)

SUMMARY:

This is a catalogue of 534 strains of *Rhizobium* and *Bradyrhizobium* available from the Division of Tropical Crops and Pastures, CSIRO, Brisbane. The catalogue is in two parts. The first is a list of strains of *Rhizobium* and *Bradyrhizobium* by accession number and includes information concerning origin and growth characteristics. The second is an inverse list by host species in genus/species order and includes a listing of strains isolated from that host legume.

Included in this communication is a list of strains recommended for the inoculation of the most commonly sown crop and pasture legumes. Those strains that are available in commercially prepared legume seed inoculants are clearly marked.

All strains are stored as freeze-dried cultures. The method is described in an appendix.

[1] Division of Tropical Crops and Pastures, CSIRO, Cunningham Laboratory, 306 Carmody Rd, St Lucia, Queensland 4067, Australia.

Keywords: inoculation, freeze-drying

Published by: CSIRO, Division of Tropical Crops and Pastures, St Lucia, Brisbane, Queensland 4067, Australia.

The CB *Rhizobium/Bradyrhizobium* strain collection

R.A. Date and R. W. Williams

The Division of Tropical Crops and Pastures' collection of root-nodule bacteria for tropical and sub-tropical legumes began in 1956 when Dr D.O. Norris commenced his studies on defining the nodulation and nitrogen fixing requirements of potentially useful legumes imported from other parts of the world. The total germplasm bank now contains 3490 authenticated strains of *Rhizobium* and *Bradyrhizobium* isolated from a wide range of crop and forage legumes. There are strains representing 94 genera and 381 species of legume. The distribution of strains across genera and species is indicated by the information summarized in Table 1. There are 70 genera represented by "others" for the CB Collection and 25 "others" for this catalogue (Table 2). The collection contains native strains isolated from both indigenous and imported legumes as well as strains isolated from nodule material collected specifically in those regions of Africa and Central and South America from which most of the Division's plant germplasm originates.

This catalogue lists those strains (534) that have been evaluated and found effective in nitrogen fixation with one or more legume hosts in glasshouse sand-jar (Norris and Date, 1976) and soil-pot tests (e.g., Date, 1991). Information related to effectiveness is published separately (Date, Williams and Bushby, 1993). These two Genetic Resource Communications (16 and 17) update and replace Genetic Resources Communications Nos. 5, 6 and 7 (Date, Bushby, and Panitz, 1984; Date and Norris, 1984; Bushby, Date, Norris and Panitz, 1984).

All cultures in the collection germplasm bank are maintained freeze-dried in vacuum sealed ampoules stored at room temperature (20-25°C). The method of preservation is a modification of the procedure described by Vincent (1970), and is similar to that described by Dye (1980). Details are described in Appendix I.

The CB Collection is listed in the World Directory of Collections of Cultures of Microorganisms (World Data Centre for Microorganisms, 1986) as Collection No.57, and has the Australian *Rhizobium/Bradyrhizobium* Collection identifying acronym CB (CSIRO, Brisbane). Information for a limited number of strains is included in the World Catalogue of *Rhizobium* Collections (UNESCO/UNEP, 1986).

The catalogue is in two parts, **The CB Accession List** and **The Host List.**

The CB Accession List

Strains are listed by their CB accession number with details of host and country of origin and brief bacteriological details. No distinction is made between *Rhizobium* (generally fast-growing) and *Bradyrhizobium* (generally slow-growing) (Jordan, 1984). The headings GENUS, SPECIES, and TOWN are self explanatory. The abbreviations used for CTRY(=COUNTRY) are those recommended by the International Board for Plant Genetic Resources (IBPGR, 1982). CBNO is the CB Collection accession number and ORIG.NO. records the label or number of a strain received from another laboratory or project. Strains with ORIG.NO. prefixes RAD and ST and those without an ORIG.NO. were isolated by

Division of Tropical Crops and Pastures. GROWTH and REACTION refer to the general rate of growth and the culture medium pH when grown in a standard yeast-mannitol medium (Vincent, 1970). Growth is recorded as either 'fast' (2-3 days), 'intmed' (=intermediate) (3-5 days), 'slow' (5-7 days), 'v.slow' (10-14 days) or 'var' (=variable) (? days). REACTION is final pH expressed as 'acid', 'neutral' or 'alkaline', relative to the starting level (pH 6.8-7.0), at the end of the growth period (Norris, 1965). We use the information listed under GROWTH and REACTION as a general guide to a strain's behaviour. Many strains react differently with small changes in medium composition and growth condition (Date and Halliday, 1979). The COMMENT column is used to amplify previous information or report a special characteristic. Abbreviations used are E or Eff = effective in N_2-fixation, Ex or ex = from, I = ineffective, km = kilometres and Orig = origin.

The Host List

This is a list of host legumes represented by the strains of *Rhizobium* and *Bradyrhizobium* in The CB Accession List above. The strains isolated from each host are listed by CB number after each plant name. These represent 48 genera and 142 species.

Recommended Strains

A list of strains recommended for the inoculation of most of the commonly sown legumes is included following The Host List. Strains are listed by CB number and are available in vacuum sealed ampoules, small screw-capped-tube agar cultures and in special circumstances as peat culture. Strains marked with an asterisk (*) are available as commercially produced inoculant in Australia. They may not form effective associations with all lines, varieties and accessions of the indicated species since strong host by strain specificities are well known in some species (Date, 1991; Brockwell *et al.*, 1982).

References

Brockwell, J., Diatloff, A., Roughley, R.J. and Date, R.A. (1982). Selection of rhizobia for inoculants. In 'Nitrogen Fixation in Legumes'. (Ed J.M. Vincent). pp. 173-191. Academic Press: Sydney.

Bushby, H.V.A., Date, R.A., Norris, D.O. and Panitz, R.B. (1984). *Rhizobium* screening for a range of crop and pasture legumes: Lists of strains of *Rhizobium* and host legumes forming effective and highly effective associations. CSIRO Aust., Div. Trop. Crops Past. Genet. Resourc. Commun. No. **7**.

Date, R.A. (1991). Nitrogen fixation in *Desmanthus*: Strain specificity of *Rhizobium* and responses to inoculation in acidic and alkaline soil. Trop. Grasslds. **25**, 47-55.

Date, R.A., Bushby, H.V.A. and Panitz, R.B. (1984). The CB *Rhizobium* Collection. CSIRO Aust., Div. Trop. Crops Past. Genet. Resourc. Commun. No. **5**.

Date, R.A. and Halliday, J. (1979) Selecting *Rhizobium* for acid infertile soils of the tropics. Nature **277**, 62-64.

Date, R.A. and Norris, D.O. (1979). *Rhizobium* screening of *Stylosanthes* species for effectiveness in nitrogen fixation. Aust. J. Agric. Res. **30**, 85-104.

Date, R.A. and Norris, D.O. (1984). Supplement to "*Rhizobium* screening of *Stylosanthes* for effectiveness in nitrogen fixation [Date and Norris (1979) Aust. J. Agric. Res. **30**,85-104]: Lists of host accessions and strains of *Rhizobium* forming effective and highly effective associations. CSIRO Aust., Div. Trop. Crops Past. Genet. Resourc. Commun. No. **6**.

Date, R.A., Williams, R.W., and Bushby, H.V.A. (1993). Screening crop and Pasture legumes for effective nitrogen-fixing associations: list of host legumes and strains of root-nodule bacteria forming effective nitrogen fixing associations. CSIRO Aust., Div. Trop. Crops Past. Genet. Resourc. Commun. No. 17.

Dye, M. (1980). Functions and maintenance of a *Rhizobium* collection. In 'Recent Advances in Biological Nitrogen Fixation'. (Ed N.S.Subba Rao). pp. 435-471. Edward Arnold: London.

IBPGR (1982). Country abbreviations for use with IBPGR descriptions. Plant Genetic Resources - Newsletter No.**49**.

Jordan, D.C. (1984). Family III. Rhizobiaceae Conn 1938, 321. In "Bergey's Manual of Systematic Bacteriology, Volume 1". (Eds N.R. Krieg and J.G. Holt). pp. 234-244. Williams & Williams: Baltimore.

Norris, D.O. (1965). Acid production by *Rhizobium* - a unifying concept. Plant Soil **22**,143-166.

Norris, D.O. and Date, R.A. (1976). Legume Bacteriology. In 'Tropical Pasture Research - Principles and Methods'. (Eds N.H. Shaw and W.W.Bryan) Comm. Bur. Past. Fld. Crops Bull. No.51. pp. 134-174.

UNESCO/UNEP (1986). World Catalogue of *Rhizobium* Collections. (Ed V.B.D.Skerman). University of Queensland, Brisbane.

Vincent, J.M. (1970). A manual for the practical study of root-nodule bacteria. Blackwell Scientific Publications: Oxford.

World Data Center for Microorganisms (1986). World Directory of Collections of Microorganisms, 3rd Edition. (Eds J.E.Staines, V.F. McGowan and V.B.D.Skerman). University of Queensland: Brisbane.

Table 1. Summary of number of strains of *Rhizobium* and *Bradyrhizobium*, plant genera and species represented in the CB germplasm collection and in this catalogue.

Genus	CB Collection		This Catalogue	
	No.species	No.strains	No.species	No.strains
Acacia	10	19	2	3
Arachis	6	63	5	8
Cajanus	2	35	1	5
Calopogonium	3	41	1	2
Centrosema	9	164	5	12
Desmanthus	6	76	2	2
Desmodium	29	380	10	27
Glycine	10	132	4	42
Indigofera	15	47	8	15
Leucaena	11	255	9	132
Lotononis	6	30	5	19
Lotus	7	13	3	4
Macroptilium	8	29	4	18
Macrotyloma	5	9	3	3
Medicago	8	40	4	22
Neonotonia	1	25	1	9
Phaseolus	3	48	1	3
Psoralea	6	29	0	0
Sesbania	11	51	6	10
Stylosanthes	21	1081	8	75
Teramnus	4	29	1	2
Trifolium	24	154	17	40
Vigna	18	138	9	23
Others *	158	602	33	58
Total	381	3490	142	534
Total genera	94		48	

* See Table 2.

Table 2. List of genera represented in the CB Germplasm Collection by strains of root-nodule bacteria

Abrus +	*Dorycnium* +	*Onobrychis* *
Acacia	*Dunbaria* +	*Ornithopus* *
Adesmia *	*Eriosema* +	*Oxytropus* +
Aeschynomene *	*Erythrina* +	*Pachyrhizus* +
Albizia +	*Flemingia* +	*Petalostemum* +
Alysicarpus *	*Galactia* +	*Phaseolus*
Andira +	*Gliricidia* *	*Pisum* *
Anthyllis +	*Glycine*	*Pongamia* +
Arachis	*Gompholobium* +	*Prosopis* *
Argyrolobium +	*Hedysarum* +	*Psoralea*
Astragalus +	*Indigofera*	*Pueraria* +
Atylosia +	*Jacksonia* +	*Pultenaea* +
Cajanus	*Kummerowia* +	*Rhynchosia* *
Calliandra +	*Lablab* *	*Schleinitzia* *
Calopogonium	*Lathyrus* +	*Sesbania* *
Canavalia +	*Lens* +	*Sophora* +
Carmichaelia +	*Lespedeza* +	*Stizolobium* +
Cassia *	*Leucaena*	*Stylosanthes*
Centrosema	*Listia* *	*Templetonia* +
Chamaecrista +	*Lonchocarpus* +	*Tephrosia* +
Chamaecytisus *	*Lotononis*	*Teramnus*
Cicer *	*Lotus*	*Trifolium*
Clitoria *	*Lupinus* +	*Trigonella* +
Codariocalyx *	*Machaerium* +	*Uraria* +
Coronilla *	*Macroptilium*	*Vandasina* +
Crotalaria *	*Macrotyloma*	*Vicia* *
Dalbergia +	*Medicago*	*Vigna*
Dalea +	*Melilotus* +	*Zornia* *
Daviesia +	*Mimosa* *	(Unknown genera)
Desmanthus	*Mucuna* +	
Desmodium	*Neonotonia*	
Dolichos *	*Neptunia* *	

\+ indicates genera for which strains exist in the germplasm collection but for which no nitrogen fixation effectiveness data are available.

* indicates genera included as "others" in This Catalogue section of Table 1.

THE CB STRAIN ACCESSION LIST

∞

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
1	SU157	Trifolium	repens	AUS	Glen Innes	fast	acid	
3	NA34	Trifolium	subterraneum	AUS		fast	acid	
27		Macroptilium	lathyroides	AUS	Beerwah	slow	acid	
31		Arachis	diogoi	AUS	Elimbah	slow	alkaline	
33		Indigofera	trita	AUS	Beerwah	intmed	alkaline	
40		Glycine	tabacina	AUS	Grantham	slow	alkaline	
42		Macroptilium	lathyroides	AUS		slow	alkaline	
44		Stylosanthes	guianensis	AUS	Colston	slow	alkaline	
46		Desmodium	triflorum	AUS	Brisbane	slow	alkaline	
52		Stylosanthes	guianensis	AUS	Gatton	slow	alkaline	
53		Macroptilium	lathyroides	AUS	Gatton	slow	alkaline	
54		Macroptilium	lathyroides	AUS	Gatton	slow	alkaline	
61	AH2	Medicago	sativa	GBR		fast	acid	
64	Barrel	Medicago	truncatula	AUS		fast	acid	
65		Stylosanthes	(sp.)	AUS	Strathpine	intmed	alkaline	
76		Stylosanthes	humilis	AUS	Townsville	intmed	alkaline	
81		Leucaena	leucocephala	AUS	Brisbane	fast	acid	
82		Stylosanthes	guianensis	AUS	Fitzroyvale	intmed	neutral	
93		Stylosanthes	fruticosa	AUS	Strathpine	slow	alkaline	
98		Medicago	truncatula	AUS	Cecil Plains	fast	acid	
103		Stylosanthes	humilis	AUS	Katherine	slow	neutral	
105		Stylosanthes	humilis	AUS	Katherine	slow	alkaline	
108		Pisum	sativum	AUS	Mooloola	fast	neutral	
110		Medicago	truncatula	AUS	Gatton	fast	acid	
112		Medicago	(sp.)	AUS	Gatton	intmed	alkaline	
113		Medicago	sativa	AUS	Gatton	fast	acid	
115		Medicago	sativa	AUS	Gatton	fast	acid	
118		Medicago	sativa	AUS	Kingaroy	fast	acid	
119		Medicago	sativa	AUS	Gatton	fast	acid	
121		Macroptilium	lathyroides	AUS	Rockhampton	slow	alkaline	
128		Desmodium	uncinatum	AUS	Redland Bay	slow	alkaline	
134		Vicia	sativa	AUS	St Lucia	fast	neutral	
136		Cajanus	cajan	AUS	Biloela	intmed	alkaline	
147	ROTH CLF	Trifolium	repens	GBR		fast	acid	
152		Indigofera	trifoliata	AUS	Calliope	fast	alkaline	
159		Dolichos	trilobus	AUS	Maryborough	slow	alkaline	Mild alkali production
170		Macroptilium	lathyroides	AUS	Calliope	slow	alkaline	
187		Desmodium	uncinatum	AUS	Redland Bay	slow	alkaline	
188		Crotalaria	brevidens	AUS	Redland Bay	slow	alkaline	Grows 41 oC

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
214		Medicago	(sp.)	AUS	Toowoomba	fast	acid	
217		Medicago	sativa	AUS	Stanthorpe	fast	acid	
227		Medicago	sativa	AUS	Rodds Bay	fast	alkaline	
232		Glycine	tomentella	AUS	Jondaryan	slow	alkaline	
257		Medicago	sativa	AUS	Gatton	fast	acid	
273		Stylosanthes	fruticosa	PNG	Lae	intmed	acid	
278		Alysicarpus	vaginalis	AUS	Katherine	intmed	alkaline	
279		Clitoria	ternatea	AUS	Katherine	slow	alkaline	
284		Vigna	mungo	AUS	Katherine	slow	alkaline	
291		Glycine	tabacina	AUS	Katherine	slow	alkaline	
319		Macroptilium	lathyroides	AUS	Rodds Bay	slow	alkaline	
327		Glycine	clandestina	AUS	Esk	intmed	alkaline	
328		Zornia	diphylla	AUS	Katherine	slow	alkaline	
331		Indigofera	suffruticosa	AUS	Brisbane	intmed	alkaline	
333		Indigofera	suffruticosa	AUS	Brisbane	intmed	alkaline	
334		Indigofera	australis	AUS	Brisbane	slow	alkaline	
336		Indigofera	trita	AUS	Brisbane	intmed	alkaline	
337		Indigofera	trita	AUS	Brisbane	slow	alkaline	
341		Indigofera	suffruticosa	AUS	Brisbane	intmed	alkaline	
344		Indigofera	mucronata	AUS	Brisbane	intmed	acid	
345		Indigofera	arrecta	AUS	Brisbane	intmed	alkaline	
348		Indigofera	suffruticosa	AUS	Brisbane	intmed	alkaline	
349		Indigofera	arrecta	AUS	Brisbane	intmed	alkaline	
350		Indigofera	hirsuta	AUS	Brisbane	intmed	alkaline	
356		Indigofera	(sp.)	AUS	Brisbane	slow	alkaline	
358		Indigofera	trita	AUS	Brisbane	slow	alkaline	
376		Lotononis	bainesii	ZAF	Pretoria	intmed	alkaline	Pinkish colonies
430		Leucaena	leucocephala	AUS	Rodds Bay	intmed	neutral	
453		Neonotonia	wightii	AUS	Mareeba	intmed	alkaline	
483		Cajanus	cajan	AUS	Strathpine	slow	alkaline	
484		Teramnus	uncinatus	AUS	Strathpine	slow	alkaline	
512		Vigna	radiata	AUS	Taroom	intmed	alkaline	
516		Stylosanthes	humilis	AUS	Taroom	intmed	alkaline	
526	58A 6 6	Trifolium	semipilosum	KEN	Nairobi	fast	neutral	
530		Arachis	prostrata	AUS	Samford	intmed	alkaline	
627	22-4	Desmodium	intortum	ZAR		intmed	alkaline	
661		Vigna	radiata	IND	Modhya	intmed	alkaline	
714		Trifolium	rueppellianum	TZA	Mbulu	fast	acid	
727	NA175	Trifolium	burchellianum	ZAF	E.Griquland	fast	acid	

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
730		Lotononis	bainesii	ZAF	Louis Trich	slow	alkaline	Pinkish colonies
756		Macrotyloma	africanum	ZIM	Marandellas	slow	neutral	
758	NA176	Trifolium	tembense	TZA	Bashai	fast	acid	
763		Trifolium	semipilosum	UGA	Entebbe	fast	neutral	
766		Trifolium	rueppellianum	TZA	Mbulu	fast	acid	
768		Listia	heterophylla	ZIM	Bvumbwe	slow	alkaline	Pinkish colonies
771	NA179	Trifolium	usambarense	TZA	Mbulu	fast	acid	
772		Trifolium	rueppellianum	TZA	Mbulu	fast	acid	
773		Trifolium	tembense	TZA	Mbulu	fast	acid	
774		Trifolium	rueppellianum	TZA	Mbulu	fast	acid	
775		Trifolium	usambarense	TZA	Mbulu	fast	acid	
778		Trifolium	semipilosum	KEN	01 Joro Oro	intmed	acid	
782		Trifolium	semipilosum	KEN	Kitale	fast	acid	
786		Vigna	oblongifolia	UGA	Murchison F	slow	alkaline	
788		Trifolium	semipilosum	AUS	Beerwah	intmed	acid	
806		Trifolium	isthmocarpum	BRA	Montenegro	fast	acid	
813	Lucerne 51	Medicago	sativa	AUS	Perth	intmed	acid	
867	AR30	Trifolium	subterraneum	AUS	Bundarra	fast	acid	
875	AR43	Trifolium	subterraneum	AUS	Uralla	fast	acid	
876	AR44A	Trifolium	subterraneum	AUS	Uralla	fast	acid	
890		Vigna	radiata	AUS	Kilcummin	slow	alkaline	
905		Sesbania	macrocarpa	USA	Beltsville	fast	acid	
915		Vigna	marina	AUS	Bingil Bay	slow	alkaline	
924		Neptunia	(sp.)	AUS	Camooweal	intmed	acid	
947	712	Leucaena	leucocephala	USA		fast	acid	
948	NGR8	Leucaena	leucocephala	PNG		fast	acid	
952		Leucaena	leucocephala	AUS	Darwin	fast	acid	
967		Medicago	sativa	AUS	Taroom	fast	neutral	
985		Vigna	mungo	PHL	Baguio	slow	alkaline	
1003		Glycine	max	THA	Srisommong F	intmed	alkaline	
1011		Vigna	mungo	IND	Haringhata F	intmed	alkaline	
1015		Vigna	radiata	IND	Haringhata F	slow	alkaline	
1017		Vigna	radiata	IND	Haringhata F	intmed	acid	
1024		Macrotyloma	uniflorum	IND	Coimbatore	intmed	alkaline	Colonies have firm centre
1027		Desmodium	intortum	LKA	Peraderiya	intmed	acid	
1030		Sesbania	(sp.)	LKA	Peraderiya	fast	acid	
1035		Medicago	sativa	PAK	Lyallpur	fast	acid	
1042		Vigna	radiata	PAK		fast	alkaline	
1057	QA922	Neonotonia	wightii	AUS		slow	alkaline	

CSIRO, Division of Tropical Crops & Pastures, Root-Nodule Bacteria Genetic Resource Collection, April 1993

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
1071	CC511	Phaseolus	vulgaris	USA		intmed	acid	
1091	USDA316T	Lablab	purpureus	USA		fast	acid	
1103		Centrosema	pubescens	AUS	Utchee Ck	slow	alkaline	
1149	NGR31	Leucaena	leucocephala	PNG	Port Moresby	fast	acid	
1170	G'lands308	Medicago	sativa	USA		fast	acid	from Nodogen peat
1209	95E3	Lotus	uliginosus	USA	Milwaukee	slow	alkaline	
1224		Phaseolus	vulgaris	AUS	Charlton	fast	acid	
1243		Vigna	mungo	AUS	Humpty Doo	intmed	alkaline	
1247		Vigna	mungo	AUS	Kununurra	slow	alkaline	
1263		Desmodium	(sp.)	MYS	Kuching	fast	alkaline	
1267		Neonotonia	wightii	MYS	Kuching	slow	alkaline	
1272		Stylosanthes	(sp.)	MYS	Kuching	slow	alkaline	
1297		Lotononis	angolensis	ZIM	Fort Jamison	intmed	alkaline	Pinky-white colonies.
1298		Lotononis	angolensis	ZIM	Fort Jamison	slow	alkaline	
1299		Lotononis	angolensis	ZIM	Fort Jamison	slow	alkaline	
1300	CC?	Lotus	maroccanus	AUS	Canberra	fast	acid	
1321		Lotononis	angolensis	ZIM	Fort Jameson	intmed	alkaline	Pinky-white colonies.
1322		Lotononis	angolensis	ZIM	Fort Jameson	intmed	alkaline	Pinky-white colonies.
1323		Lotononis	angolensis	ZIM	Fort Jameson	intmed	alkaline	Pinky-white colonies.
1353		Leucaena	leucocephala	COL		fast	neutral	
1368		Medicago	sativa	PNG	Lae	fast	acid	large gummy colonies
1394	203A	Lotononis	stipulosa	ZIM		slow	alkaline	
1397		Neptunia	plena	GUY	Mon Repos	intmed	acid	2 colony types
1408		Stylosanthes	guianensis	GUF		slow	alkaline	
1444	UNZ 29	Trifolium	repens	AUS	Sydney	slow	alkaline	
1445	U45	Medicago	sativa	URY		fast	acid	
1446	SU47	Medicago	sativa	AUS	Sydney	fast	acid	
1447	NIT175G11	Pisum	sativum	AUS	Sydney	fast	acid	ex SU391(Nitragin peat)
1483		Cassia	rotundifolia	BRA		slow	alkaline	
1491		Centrosema	pubescens	BRA	Matao	slow	alkaline	
1494		Centrosema	pubescens	BRA	Km47	slow	alkaline	
1517		Desmodium	pabulare	BRA	Araraquara	slow	alkaline	
1524		Macroptilium	lathyroides	BRA	Matao	slow	alkaline	
1546		Zornia	diphylla	BRA	Matao	fast	alkaline	
1552		Stylosanthes	guianensis	BRA	Matao	slow	alkaline	Colonies coalescing
1564		Desmodium	canum	BRA	Tres Coracoes	intmed	alkaline	
1580		Stylosanthes	guianensis	BRA	Campinas	intmed	alkaline	
1622		Desmodium	tortuosum	BRA	Campinas	intmed	alkaline	
1627		Desmodium	barbatum	BRA	Valinhos	fast	neutral	Colonies coalescing

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
1632	SFS97	Desmodium	adscendens	BRA	Valinhos	intmed	acid	
1650		Stylosanthes	guianensis	BRA	Matao	slow	acid	
1668		Glycine	max	BRA	Matao	intmed	alkaline	
1675		Stylosanthes	humilis	BRA	Matao	slow	acid	
1689		Stylosanthes	humilis	BRA	Matao	slow	neutral	
1698	SFS79	Centrosema	plumieri	BRA	Matao	slow	alkaline	
1717		Macroptilium	erythroloma	BRA	Pirassununga	slow	alkaline	
1727		Stylosanthes	humilis	BRA	Campinas	slow	alkaline	
1753		Glycine	max	USA	Princeton	slow	alkaline	Isolated fr Nodogen peat
1761		Adesmia	bicolor	URY	Pan De Azuca	fast	acid	
1775	969BA	Lotononis	bainesii	ZIM	Marandellas	intmed	alkaline	Pinky colonies
1776	970AA	Lotononis	bainesii	ZIM	Marandellas	slow	alkaline	Pinky colonies
1777	968AA	Lotononis	bainesii	ZIM	Marandellas	slow	alkaline	Pinky colonies
1778	971AA	Lotononis	bainesii	ZIM	Marandellas	slow	alkaline	Pinky colonies
1779	932A	Lotononis	bainesii	ZIM	Marandellas	slow	alkaline	
1780	606B	Dolichos	kilimand'icus	ZIM	Marandellas	slow	acid	
1782		Stylosanthes	humilis	USA	Chapel Hill	intmed	alkaline	Yellowish/white colonies
1786		Glycine	max	THA	Lampoon	intmed	alkaline	Cols firm ctr gummy outer
1791	USDA6	Glycine	max	USA	Beltsville	intmed	alkaline	Effective isolate fr Iowa
1793	USDA40	Glycine	max	USA	Beltsville	slow	alkaline	Orig from N.Jersey
1794	USDA44	Glycine	max	USA	Beltsville	slow	alkaline	Orig from USDA
1795	USDA46	Glycine	max	USA	Beltsville	slow	alkaline	Heat stable Ag fr Alabama
1797	USDA62	Glycine	max	USA	Beltsville	slow	alkaline	Orig fr N.Carolina
1799	USDA110	Glycine	max	USA	Beltsville	intmed	alkaline	Highly competitive Bville
1802	USDA122	Glycine	max	USA	Beltsville	fast	alkaline	Dominant type M'ppi soil
1803	USDA46	Glycine	max	USA	Beltsville	intmed	alkaline	Fr commercial culture
1805	USDA125	Glycine	max	USA	Beltsville	intmed	alkaline	Dominant Beltsville soil
1808	USDA135	Glycine	max	USA	Beltsville	slow	alkaline	In high pH soils Iowa
1809	USDA136	Glycine	max	USA	Beltsville	intmed	alkaline	Dominant Beltsville soil
1810	JAP36-2	Glycine	max	USA	Beltsville	slow	alkaline	
1895		Teramnus	uncinatus	DOM	Santiago	slow	alkaline	
1908		Glycine	tomentella	AUS	Gin Gin	slow	alkaline	
1911	QA981	Glycine	max	AUS	Warwick	slow	alkaline	
1914	SFS13	Neonotonia	wightii	BRA	Km47	intmed	alkaline	
1915	SFS14	Neonotonia	wightii	BRA	Km47	slow	alkaline	
1916	SFS19	Neonotonia	wightii	BRA	Matao	slow	alkaline	
1918	SFS31	Neonotonia	wightii	BRA	Km47	slow	alkaline	
1922	SFS237	Centrosema	pubescens	BRA	Campinas	slow	alkaline	
1923	SFS261	Centrosema	pubescens	BRA	Campinas	slow	alkaline	Black nod strain

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
1924	SFS84	Glycine	max	BRA	Campinas	slow	alkaline	Orig USDA 3I1B11(A)
1925	SFS85	Glycine	max	BRA	Campinas	slow	alkaline	
1926	SFS86	Glycine	max	BRA	Campinas	slow	alkaline	
1929	SFS89	Glycine	max	BRA	Campinas	slow	alkaline	
1930	SFS112	Glycine	max	BRA	Campinas	slow	alkaline	Orig JJF504C=WIS504
1932	SFS114	Glycine	max	BRA	Campinas	intmed	alkaline	Orig JJF513RE=USDA3I1B6
1934	SFS116	Glycine	max	BRA	Campinas	intmed	neutral	Orig JJF527 local isol
1935	SFS117	Glycine	max	BRA	Campinas	slow	alkaline	Orig JJF531 local isol
1936	SFS120	Glycine	max	BRA	Campinas	slow	alkaline	Orig WIS 501
1940	SFS124	Glycine	max	BRA	Campinas	slow	alkaline	Local isolate
1941	SFS125	Glycine	max	BRA	Campinas	slow	alkaline	Local isolate
1942	SFS126	Glycine	max	BRA	Campinas	slow	alkaline	Local isolate
1943	SFS127	Glycine	max	BRA	Campinas	slow	alkaline	Orig WIS505
1984		Stylosanthes	fruticosa	SDN		slow	alkaline	
1990	TA1	Trifolium	subterraneum	AUS	Sydney	fast	acid	
1992	TA101	Pisum	sativum	AUS	Sydney	fast	acid	
2000	116 A5	Onobrychis	viciifolia	USA	Milwaukee	fast	acid	
2001		Neptunia	gracilis	AUS	Brian Past	fast	acid	
2002		Neptunia	gracilis	AUS	Brian Past	fast	acid	
2003		Neptunia	gracilis	AUS	Brian Past	fast	acid	
2004		Neptunia	gracilis	AUS	Brian Past	fast	acid	
2012	CC401	Coronilla	varia	USA		fast	acid	from Nitragin peat
2026	WU425	Ornithopus	compressus	AUS		intmed	neutral	
2031	No.409	Trifolium	semipilosum	ZIM	Marandellas	fast	acid	
2032	No.862	Trifolium	semipilosum	ZIM	Marandellas	fast	neutral	
2033		Stylosanthes	guianensis	AUS	Kungurrabar	slow	alkaline	Coalescing colonies.
2085		Desmodium	heterophyllum	AUS	Sth Johnstone	slow	neutral	
2116		Trifolium	semipilosum	AUS	Milla Milla	fast	acid	
2117		Trifolium	semipilosum	AUS	Gympie	fast	acid	
2121		Codariocalyx	gyroides	FJI		slow	alkaline	
2123		Desmodium	heterophyllum	FJI		slow	alkaline	
2126		Stylosanthes	hamata	JAM	Kingston	slow	alkaline	
2127		Centrosema	pubescens	PAN	David	slow	alkaline	
2134		Stylosanthes	hamata	JAM	Kingston	slow	alkaline	
2135		Stylosanthes	hamata	JAM	Kingston	slow	alkaline	
2136		Stylosanthes	hamata	JAM	Kingston	slow	alkaline	
2144		Stylosanthes	sundaica	IDN	Gilimanuk	slow	alkaline	
2150		Stylosanthes	guianensis	PAN	David	intmed	alkaline	
2152		Stylosanthes	hamata	USA	Miami	slow	alkaline	

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
2154	CB952	Leucaena	leucocephala	AUS	Darwin	fast	acid	Small colony variant
2163		Desmodium	heterophyllum	AUS	Sth Johnstone	slow	neutral	
2164		Desmodium	heterophyllum	AUS	Sth Johnstone	fast	alkaline	
2165		Neonotonia	wightii	AUS	Kiari	slow	alkaline	Uninoc sowing by DPI
2168		Stylosanthes	fruticosa	TZA	Msalto	slow	acid	
2178	TA1	Trifolium	(sp.)	AUS	Bridport	fast	acid	Eff most European clovers
2179	WU290	Trifolium	subterraneum	AUS		fast	acid	Survival in dry soil
2190		Zornia	brasiliensis	BRA		intmed	acid	
2195		Neonotonia	wightii	UGA		slow	alkaline	
2201		Alysicarpus	(sp.)	PAN	Las Tablos	slow	alkaline	
2212		Stylosanthes	(sp.)	PAN	Boquete	slow	alkaline	
2213		Trifolium	repens	PAN	Cerro Punta	fast	acid	
2216		Stylosanthes	(sp.)	PAN	Pedasi	slow	alkaline	Very slow colony growth.
2229		Stylosanthes	guianensis	CRI	Toboga	intmed	alkaline	
2248		Stylosanthes	guianensis	CRI	Finca Volcan	intmed	alkaline	
2270	CC829	Lotus	uliginosus			slow	alkaline	
2273	W118	Medicago	rugosa	AUS		fast	acid	
2286		Stylosanthes	guianensis	CRI	Guanacaste	intmed	alkaline	
2312		Aeschynomene	falcata	AUS	Grafton	slow	alkaline	
2325		Stylosanthes	guianensis	CRI	San Ramon	intmed	alkaline	
2344	R933	Lotononis	bainesii	ZIM		slow	alkaline	pinkish colonies
2354		Stylosanthes	guianensis	CRI	Villa Colon	slow	alkaline	
2368		Vigna	(sp.)	CRI	Atenas	slow	alkaline	
2388		Aeschynomene	falcata	AUS	Grafton	intmed	alkaline	Col plum 1A fr CB2312
2390		Aeschynomene	falcata	AUS	Grafton	intmed	alkaline	Col yellow 1A fr CB2312
2391		Aeschynomene	falcata	AUS	Grafton	intmed	alkaline	Col yellow 6B fr CB2312
2406	QA9887	Lotononis	angolensis	ZAM	Mbale	intmed	alkaline	Gummy growth pale pink
2464		Stylosanthes	guianensis	BRA	Uberlandia	v.slow	alkaline	
2534		Stylosanthes	guianensis	AUS	Redland Bay	slow	alkaline	
2645		Lotononis	angolensis	TZA	Mbeya	intmed	neutral	Pale pink & yellow cols
2648		Lotononis	platycarpos	ZAF	L Trichardt	slow	alkaline	
2676		Macroptilium	atropurpureum	ZAF	Pretoria	slow	alkaline	
2695		Macroptilium	atropurpureum	ZAF	Komga	slow	alkaline	I 60288 E 60286
2705		Lotononis	mucronata	ZAF	Pearston	intmed	alkaline	Pinkish colonies
2743	ST78/1/1	Sesbania	erubescens	AUS	Kununurra	fast	acid	Nodules from water
2793	DII/13	Stylosanthes	guianensis	AUS	Tumbulgum	slow	alkaline	DII/13 See RAD/E1
2794	FI/9	Macroptilium	atropurpureum	AUS	Tumbulgum	slow	alkaline	
2795	DR1/5	Glycine	clandestina	AUS	Piccabeen	slow	alkaline	
2796	ST6/C1	Glycine	clandestina	AUS	Tumbulgum	slow	alkaline	2 colony types R & SRMWS

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
2797	BR-1CA(S5)	Macroptilium	atropurpureum	BRA		fast	acid	
2802		Arachis	monticola	AUS	Samford	intmed	alkaline	
2803	BR-1AE	Macroptilium	atropurpureum	BRA		slow	alkaline	Str resist but tetrac sen
2837	ST17/27/2	Stylosanthes	hamata	AUS	Fanning Riv	intmed	alkaline	
2839	ST17/29/1	Stylosanthes	hamata	AUS	Fanning Riv	slow	alkaline	
2841	ST17/19/1	Stylosanthes	hamata	AUS	Lansdown	slow	alkaline	
2843	ST30/2/2	Stylosanthes	guianensis	AUS	Tecoma	slow	alkaline	ST30/2/2
2844	ST27/1	Stylosanthes	guianensis	AUS	Boomerang	slow	alkaline	
2851	ST19/1/1/1	Stylosanthes	guianensis	AUS	Katherine	slow	alkaline	
2855	CC1192	Cicer	arietinum			intmed	neutral	
2885	CC709	Glycine	max	AUS	Canberra	intmed	alkaline	for cv Hardee
2898	ST45/4	Stylosanthes	capitata	AUS	Townsville	slow	alkaline	ST45/4, Eff CPI94404
2899	CC511	Phaseolus	vulgaris			intmed	neutral	
2914	NZP5435	Leucaena	leucocephala			fast	neutral	
2915	NZP5258	Leucaena	leucocephala			fast	acid	non-acid isolate fr NGR8
2919	ST54/2/1/	Leucaena	leucocephala	AUS	Hughenden	fast	acid	ST54/2/1
2921	ST60/6	Leucaena	leucocephala	AUS	Kobble Ck	fast	acid	ST60/6
2922	ST62/1	Leucaena	leucocephala	AUS	Samford	fast	acid	ST62/1 nr orig RJJ sowing
2923	TAL82	Leucaena	leucocephala	USA	Paia	fast	acid	
2927		Arachis	pintoi	AUS	Samford	intmed	neutral	
2929	NZP5460/1	Schleinitzia	insularum	NZL	Aitutaki	intmed	acid	pale creamy-white
2937	WU95	Trifolium	subterraneum	AUS		fast	neutral	
2938	SU343	Lotus	corniculatus	AUS		fast	acid	Ex Nodogen peat
2940	exCb1809	Glycine	max	USA		intmed	alkaline	Str+spc resis ex NifTAL
2944		Centrosema	schottii	AUS	Katherine	intmed	alkaline	
2947		Centrosema	brasilianum	AUS	Katherine	fast	alkaline	
2948		Centrosema	brasilianum	AUS	Katherine	slow	alkaline	
2949		Centrosema	brasilianum	AUS	Katherine	fast	alkaline	
2987	CB40	Glycine	tabacina	AUS	Grantham	slow	alkaline	fr CB oil collection
3023	ST78/2/1/	Sesbania	erubescens	AUS	Kununurra	fast	acid	nods fr plants in water
3035	QA1083	Macrotyloma	axillare	AUS	Gatton	intmed	alkaline	For C. tetragonolobus
3036	CIAT3144	Arachis	pintoi	COL	Carimagua	slow	acid	
3043	ST17/14/5	Stylosanthes	hamata	AUS	Lansdown	slow	alkaline	E on 38842, I on 40264
3048	RAD446/1	Stylosanthes	capitata	VEN	Pariaguan	v.slow	alkaline	E80-10 E assay capitata
3049	RAD446/4	Stylosanthes	capitata	VEN	Pariaguan	intmed	neutral	E80-10 E assay capitata
3050	RAD261/7	Stylosanthes	guianensis	COL	Pto Lopez	slow	acid	CIAT1460 see E80-10
3051	RAD261/12	Stylosanthes	guianensis	COL	Pto Lopez	slow	alkaline	see E80-10
3052	RAD261/17	Stylosanthes	guianensis	COL	Pto Lopez	slow	alkaline	see also E80-10
3053	RAD105/3	Stylosanthes	hamata	ATG	Shell Beach	slow	alkaline	see also E80-10

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
3055	CIAT170	Stylosanthes	(sp.)	BRA		slow	alkaline	CIAT170, see E80-10
3056	IHP95	Cajanus	cajan	IND		slow	alkaline	IHP95, fr ICRISAT
3057	RAD603.6	Gliricidia	sepium	AUS	Moggill	fast	acid	not highly raised
3059	RAD604.2	Gliricidia	sepium	SLB	Honiara	fast	acid	uptake of Congo red
3060	ST71/4/4	Leucaena	diversifolia	AUS	Townsville	fast	neutral	
3061	CC169	Medicago	rugosa			fast	acid	sticky colonies
3068	IHP53	Cajanus	cajan	IND		fast	alkaline	2 col types white & yell
3069	IHP377	Cajanus	cajan	IND		fast	alkaline	
3074	CC1500	Chamaecytisus	palmensis	AUS	Michelago		neutral	On CaCO3 agar
3077	570/5	Desmodium	intortum	AUS	Tumbulgum	intmed	alkaline	Pinpoint cols, lot of gum
3078	570/40	Desmodium	intortum	AUS	Tumbulgum	slow	alkaline	
3079	831/18	Desmodium	intortum	AUS	Beerwah	slow	alkaline	
3080	673/19	Desmodium	intortum	AUS	Samford	intmed	alkaline	
3081	677/3	Desmodium	intortum	AUS	Samford	slow	alkaline	
3083	RAD603.1	Gliricidia	sepium	AUS	Moggill	slow	alkaline	
3084	RAD603.3	Gliricidia	sepium	AUS	Moggill	slow	alkaline	
3085	RAD604.4	Gliricidia	sepium	SLB	Honiara	slow	alkaline	
3086	RAD604.5	Gliricidia	sepium	SLB	Honiara	slow	alkaline	
3087	RAD604.6	Gliricidia	sepium	SLB	Honiara	slow	alkaline	
3088	RAD608.2	Gliricidia	sepium	LKA	Peradeniya	slow	alkaline	
3089	RAD608.5	Gliricidia	sepium	LKA	Peradeniya	slow	alkaline	
3090	RAD608.6	Gliricidia	sepium	LKA	Peradeniya	intmed	acid	
3091	RAD609.2	Gliricidia	sepium	LKA	Peradeniya	slow	alkaline	
3092	RAD609.6	Gliricidia	sepium	LKA	Peradeniya	slow	alkaline	
3094	NC92	Arachis	hypogaea			fast	acid	
3096	570/6RS2	Desmodium	intortum	AUS	Tumbulgum	slow	neutral	A/A Rx is C-B
3097	570/40RS8	Desmodium	intortum	AUS	Tumbulgum	intmed	alkaline	
3098	831/19RS9	Desmodium	intortum	AUS	Beerwah	fast	neutral	A/A Rx is C-B
3099	673/19RS5	Desmodium	intortum	AUS	Samford	intmed	neutral	A/A Rx is C-B
3100	677/3RS6	Desmodium	intortum	AUS	Samford	slow	neutral	A/A Rx is C-B
3101	CB627RS6	Desmodium	intortum	ZAR		slow	neutral	A/A Rx is C-B
3108	TAL600	Prosopis	chilensis	USA	Paia	fast	acid	TAL 600
3109	ST71/4/4	Leucaena	diversifolia	AUS	Townsville	fast	neutral	=CIAT1967=TAL1145=CB3060
3120	CC283b	Trifolium	ambiguum			fast	neutral	
3125	CIAT3101	Centrosema	macrocarpum	COL	Santa Marta	fast	neutral	
3126	RAD44.1	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3127	RAD54.7	Leucaena	esculenta	MEX	Altamirano	fast	acid	
3128	RAD59.2	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3129	RAD96.2	Leucaena	leucocephala	MEX	Merida	fast	acid	

CSIRO, Division of Tropical Crops & Pastures, Root-Nodule Bacteria Genetic Resource Collection, April 1993

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
3130	RAD119.1	Leucaena	leucocephala	WES	Fitches Creek	fast	acid	
3131	RAD398.3	Leucaena	trichoides	MEX	El Rodeo	fast	acid	
3132	RAD561.4	Desmanthus	fruticocus	MEX	Mulege	fast	acid	
3133	RAD564.1	Desmanthus	virgatus	ECU	Constituentes	fast	acid	
3138	MS111	Leucaena	leucocephala	MYS		fast	acid	MARDI
3154	RAD330.14	Stylosanthes	capitata	BRA	Vianopilis	slow	alkaline	
3155	RAD712.1	Acacia	angustissima	AUS	Gatton	slow	alkaline	
3156	RAD723.1	Acacia	mangium	PNG	Oriomo R	fast	acid	
3158	KKU1	Stylosanthes	humilis	THA	Khon Kaen	slow	acid	
3160	KKU2	Leucaena	leucocephala	THA	Khon Kaen	fast	acid	
3162	M11	Calopogonium	caeruleum	MYS				
3163	M28	Calopogonium	caeruleum	MYS				
3164	NA1583	Vigna	unguiculata	NGA		slow	alkaline	nods in soln at pH4.5
3165	NA1601	Vigna	unguiculata	NGA		slow	alkaline	nods in soln at pH4.5
3166	TAL1	Calliandra	calothyrsus	NIC	San Ramon	fast	acid	
3169	TAL1456	Calliandra	inequilatera	JAP	Nagoya	fast	acid	
3171	TAL33	Calliandra	calothyrsus	NIC	San Ramon	fast	acid	
3197	USDA8/T	Glycine	max	USA		slow	alkaline	
3200	RAD745.1	Sesbania	grandiflora?	PAK	Tan Jam Sindh	fast	acid	
3236	PMA311.1	Acacia	mangium	PNG	Forest Res St	slow		
3237	PMA119	Sesbania	grandiflora	THA	Ratchapuri			
3241	CIAT2400	Stylosanthes	capitata	BRA	Manaus			
3243	NA1580	Vigna	unguiculata	NGA		slow	alkaline	
3244	NA1581	Vigna	unguiculata	NGA		slow	alkaline	
3245	CP13.3	Vigna	parkeri	AUS	Kin Kin	slow	alkaline	
3246	CP1.1	Vigna	parkeri	AUS	Beerwah	slow	alkaline	
3256	CIAT4969	Stylosanthes	(sp.)	BRA		slow	alkaline	Eff CPI94404
3275	CIAT1460MIC	Stylosanthes	guianensis	JAM	Kingston	v.slow	alkaline	Strep, Spec, Rif resist
3282	TAL2	Calliandra	calothyrsus	NIC	San Ramon	fast	acid	
3283	CC707	Glycine	max	USA		slow	alkaline	WIS507
3284	CB756M1	Macrotyloma	africanum	ZIM	Marandellas	slow	alkaline	
3287	PMA295/2	Sesbania	sesban	IDN				
3289	RAD120.01	Stylosanthes	hamata	WES	Indian Castle	slow	alkaline	Nevis soil on CPI38842
3290	RAD142.01	Stylosanthes	hamata	VEN	Maracaibo	slow	alkaline	
3291	RAD143.12	Stylosanthes	hamata	VEN	Maracaibo	slow	alkaline	
3292	RAD145.01	Stylosanthes	hamata	VEN	Maracaibo	slow	alkaline	
3293	RAD149.01	Stylosanthes	hamata	VEN	Maracaibo	slow	alkaline	
3294	RAD464.01	Stylosanthes	(sp.)	USA	Sanford	slow	alkaline	
3295	RAD724.01	Stylosanthes	capitata	VEN	Calobozo	v.slow	alkaline	

CSIRO, Division of Tropical Crops & Pastures, Root-Nodule Bacteria Genetic Resource Collection, April 1993

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
3296	RAD725.01	Stylosanthes	capitata	VEN	Calobozo	v.slow	alkaline	
3297	RAD718.01	Leucaena	retusa	AUS	Lansdown	fast	acid	
3298	RAD726.1	Leucaena	retusa	AUS	Townsville	fast	acid	
3299	RAD727.2	Leucaena	greggii	AUS	Townsville	fast	acid	
3300	RAD746.03	Sesbania	grandiflora?	PAK	Tan Jam Sindh	fast	acid	
3301	RAD747.01	Sesbania	grandiflora?	PAK	Tan Jam Sindh	fast	acid	
3303	RAD624.03	Sesbania	(sp.)	AUS	Brisbane	fast		
3306	RAD436.03	Stylosanthes	capitata	VEN	El Tigre	v.slow	alkaline	
3307	RAD437.02	Stylosanthes	capitata	VEN	El Tigre	v.slow	alkaline	
3308	RAD439.05	Stylosanthes	capitata	VEN	El Tigre	v.slow	alkaline	
3310	RAD580.01	Trifolium	semipilosum	ETH	Dabra Berhan	fast	acid	
3311	RAD581.01	Trifolium	polystachyum	ETH	Debra Sina	fast	acid	
3312	RAD584.02	Trifolium	mattirolianum	ETH	Dangla	fast	acid	
3313	RAD586.04	Trifolium	multinerve	ETH	Dabra Berhan	fast	acid	
3314	RAD590.01	Trifolium	cryptopodium	ETH	Dabra Berhan	fast	acid	
3315	RAD593.03	Trifolium	decorum	ETH	Dangla	fast	acid	
3316	RAD597.01	Trifolium	calocephalum	ETH	Debra Sina	fast	acid	Dark red nods on CPI91719
3318	ST87/2	Mimosa	pigra	AUS	Darwin			
3319	VB178/1a	Rhynchosia	minima	AUS	Mywybilla			
3320	VB240/1aa	Rhynchosia	minima	AUS				
3321	VB560/1ab	Desmodium	(sp.)	AUS				
3322	RAD282.01	Macroptilium	atropurpureum	BRA	Belem	slow	neutral	
3323	RAD282.13	Macroptilium	atropurpureum	BRA	Belem	slow	alkaline	
3324	RAD758.01	Trifolium	steudneri	ETH	Debra Sina	fast	acid	
3325	RAD294.02	Macroptilium	atropurpureum	BRA	Belem	slow	acid	
3326	RAD497.1	Vigna	trilobata	BUR	Magwe			
3328	RAD24.01	Leucaena	leucocephala	USA	Kipahulu	fast	acid	
3329	RAD24.02	Leucaena	leucocephala	USA	Kipahulu	fast	acid	
3330	RAD24.03	Leucaena	leucocephala	USA	Kipahulu	fast	acid	
3331	RAD24.04	Leucaena	leucocephala	USA	Kipahulu	fast	acid	
3332	RAD30.01	Leucaena	leucocephala	USA	Kakipi	fast	acid	
3333	RAD30.03	Leucaena	leucocephala	USA	Kakipi	fast	acid	
3334	RAD30.04	Leucaena	leucocephala	USA	Kakipi	fast	acid	
3335	RAD44.01	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3336	RAD44.02	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3337	RAD53.05	Leucaena	diversifolia	MEX	Altamirano	fast	acid	
3338	RAD54.01	Leucaena	esculenta	MEX	Altamirano	fast	acid	
3340	RAD54.05	Leucaena	esculenta	MEX	Altamirano	fast	acid	
3341	RAD54.07	Leucaena	esculenta	MEX	Altamirano	fast	acid	

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
3342	RAD54.08	Leucaena	esculenta	MEX	Altamirano	fast	acid	
3343	RAD54.09	Leucaena	esculenta	MEX	Altamirano	fast	acid	
3344	RAD54.10	Leucaena	esculenta	MEX	Altamirano	fast	acid	
3347	RAD59.01	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3348	RAD59.02	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3349	RAD59.03	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3350	RAD59.06	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3351	RAD59.07	Leucaena	leucocephala	MEX	Altamirano	fast	acid	
3352	RAD71.02	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3353	RAD71.03	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3354	RAD71.04	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3355	RAD71.05	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3356	RAD71.06	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3357	RAD71.09	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3358	RAD73.02	Leucaena	leucocephala	MEX	Ometepec	fast	acid	
3359	RAD83.01	Leucaena	leucocephala	MEX	Villahermosa	fast	acid	
3360	RAD83.02	Leucaena	leucocephala	MEX	Villahermosa	fast	acid	
3361	RAD83.04	Leucaena	leucocephala	MEX	Villahermosa	fast	acid	
3362	RAD83.07	Leucaena	leucocephala	MEX	Villahermosa	fast	acid	
3363	RAD83.08	Leucaena	leucocephala	MEX	Villahermosa	fast	acid	
3364	RAD96.01	Leucaena	leucocephala	MEX	Merida	fast	acid	
3365	RAD96.02	Leucaena	leucocephala	MEX	Merida	fast	acid	
3366	RAD96.03	Leucaena	leucocephala	MEX	Merida	fast	acid	
3367	RAD96.05	Leucaena	leucocephala	MEX	Merida	fast	acid	
3368	RAD96.06	Leucaena	leucocephala	MEX	Merida	fast	acid	
3369	RAD96.08	Leucaena	leucocephala	MEX	Merida	fast	acid	
3370	RAD119.01	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3371	RAD119.02	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3372	RAD119.03	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3373	RAD119.04	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3374	RAD119.05	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3375	RAD119.06	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3376	RAD139.01	Leucaena	leucocephala	WES	Fitches Ck	fast	acid	
3377	RAD230.04	Leucaena	leucocephala	COL	Palmira	fast	acid	
3378	RAD230.05	Leucaena	leucocephala	COL	Palmira	fast	acid	
3379	RAD230.07	Leucaena	leucocephala	COL	Palmira	fast	acid	
3380	RAD237.01	Leucaena	leucocephala	COL	Cd Jardin	fast	acid	
3381	RAD237.03	Leucaena	leucocephala	COL	Cd Jardin	fast	acid	
3382	RAD237.04	Leucaena	leucocephala	COL	Cd Jardin	fast	acid	

CB RHIZOBIUM/BRADYRHIZOBIUM CATALOGUE

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
3383	RAD237.05	Leucaena	leucocephala	COL	Cd Jardin	fast	acid	
3385	RAD250.02	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3386	RAD250.03	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3387	RAD250.04	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3388	RAD250.05	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3389	RAD250.06	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3390	RAD250.07	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3391	RAD250.08	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3392	RAD250.09	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3393	RAD250.10	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3394	RAD250.11	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3395	RAD250.12	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3396	RAD250.13	Leucaena	leucocephala	COL	Natagaima	fast	acid	
3402	ST69/1	Leucaena	leucocephala	AUS	Samford	fast	acid	
3403	ST69/2	Leucaena	leucocephala	AUS	Samford	fast	acid	
3404	ST69/6	Leucaena	leucocephala	AUS	Samford	fast	acid	
3405	ST69/8	Leucaena	leucocephala	AUS	Samford	fast	acid	
3406	ST69/10	Leucaena	leucocephala	AUS	Samford	fast	acid	
3407	ST69/12	Leucaena	leucocephala	AUS	Samford	fast	acid	
3408	ST69/15	Leucaena	leucocephala	AUS	Samford	fast	acid	
3409	ST69/18	Leucaena	leucocephala	AUS	Samford	fast	acid	
3410	ST69/20	Leucaena	leucocephala	AUS	Samford	fast	acid	
3411	ST69/24	Leucaena	leucocephala	AUS	Samford	fast	acid	
3412	ST69/28	Leucaena	leucocephala	AUS	Samford	fast	acid	
3413	ST70/1/2	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3414	ST70/1/4	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3415	ST70/1/8	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3416	ST70/1/13	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3417	ST70/1/2	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3418	ST70/1/6	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3419	ST70/1/10	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3420	ST70/1/13	Leucaena	leucocephala	AUS	Weipa	fast	acid	
3421	ST71/1/2	Leucaena	leucocephala	AUS	Lansdowne	fast	acid	
3422	ST71/2/1	Leucaena	pulverulenta	AUS	Lansdowne	fast	acid	
3423	ST71/2/4	Leucaena	pulverulenta	AUS	Lansdowne	fast	acid	
3425	ST71/2/9	Leucaena	pulverulenta	AUS	Lansdowne	fast	acid	
3426	ST71/3/2	Leucaena	pulverulenta	AUS	Lansdowne	fast	acid	
3427	ST71/3/4	Leucaena	pulverulenta	AUS	Lansdowne	fast	acid	
3428	ST71/3/5	Leucaena	pulverulenta	AUS	Lansdowne	fast	acid	

CBNO	ORIG.NO...	GENUS.....	SPECIES.....	CTRY	TOWN.....	GROWTH.	REACTION.	COMMENT.....
3429	ST71/3/7	Leucaena	pulverulenta	AUS	Lansdown	fast	acid	
3430	ST71/4/1	Leucaena	diversifolia	AUS	Lansdown	fast	acid	
3432	ST71/4/6	Leucaena	diversifolia	AUS	Lansdown	fast	acid	
3433	ST71/4/7	Leucaena	diversifolia	AUS	Lansdown	fast	acid	
3434	ST71/5/1	Leucaena	esculenta	AUS	Lansdown	fast	acid	
3435	ST71/5/3	Leucaena	esculenta	AUS	Lansdown	fast	acid	
3436	ST71/5/4	Leucaena	esculenta	AUS	Lansdown	fast	acid	
3437	ST71/5/6	Leucaena	escullenta	AUS	Lansdown	fast	acid	
3438	ST71/6/1	Leucaena	(sp.)	AUS	Lansdown	fast	acid	
3439	ST71/6/3	Leucaena	(sp.)	AUS	Lansdown	fast	acid	
3440	ST71/7/1	Leucaena	leucocephala	AUS	Lansdown	fast	acid	
3441	ST71/7/2	Leucaena	leucocephala	AUS	Lansdown	fast	acid	
3442	ST71/8/2	Leucaena	leucocephala	AUS	Lansdown	fast	acid	
3443	ST71/8/3	Leucaena	leucocephala	AUS	Lansdown	fast	acid	
3444	ST71/9/1	Mimosa	(sp.)	AUS	Lansdown	fast	acid	
3445	ST80/2	Arachis	hypogaea	BUR	Letpadan			
3446	ST80/7/2B	Arachis	hypogaea	BUR	Aungban			
3447	ST80/15/4	Vigna	unguiculata	BUR	Magwe			
3448	ST80/16/1A	Vigna	lunata	BUR	Mahlaing			
3449	ST80/19/2A	Clitoria	ternatea	BUR	Mahlaing			
3450	ST80/23	Clitoria	ternatea	BUR	Mandalay			
3451	RAD777/1	Stylosanthes	scabra aff	AUS	Hillgrove	v.slow	alkaline	Eff on CPI110370B
3452	RAD779/2	Stylosanthes	scabra aff	AUS	Hillgrove	v.slow	alkaline	Eff on CPI110370B
3453	RAD783/2	Stylosanthes	scabra aff	AUS	Cardigan	v.slow	alkaline	Eff on CPI110370B
3454	RAD775/1	Stylosanthes	scabra aff	AUS	Roma	v.slow	alkaline	Eff on CPI110370B
3455	RAD778/3	Stylosanthes	scabra aff	AUS	Hillgrove	v.slow	alkaline	Eff on CPI110370B
3456	RAD782/3	Stylosanthes	scabra aff	AUS	Cardigan	v.slow	alkaline	Eff on CPI110370B
3457	USDA110	Glycine	max	USA		slow	alkaline	Eff on range cultivars
3458	INA4b	Calliandra	calothrysus	IDN		fast	acid	
3459	INA4a	Calliandra	calothyrsus	IDN		fast	acid	
3460	INA5	Calliandra	calothyrsus	IDN		fast	acid	
3461	RAD899	Swainsona	galegifolia	AUS	Brisbane	fast	acid	
3462	RAD892/1	Arachis	pintoi	MYS	Serdang	slow	alkaline	

HOST LIST

CB COLLECTION HOST LIST

GENUS	SPECIES	CB NUMBER OF STRAIN ISOLATED FROM HOST LEGUME
Acacia	angustissima	3155
Acacia	mangium	3156 3236
Adesmia	bicolor	1761
Aeschynomene	falcata	2312 2388 2390 2391
Alysicarpus	(sp.)	2201
Alysicarpus	vaginalis	278
Arachis	diogoi	31
Arachis	hypogaea	3094 3445 3446
Arachis	monticola	2802
Arachis	pintoi	2927 3036
Arachis	prostrata	530
Cajanus	cajan	136 483 3056 3068 3069
Calliandra	calothyrsus	3166 3171 3282
Calliandra	inequilatera	3169
Calopogonium	caeruleum	3162 3163
Cassia	rotundifolia	1483
Centrosema	brasilianum	2947 2948 2949
Centrosema	macrocarpum	3125
Centrosema	plumieri	1698
Centrosema	pubescens	1103 1491 1494 1922 1923 2127
Centrosema	schottii	2944
Chamaecytisus	palmensis	3074
Cicer	arietinum	2855
Clitoria	ternatea	279 3449 3450
Codariocalyx	gyroides	2121
Coronilla	varia	2012
Crotalaria	brevidens	188
Desmanthus	fruticocus	3132
Desmanthus	virgatus	3133
Desmodium	(sp.)	1263 3321
Desmodium	adscendens	1632
Desmodium	barbatum	1627
Desmodium	canum	1564
Desmodium	heterophyllum	2085 2123 2163 2164
Desmodium	intortum	627 1027 3077 3078 3079 3080 3081 3096 3097 3098 3099 3100 3101
Desmodium	pabulare	1517
Desmodium	tortuosum	1622
Desmodium	triflorum	46
Desmodium	uncinatum	128 187

CSIRO, Division of Tropical Crops & Pastures, Root-Nodule Bacteria Genetic Resource Collection, April 1993

CB COLLECTION HOST LIST

GENUS	SPECIES	CB NUMBER OF STRAIN ISOLATED FROM HOST LEGUME
Dolichos	kilimand'icus	1780
Dolichos	trilobus	159
Gliricidia	sepium	3057 3059 3083 3084 3085 3086 3087 3088 3089 3090 3091 3092
Glycine	clandestina	327 2795 2796
Glycine	max	1003 1668 1753 1786 1791 1793 1794 1795 1797 1799 1802 1803 1805 1808 1809 1810 1911 1924 1925 1926 1929 1930 1932 1934 1935 1936 1940 1941 1942 1943 2885 2940 3197 3283
Glycine	tabacina	40 291 2987
Glycine	tomentella	232 1908
Indigofera	(sp.)	356
Indigofera	arrecta	345 349
Indigofera	australis	334
Indigofera	hirsuta	350
Indigofera	mucronata	344
Indigofera	suffruticosa	331 333 341 348
Indigofera	trifoliata	152
Indigofera	trita	33 336 337 358
Lablab	purpureus	1091
Leucaena	(sp.)	3438 3439
Leucaena	diversifolia	3060 3109 3337 3430 3432 3433
Leucaena	esculenta	3127 3338 3340 3341 3342 3343 3344 3434 3435 3436 3437
Leucaena	greggii	3299
Leucaena	leucocephala	81 430 947 948 952 1149 1353 2154 2914 2915 2919 2921 2922 2923 3126 3128 3129 3130 3138 3160 3328 3329 3330 3331 3332 3333 3334 3335 3336 3347 3348 3349 3350 3351 3352 3353 3354 3355 3356 3357 3358 3359 3360 3361 3362 3363 3364 3365 3366 3367 3368 3369 3370 3371 3372 3373 3374 3375 3376 3377 3378 3379 3380 3381 3382 3383 3385 3386 3387 3388 3389 3390 3391 3392 3393 3394 3395 3396 3402 3403 3404 3405 3406 3407 3408 3409 3410 3411 3412 3413 3414 3415 3416 3417 3418 3419 3420 3421 3440 3441 3442 3443
Leucaena	pulverulenta	3422 3423 3425 3426 3427 3428 3429
Leucaena	retusa	3297 3298
Leucaena	trichoides	3131
Listia	heterophylla	768
Lotononis	angolensis	1297 1298 1299 1321 1322 1323 2406 2645
Lotononis	bainesii	376 730 1775 1776 1777 1778 1779 2344
Lotononis	mucronata	2705
Lotononis	platycarpos	2648
Lotononis	stipulosa	1394

CSIRO, Division of Tropical Crops & Pastures, Root-Nodule Bacteria Genetic Resource Collection, April 1993

CB COLLECTION HOST LIST

GENUS	SPECIES	CB NUMBER OF STRAIN ISOLATED FROM HOST LEGUME
Lotus	corniculatus	2938
Lotus	maroccanus	1300
Lotus	uliginosus	1209 2270
Macroptilium	africanum	3284
Macroptilium	atropurpureum	2676 2695 2794 2797 2803 3322 3323 3325
Macroptilium	erythroloma	1717
Macroptilium	lathyroides	27 42 53 54 121 170 319 1524
Macrotyloma	africanum	756
Macrotyloma	axillare	3035
Macrotyloma	uniflorum	1024
Medicago	(sp.)	112 214
Medicago	rugosa	2273 3061
Medicago	sativa	61 113 115 118 119 217 227 257 813 967 1035 1170 1368 1445 1446
Medicago	truncatula	64 98 110
Mimosa	(sp.)	3444
Mimosa	pigra	3318
Neonotonia	wightii	453 1057 1267 1914 1915 1916 1918 2165 2195
Neptunia	(sp.)	924
Neptunia	gracilis	2001 2002 2003 2004
Neptunia	plena	1397
Onobrychis	viciifolia	2000
Ornithopus	compressus	2026
Phaseolus	vulgaris	1071 1224 2899
Pisum	sativum	108 1447 1992
Prosopis	chilensis	3108
Rhynchosia	minima	3319 3320
Schleinitzia	insularum	2929
Sesbania	(sp.)	1030 3303
Sesbania	erubescens	2743 3023
Sesbania	grandiflora	3237
Sesbania	grandiflora?	3200 3300 3301
Sesbania	macrocarpa	905
Sesbania	sesban	3287
Stylosanthes	(sp.)	65 1272 2212 2216 3055 3256 3294
Stylosanthes	capitata	2898 3048 3049 3154 3241 3295 3296 3306 3307 3308
Stylosanthes	fruticosa	93 273 1984 2168
Stylosanthes	guianensis	44 52 82 1408 1552 1580 1650 2033 2150 2229 2248 2286 2325 2354 2464 2534 2793 2843 2844 2851 3050 3051 3052 3275

CB COLLECTION HOST LIST

GENUS	SPECIES	CB NUMBER OF STRAIN ISOLATED FROM HOST LEGUME
Stylosanthes	hamata	2126 2134 2135 2136 2152 2837 2839 2841 3043 3053 3289 3290 3291 3292 3293
Stylosanthes	humilis	76 103 105 516 1675 1689 1727 1782 3158
Stylosanthes	scabra	3451 3452 3453 3454 3455 3456
Stylosanthes	sundaica	2144
Teramnus	uncinatus	484 1895
Trifolium	(sp.)	2178
Trifolium	ambiguum	3120
Trifolium	burchellianum	727
Trifolium	calocephalum	3316
Trifolium	cryptopodium	3314
Trifolium	decorum	3315
Trifolium	isthmocarpum	806
Trifolium	mattirolianum	3312
Trifolium	multinerve	3313
Trifolium	polystachyum	3311
Trifolium	repens	1 147 1444 2213
Trifolium	rueppellianum	714 766 772 774
Trifolium	semipilosum	526 763 778 782 788 2031 2032 2116 2117 3310
Trifolium	steudneri	3324
Trifolium	subterraneum	3 867 875 876 1990 2179 2937
Trifolium	tembense	758 773
Trifolium	usambarense	771 775
Vicia	sativa	134
Vigna	(sp.)	2368
Vigna	lunata	3448
Vigna	marina	915
Vigna	mungo	284 985 1011 1243 1247
Vigna	oblongifolia	786
Vigna	parkeri	3245 3246
Vigna	radiata	512 661 890 1015 1017 1042
Vigna	trilobata	3326
Vigna	unguiculata	3164 3165 3243 3244 3447
Zornia	brasiliensis	2190
Zornia	diphylla	328 1546

List of Recommended Strains

Acacia	*angustissima*	CB3155		R+	
Acacia	*mangium*	CB3156		R	
Adesmia	*bicolor*	CB1761		R	
Aeschynomene	*americana v glandulosa*	CB2312		B	
Aeschynomene	*falcata*	CB2312		B	
Alysicarpus	*vaginalis*	CB2201		B	
Arachis	*hypogaea*	NC92		R	CB3094
Arachis	*pintoi*	CIAT3101		B	CB3125
Cajanus	*cajan*	CB3068		B	
Calliandra	*calothyrsus*	TAL33		R	CB3172
Calopogonium	*caeruleum*	MS111		B	CB3128
Calopogonium	*mucunoides*	CB756	*	B	
Cassia	*rotundifolia*	CB1483		B	
Centrosema	*brasilianum*	CB2949		B	
Centrosema	*pubescens*	CB1923	*	B	
Centrosema	(most other species)	CB1923	*	B	
Chamaecytisus	*palmensis*	CC1500		R	CB3074
Cicer	*arietinum*	CC1192	*	R	CB2855
Clitoria	*ternatea*	CB756	*	B	
Codariocalyx	*gyroides*	CB627	*	B	
Coronilla	*varia*	CC401		R	CB2012
Cyamopsis	*tetragonolobus*	QA1083		B	CB3035
Desmanthus	*virgatus*	CB1397	*	R	
Desmodium	*heterophyllum*	CB2085		B	
Desmodium	*intortum*	CB627	*	B	
Desmodium	*uncinatum*	CB627	*	B	
Gliricidia	*sepium*	CB3090		B	
Glycine	*max* (all cv except Hardee)	CB1809	*	B	
Glycine	*max* (cv Hardee	CC709		B	CB2885
Lablab	*purpureus*	CB1024	*	B	
Lens	(sp.)	SU391	*	R	CB1447
Lespedeza	*striata*	CB756	*	B	
Leucaena	*diversifolia*	CB3060	*	R	TAL1145
Leucaena	*esculenta*	CB3060	*	R	TAL1145
Leucaena	*leucocephala*	CB3060	*	R	TAL1145
Leucaena	*pulverulenta*	CB3060	*	R	TAL1145
Lotononis	*angolensis*	CB1323		B	
Lotononis	*bainesii*	CB376	*	B	
Lotus	*corniculatus*	SU343	*	R	CB2938
Lotus	*uliginosus*	CC829	*	B	CB2270
Lupinus	(all species)	WU425	*	B	CB2272
Macroptilium	*atropurpureum*	CB756 (a)	*	R	
Macroptilium	*panduratum*	CB1717		R	
Macroptilium	*martii*	CB1717		R	
Macroptilium	*lathyroides*	CB756	*	R	
Macrotyloma	*africanum*	CB756	*	R	
Macrotyloma	*axillare*	CB1024	*	R	
Macrotyloma	*uniflorum*	CB1024	*	R	
Medicago	(all species except murex)	CC169	*	R	CB3061
Medicago	*murex*	WSM540		R	(g)
Neonotonia	*wightii* (all cultivars)	CB756	*	R	
Onobrychis	*sativa*	CB2000		R	
Ornithopus	*compressus*	WU425	*	R	CB2272
Ornithopus	*sativus*	WU425	*	R	CB2272
Peuraria	*phaseoloides*	CB756	*	B	
Phaseolus	*vulgaris*	CC511	*	R	CB2899
Pisum	*arvense*	SU391	*	R	CB1447
Pisum	*sativum*	SU391	*	R	CB1447
Prosopis	*chilensis*	TAL600		R	CB3108
Sesbania	*grandiflora*	PMA119			CB3237
Sesbania	*sesban*	PMA295/2			CB3287
Stylosanthes	*capitata*	CIAT170		B	CB3055
Stylosanthes	*fruticosa*	CB2168		B	
Stylosanthes	*guianensis* (b)	CB82	*	B	

Stylosanthes	*guianensis* cv Oxley (c)	CB82	*	B or	CB1650
Stylosanthes	*hamata* cv Verano (d)	CB1650	*	B	
Stylosanthes	*hamata* (e)	CB2126		B	
Stylosanthes	*humilis* (all cultivars)	CB82	*	B	
Stylosanthes	*scabra* (Seca, Fitzroy)	CB82	*	B	
Stylosanthes	*scabra* (aff. lines)	CB2126		B or	CB3053
Stylosanthes	(sp.)	(f)			
Teramnus	*uncinatus*	CB756	*	B	
Trifolium	*ambiguum*	CC283a		R	CB3062
Trifolium	*burchellianum*	CB727		R	
Trifolium	*calocephalum*	CB3316		R	
Trifolium	*cryptopodium*	CB3314		R	
Trifolium	*decorum*	CB3315		R	
Trifolium	*incarnatum*	WU95	*	R	CB2397
Trifolium	*polystachyum*	CB3311		R	
Trifolium	*repens*	TA1	*	R	CB1990
Trifolium	*rueppellianum*	CB758		R	
Trifolium	*semipilosum*	CB782	*	R	
Trifolium	*subterraneum*	WU95	*	R	CB2937
Trifolium	*tembense*	CB758		R	
Vicia	*sativa*	SU391	*	R	CB1447
Vigna	(all species)	CB1015	*	B	

+ R and B are *Rhizobium* and *Bradyrhizobium*, respectively.
* Strain available as commercial inoculant.
(a) This strain can be used for a wide range of species from many genera, e.g., *Atylosia, Canavalia, Crotalaria, Flemingia, Indigofera, Mucuna, Phosophocarpus, Rhynchosia, Tephrosia.*
(b) Schofield types, Cook, Endeavour, Graham and most lines of *S. erecta, S. fruticosa, S.viscosa.*
(c) and other *S.guianensis* var *intermedia* Fine Stemmed types.
(d) and Amiga and most tetraploid lines.
(e) all diploid lines from alkaline soils.
(f) use a mixture of CB82, CB328, CB1650, CB2229 for untested lines.
(g) not available in CB Collection.

Appendix I

Freeze-drying *Rhizobium/Bradyrhizobium*

The Equipment and Culture Preparation

We use an Edwards Model EFO3 (now FO56 -37-000) fitted with a centrifugal carrier tray of 96 x 0.5 ml ampoule (HO14-30-81) capacity for primary drying and a double headed manifold unit for secondary drying. Constriction of ampoules is achieved using an Edwards semi automatic ampoule constrictor (Rowe and Snowman, 1978; Edwards High Vacuum International, 1988).

Cultures of each strain are grown in 16 x 150 mm screw-capped test-tubes on YMA containing bromo-thymol blue indicator (Norris and Date, 1976). Freshly inoculated tubes are incubated at 26-28°C for 2-3, 3-5, 5-9 or 10-14 days, respectively, according to our categorization of growth rates for fast- (e.g., CB3060), intermediate- (e.g., CB82), slow- (e.g., CB756) and very slow- (e.g., CB2898) growing strains. Some strains (e.g. CB3049) from *Stylosanthes* require a medium of pH 4.5-5.0 for optimal growth at these times (Date and Halliday, 1979). The growth from a single test-tube is suspended in 2 ml of a 10% sucrose + 5% peptone solution. An aliquot of 0.2 ml is added to each ampoule which contains a filter paper insert 5 x 15 mm on which is printed the strain's CB accession number and the date of ampouling (e.g., CB3060 7/92). Inserts serve as labels and as a means of increasing surface area for more rapid drying. They also reduce "boiling" of the suspension when the vacuum is first applied and avoids the need for pre-freezing. The label inserts are generated on a desk-top computer running an in-house software program and printed on high grade chromatography paper using a carbon based (preservative and synthetic ink free) ribbon.

Schedule

If ampoules+inserts are prepared the day prior to freeze-drying it is possible to complete the preservation of strains in batches of 96 ampoules in a single working day. Our schedule is to add the 2 ml sucrose+peptone solution to the agar slopes (either the evening before or minimum of 1 hour before) and suspend the culture by drawing the liquid up and down forcibly with a pasteur pipette and using the same pipette to dispense 0.2 ml lots of the sucrose+peptone+culture mixture to the ampoules - about 1 hour. Primary drying, using an alcohol+dry-ice mixture as "desiccant", to a vacuum of 0.1 Torr takes 1-1.5 hours at which stage ampoules are constricted - about 0.5-1 hour - and then placed on the secondary drying manifold. This stage uses P_2O_5 as a desiccant in the vacuum chamber to remove water vapour. The ampoules are sealed using a bifurcated flame torch (Flamemaster) after 3-4 hours when the vacuum has reached <0.06 Torr.

There are three very important aspects of this freeze-drying procedure that contribute significantly to the storage life of the culture and the recovery of a high proportion of the bacterial cells on reconstitution. These are:
a) the sucrose+peptone suspending medium which affords protection for the cells during dehydration and rehydration (Table A),
b) the filter paper insert to aid in more rapid drying and a higher proportion recovery of the cells, and
c) correct (adequate) thickening of the ampoule wall at the point of constriction to prevent implosion at sealing-off or damage during storage. If the wall is too thin there is a high risk of breakage and gas (oxygen) transfer (entry). We prefer vacuum sealing to the introduction of inert gas at atmospheric pressure. A small but significant feature is the density of the cotton-wool plug in the ampoule. This must be firm (to prevent it moving) but not so dense that it retards moisture passage during the drying process. Air (oxygen) and moisture are detrimental to survival of the dried cells.

Cultures can be recovered from the ampoules by resuspending in appropriate medium or simply transferring the label insert to a culture-tube or petri-dish with appropriate medium. Ampoules should be scored with a glass-cutting knife or diamond pencil for about one-third of their circumference, 1 to 1.5 cm from the constricted end, wiped clean with an alcohol soaked swab and lightly flamed. The ampoule is then readily snapped open in front of a sterilizing flame (in a laminar flow transfer unit) by holding the body of the ampoule and the tip section above the score mark between thumbs and forefingers, with the score mark facing away from the operator, and snapping with a sharp, firm action. The ampoule will break smoothly at right-angles at the line of scoring.

Date, R.A and Halliday, J. (1979). Selecting *Rhizobium* for acid infertile soils of the tropics. Nature **277**, 62-64.

Edwards Catalogue. Vacuum. Edwards High Vacuum International: Crawley, UK.

Norris, D.O. and Date, R.A. (1976). Legume Bacteriology. In 'Tropical Pasture Research - Principles and Methods'. Bull. Commonw. Bur. Fld. Crops No.51. pp 134-174.

Rowe, T.W.G. and Snowman, J.W. (1978). Edwards Freeze-drying Handbook. Edwards High Vacuum International: Crawley, UK.

Table A. The effect of suspending medium on the percentage recovery of *Rhizobium* strain TA1 (CB1990) from freeze-dried cultures.

Suspending medium	% Recovery after			
	Primary drying	Secondary drying	6 Weeks	13 Weeks
dH_2O				<1
10% Sucrose	30	15	3	4
5% Peptone	58	51	13	26
10% Suc + 5% Pep				37