ORIGIN OF THE WORLD'S COLLECTION OF THE TROPICAL FORAGE LEGUME CHAMAECRISTA ROTUNDIFOLIA

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ABSTRACT

Round leaf cassia (*Chamaecrista rotundifolia*) cv. Wynn is an important legume in light textured soils in sub-tropical Queensland and forage evaluators in other regions of the tropics frequently wish to include in their evaluation trials this cultivar plus other accessions which represent the variation in the species. Provenance data of a world collection of 130 accessions of round leaf cassia were examined and a core set of 26 accessions selected.

KEYWORDS

Chamaecrista rotundifolia, germplasm, plant geography, core collection

INTRODUCTION

Round leaf cassia (*Chamaecrista rotundifolia*) cv. Wynn is an important forage legume for the light textured, acid soils of sub-tropical Queensland. This particular cultivar is an early flowering, heavy seeding short-lived perennial which is persistent under grazing and is most frequently used as a legume sown into native speargrass (*Heteropogon contortus*) pastures. The species is widespread throughout tropical America and is found in savannas, campos, llanos, openings in woodlands and is an abundant coloniser of disturbed areas (Irwin and Barneby, 1982). In a comparative study of 18 accessions of the species from which cv. Wynn was selected for commercial release (Strickland *et al.*, 1985), variation in morphological and agronomic attributes including yield, flowering time, seed weight and broad adaptation were clearly related to geographic origin. More recently, Whitty *et. al.*, (1994) were able to relate variation within the species to geographic origin using RAPD analysis. However relationships between phenotypes of *C. rotundifolia* and geographic origin have been difficult to establish in other studies (Irwin and Barneby 1982, Maass and Cárdenas (pers. com.). Wynn was collected from Sao Paulo, Brazil in 1964 and released in 1983. Since its release, the number of accessions held in the world's major tropical forage genebanks has increased to 130. This paper reports the geographic origin of those accessions and identifies a core collection of the species. Using that core collection in future evaluation studies should result inefficiencies in utilisation of the collection and, because of the reduced number of accessions for which large quantities of seed need to be available, improved efficiencies in seed multiplication and maintenance of the collection.

METHODS AND MATERIALS

Provenance data for *C. rotundifolia* accessions held at the two major tropical forage germplasm centres (CIAT and ATFGRC) were assembled. Data were examined to identify duplicate accessions, mapped and studied to identify the range of latitudes, mean annual rainfall, altitude, soil texture, soil pH and associated species at the site of collection. A core set of accessions was selected on the basis of provenance data. It includes accessions from the geographic range of the species as well as accessions from the extremes of rainfall, altitude and soil reaction (Table 1). CPI 34721, cv. Wynn, is included in the core set because of its cultivar status.

RESULTS AND DISCUSSION

Latitude. Site of collection is available for 117 of the 130 accessions. *C. rotundifolia* accessions have been collected from North, Central and South America with latitude ranging from 22°55' N in Jalisco, Mexico to 28°53' S in Corrientes, Argentina (Map 1). Some accessions have been collected from Ghana and Nigeria in West Africa. Hutchinson and Dalziel (1958) and Lock (1989), however, consider the species to have been introduced into Africa from the Americas. On the basis of seed size reported by Strickland *et al.*, (1985), it would appear that the origin of the west African material is possibly Brazilian. However Whitty *et. al.*, (1994) suggested differences between the African and American germplasm based on RAPD analysis.

Mean annual rainfall. *C. rotundifolia* has been collected from sites with mean annual rainfall ranging from 400mm to 3720mm. Most accessions were collected from sites with a mean annual rainfall of ca. 1000mm which is reflected in the adaptation of *C. rotundifolia* to the sub-humid and semi-arid areas of Africa (Tarawali 1994). The majority of accessions from dry sites (<1000mm) were collected from the states of Bahia, Rio Grande de Norte, Pernambuco in northern Brazil while the wetter sites were almost invariably located in Colombia.

Altitude. The majority of accessions were collected from below 0.9 m altitude although 6 accessions were collected from altitudes >1000m - from Jalisco in Mexico and from District Federal and the state of Goias in Brazil. The accessions from Jalisco, Mexico were collected from near the northern extremes of the species' distribution, at ca. 20°N and these accessions are likely to be the most cold tolerant accessions in the collection.

Soil texture and pH. Data for soil texture, fertility and pH at the site of collection are limited. In the 52 cases where soil texture data were available, 3 accessions were collected from stony soils, 28 were from sands, 13 from loams and 8 from clay loams or clay soils. These results confirm the observation of Irwin and Barneby (1982) that the species is largely confined to light-textured soils. While most accessions were collected from slightly acid soils (pH 5.0-7.0), six accessions were collected from soils with pH 5.0 and these could be of particular value for developing cultivars for acid soils in the tropics. No accessions were collected from alkaline soils.

Associated legumes. 59 accessions of *C. rotundifolia* were collected in association with various pioneer legumes adapted to open and disturbed environments, including *Stylosanthes guianensis, S. scabra, S. humilis, Desmodium barbatum, D. incanum* and *Centrosema brasilianum*. In 48 of these, the associated legume species included *Stylosanthes* spp. Also, most accessions of *C. rotundifolia* (ca. 70%) were collected from roadsides and together, these data indicate that the species is a strong coloniser.

CONCLUSION

Although there is conflicting evidence on the relationship between morphological variation and geographic origin, the results from Strickland *et. al.*, (1985) and Whitty *et. al.* (1994) justify the selection of a core set of accessions based on geographic origin and other provenance data. A core collection of 26 accessions of *C. rotundifolia*, which takes into account the geographic origin, soil, mean annual rainfall and altitude at the site of collection has been identified (Map 1, Table 1.). No representatives from Africa are included in the core set since most evidence points to the species being adventive in that continent. There are a number of regions of the Americas where *C.*

rotundifolia is reported and which are yet to be sampled. Important among these are Cuba, Honduras, coastal Ecuador and Bolivia.

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Table 1

Core accessions of *Chamaecrista rotundifolia* selected on the basis of geographic origin, rainfall, altitude and soil data.

Accession*	Country	State	Latitude	Longitude	Altitude (m)	Rainfall (mm)	pH
CPI 86162	Mexico	Jalisco	20.37N	105.15W	10	1500	6.5
CPI 86178	Mexico	Jalisco	19.35N	104.25W	1000	850	6.5
CPI 85836	Mexico	Guerrero	16.45N	99.30W	50	1400	6.5
CIAT7091	Panama	Chirique	8.43N	82.37W	770	2720	
CIAT7288	Venezuela	Anzoategui	8.37N	63.50W	130	1080	
CIAT18252	Venezuela	Zulia	8.29N	72.29W	10	2730	4.8
CIAT8158	Colombia	Arauca	6.23N	71.36W	280	2680	
CIAT21715	Colombia	Meta	4.03N	73.27W	340	3700	
CIAT20715	Colombia	Huila	3.50N	75.06W	550	1090	6.9
CIAT17958	Colombia	Meta	3.38N	73.44W	380	2850	4.6
CIAT17440	Brazil	Roraima	2.22N	61.10W	80	1930	
CIAT8389	Brazil	Paraiba	7.06S	36.17W	570	400	
Q10057	Brazil	Paraiba	7.22S	36.30W	580	420	
CIAT9847	Brazil	Mato Grosso do Sul	11.37S	50.40W	250	1580	
CIAT8556	Brazil	Goias	12.24S	46.27W	690	1510	5.0
CIAT8994	Brazil	Bahia	13.53S	40.01W	200	690	
CIAT8559	Brazil	Goias	15.23S	47.32W	1220	1600	
CIAT17002	Brazil	Bahia	18.01S	39.51W	90	1510	
CIAT17000	Brazil	Espirito Santo	18.46S	39.51W	70	1420	
CIAT9735	Brazil	Mato Grosso do Sul	20.23S	54.32W	580	1450	4.5
ATF2208	Paraguay	Nuevo Asuncion	20.57S	61.48W	300	500	6.0
CPI 34721	Brazil	Sao Paulo	22.54S	47.03W	800	1390	
ATF2222	Paraguay	Concepcion	23.17S	57.20W	250	1300	7.0
CPI 92985	Brazil	Parana	25.36S	49.48W	790	1260	
ATF2228	Paraguay	Itapua	27.14S	56.04W	260	1600	
CPI 78355	Argentina	Corrientes	28.53S	58.45W	80	1320	

CPI = Australian Commonwealth Plant Introdusction number
CIAT = Centro Internacional de Agricultura Tropical, Colombia
ATF = Australian Tropical Forages Genetic Resource Centre

Figure 1

Distribution of the world genertic resource collection of *Chamaecrista rotundifolia* together with those accessions selected on the basis of provenence data as being part of the core collection.