

CASTANOSPERMINE IN *ALEXA* SPECIES

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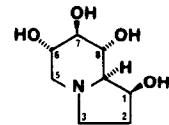
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Abstract—Castanospermine, a physiologically active polyhydroxylated indolizidine alkaloid first isolated from seeds of *Castanospermum australe*, has been isolated from the dried pod of *Alexa leiopetala* and tentatively identified in seven other species of the same genus

INTRODUCTION

Castanospermine **1**, an alkaloid first isolated from the seeds of the monotypic Australian rainforest and riverine tree *Castanospermum australe* [1] is an inhibitor of plant, insect and mammalian α - and β -D-glucosidases *in vitro* [2, 3] and has been shown to affect the processing of glycoproteins *in vivo* by inhibiting α -glucosidases I and II [4]. The alkaloid alters glycogen metabolism in rats [5] and inhibits the growth of HIV 1 and 2 in C8166 cells [6].



RESULTS AND DISCUSSION

We are now able to report that castanospermine has been isolated from the dried pod of another legume,

Table 1 Castanospermine concentration in *Alexa* and *Castanospermum*

Species	Collector(s)	Part of plant	% dry weight
<i>Alexa canaracunensis</i> Pittier	Holst and Liesner	leaf	0.18
	2823	pod	0.12
	Steyermark 75425	seed	1.13
<i>Alexa cowanii</i> Yakovlev	Maguire, Steyermark	leaf	0.03
	and Maguire 53510	pod	0.002
<i>Alexa grandiflora</i> Ducke	Ducke 286	leaf	0.57
	Archer 8061	pod	0.01
	Archer 8061	seed	1.39
<i>Alexa herminiana</i> Ramirez	Steyermark, Davidse	leaf	0.42
	and Guanchez 122206		
<i>Alexa imperatricis</i> (Schomb.) Baill	Wurdack and Monachino 39681	leaf	0.02
<i>Alexa leiopetala</i> Sandwith	Davis 1056	leaf	0.003
	Fanshawe 3077	pod	0.10
	Fanshawe 3077	seed	1.20
<i>Alexa superba</i> R. S. Cowan	Cardona 2485	leaf	0.17
<i>Alexa wachenheimii</i> Benoist	Forest Herbarium	leaf	0.16
	Surinam 4308	pod	0.056
<i>Castanospermum australe</i> A. Cunn	Hegarty s.n.	leaf	0.27
	Hegarty s.n.	pod	0.003

Herbarium material is held at R.B.G. Kew

Results are the mean of two analyses

Alexa leiopetala Sandwith, collected in 1931 in Guyana (Tinamu Line, Lower Cuyuni River–Davis, Forest Dept. 1056) The identity of the isolate with authentic castanospermine has been established by ^1H and ^{13}C NMR and EIMS. The yield was 0.09%. Castanospermine was also tentatively identified from dried herbarium material in seven other *Alexa* species. The concentration of castanospermine detected by gas chromatography in *Alexa* and *Castanospermum* extracts are shown in Table 1. It should be noted that drying and storage of the herbarium material may have affected the levels of the alkaloid. Ripe *C. australe* seeds can contain 1.3% fresh weight of castanospermine.

Alexa spp. are native to the wet lands of Guyana, Surinam, French Guiana, Venezuela and the Brazilian Amazon Basin but despite their geographical separation from *Castanospermum australe* the possession of castanospermine and a large number of other morphological and anatomical features in common suggest that the two genera are closely related. A detailed taxonomic study will be reported separately (Stirton, C. H., in preparation).

EXPERIMENTAL

Isolation of castanospermine 11 g of dried *Alexa leiopetala* pod was finely ground and extracted with 75% EtOH (3 \times 55 ml). After filtration the extract was concd under red pres to 30 ml and castanospermine isolated by ion exchange chromatography [1]. The alkaloid was obtained as a viscous syrup after freeze-drying fractions found to contain the compound by high voltage paper ionophoresis [1].

^1H and ^{13}C NMR Comparison of 89.55 MHz ^1H NMR and 22.5 MHz ^{13}C NMR spectra of the alkaloid isolated from *A. leiopetala* and authentic castanospermine in D_2O showed them to be the same. Calculation of proton–proton couplings for H_6 and $\text{H}_{5\alpha}$ showed the alkaloid to be castanospermine and not 6-epicastanospermine [7].

EIMS A low resolution mass spectrum of the alkaloid from

A. leiopetala was virtually identical to that of authentic castanospermine with intense ions at m/z 189, 172, 154 and 145.

Gas chromatographic analysis of castanospermine Dry herbarium material of 8 *Alexa* species and *Castanospermum australe* was finely ground and extracted in 75% EtOH (100 mg/ml) for 24 hr. 1 ml aliquots of the extracts were applied to Pasteur pipette columns of strongly acidic cation exchange resin (Amberlite CG120) in the H^+ form. After washing with H_2O and 1 M pyridine, castanospermine was displaced from the column with 2 M NH_4OH and fractions combined and freeze-dried for gas chromatographic analysis. 200 μl Sigma Sil A was added per sample and the TMS derivative of castanospermine chromatographed on a glass column (1.5 m \times 4 mm) packed with 3% OV1 [8]. The concentration of castanospermine in the extracts was determined by comparison with the pure compound.

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