

## CASTANOSPERMINE IN *ALEXA* SPECIES

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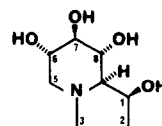
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**Key Word Index**—*Alexa*, Leguminosae, castanospermine, polyhydroxyalkaloid; chemotaxonomy

**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  $\alpha$ - and  $\beta$ -D-glucosidases *in vitro* [2, 3] and has been shown to affect the processing of glycoproteins *in vivo* by inhibiting  $\alpha$ -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	pod	0.002
<i>Alexa grandiflora</i> Ducke	53510		
	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		
<i>Alexa imperatricis</i> (Schomb.) Baill	122206		
	Wurdack and	leaf	0.02
<i>Alexa leiopetala</i> Sandwith	Monachino 39681		
	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 castanospermene has been established by  $^1\text{H}$  and  $^{13}\text{C}$  NMR and EIMS. The yield was 0.09%. Castanospermene was also tentatively identified from dried herbarium material in seven other *Alexa* species The concentration of castanospermene 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 castanospermene

*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 castanospermene 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 castanospermene* 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 castanospermene 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]

$^1\text{H}$  and  $^{13}\text{C}$  NMR Comparison of 89.55 MHz  $^1\text{H}$  NMR and 22.5 MHz  $^{13}\text{C}$  NMR spectra of the alkaloid isolated from *A. leiopetala* and authentic castanospermene in  $\text{D}_2\text{O}$  showed them to be the same Calculation of proton–proton couplings for  $\text{H}_\alpha$  and  $\text{H}_{\alpha\alpha}$  showed the alkaloid to be castanospermene and not 6-epicastanospermene [7]

*EIMS* A low resolution mass spectrum of the alkaloid from

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

*Gas chromatographic analysis of castanospermene* 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  $\text{H}^+$  form After washing with  $\text{H}_2\text{O}$  and 1 M pyridine, castanospermene was displaced from the column with 2 M  $\text{NH}_4^+\text{OH}^-$  and fractions combined and freeze-dried for gas chromatographic analysis 200  $\mu\text{l}$  Sigma Sil A was added per sample and the TMS derivative of castanospermene chromatographed on a glass column (1.5 m  $\times$  4 mm) packed with 3% OV1 [8] The concentration of castanospermene in the extracts was determined by comparison with the pure compound

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