

## CHAPTER I

### INTRODUCTION



#### 1. BOTANICAL ASPECTS OF THE *ALBIZZIA*

*Albizzia julibrissin* Durazz. has a common name of "silk tree" and belongs to the family and subfamily of "leguminosae" and "mimosaideae" respectively. It is an ornamental deciduous tree with a grayish white stem bark and is considered as a medium perennial. Its height is about 3-5 metres. *Albizzia julibrissin* Durazz. is similar to a well-known tree in Thailand, namely "rain tree" (or chamchuree in Thai).

There are many other species in the genus of *Albizzia*, for example, *A. lebbek*, *A. procera*, *A. lucida*, etc. According to the Gray's Manual of Botany<sup>(1)</sup> *Albizzia* Durazz. has "flowers perfect or polygamous calyx. tubular, 5-dentate. Petals united for more than half their length in to a tubular somewhat salverform corolla. Stamens numerous; the filaments much elongated. Legume narrowly oblong, the valves neither twisted nor elastically spreading. -Unarmed trees nat. of Mex., Asia, Afr. and Austral., with bipinnate leaves. (Dedicated to Filippo degli Albizzi, who, two centuries ago, introduced this genus into European cult.) Original spelled *Albizia*, corrected to *Albizzia* by Bentham."

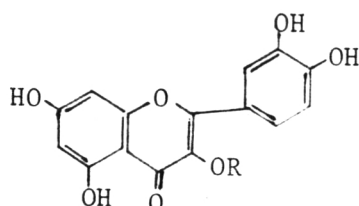
The manual further describes *Albizzia julibrissin* as saying. "Flowers pink or lilac, in several tassel-like globular clusters about 5 cm. in diameter at the end or slender naked peduncles; legumes flat, 1-1.8 dm. long, 1.8-2.5 cm. broad. Frequently cult., and natzd. on roadsides and in thickets and borders of woods."

## 2. CHEMICAL STUDIES

Although *A. julibrissin* has been investigated in various aspects, mostly in cultivation and agriculture, for a long time, its chemical studies started only less than ten years ago. In 1975, Nakano and Takashima<sup>(2)</sup> isolated 4,6-dimethoxy phthalide, (+)-penitol,  $\alpha$ -spinasterol and  $\alpha$ -spinasterone as well as an unidentified acid from the methanolic extracts of the heartwood. Two years later, Sergienko investigated the ethanolic extract of the bean valves and found a saponin compound called "albiside" which was proved to be a polyglycoside, consisting of echinocystic acid and glucose, xylose, arabinose, fucose and rhamnose.<sup>(3)</sup>

In a recent report, Kaneta and his co-workers<sup>(4)</sup> identified the flavones in sixteen species of leguminosae. At least two compounds were found in *A. julibrissin*, namely quercetin-3-O-galactoside and quercetin-3-O-rhamnoside which had a common

structure as follows:



quercetin-3-O-galactoside; R = galactose

quercetin-3-O-rhamnoside; R = rhamnose

In general there have been a number of flavonoids, steroids and sapogenins found in various parts of *A. julibrissin* as shown in Table I, Table II and Table III, respectively. However, to the best of our knowledge, the stembark of *A. julibrissin* has not been investigated and reported in any literature.

Table I Flavonoids in *Albizzia* genus.

Species	Flavonoids	Part	Ref
<i>A. adianthi- folia</i>	3,4,2',3',4'-pentahydroxy- chalcone (okanin)	wood	5
	3,7,8,3',4'-pentahydroxy flavone (melanoxetin)	wood	5
	3,7,8,3',4'-pentahydroxy flavanone	wood	5

Table I Continued :-

Species	Flavonoids	Part	Ref.
<i>A. amara</i>	melanoxetin	heartwood	6
	3'-O-methylmelanoxetin	heartwood	6
	melacacidin	heartwood	6
	methyl ether of (-)-2,3-cis-3,4-cis-3-O-methylmalacacidin	heartwood	6
<i>A. falcata</i>	quercetin	wood	7
<i>A. julibrissin</i>	quercetin 3-O-galactoside	not mentioned	4
	quercetin 3-O-rhamnoside	not mentioned	4
<i>A. lebbek</i>	melanoxetin	heartwood	6,8
	3'-O-methylmelanoxetin	heartwood	6
	melacacidin	heartwood	6
	methyl ether of (-)-2,3-cis-3,4-cis-3-O-methylmelacacidin	heartwood	6
	vicenin II	leaves	9
	okanin	heartwood	8
	(+)-leucocyanidin	bark	10
	leucopelargonidin	heartwood	8
	lebbecacidin	heartwood	11
<i>A. odoratis-sima</i>	3,7,8,3',4'-tetrahydroxy flavanone	not mention	12

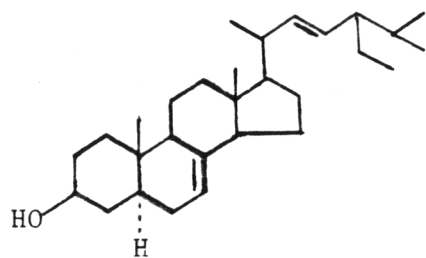
Table I Continued :-

Species	Flavonoids	Part	Ref.
<i>A. procera</i>	biochanin A (5,7-dihydroxy 4'-methoxyisoflavone)	heartwood, and bark	6
	formononetin (7-hydroxy-4'- methoxyisoflavone)	bark	6
	genistein (5,7,5'-trihydroxy- isoflavone)	bark	6
	diadzein (7,4'-dihydroxy- isoflavone)	bark	6

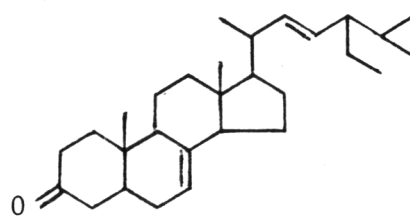
Table II Steroids in *Albizzia* genus.

Species	Flavonoids	Part	Ref.
<i>A. falcata</i>	$\alpha$ -spinasterol	wood	7
<i>A. julibrissin</i>	$\alpha$ -spinasterol	heartwood	2
	$\alpha$ -spinasterone	heartwood	2
<i>A. lebbek</i>	$\gamma$ -sitosterol	bark	13
	$\beta$ -sitosterol	leaves	14
<i>A. procera</i>	$\alpha$ -spinasterol	roots, leaves	15

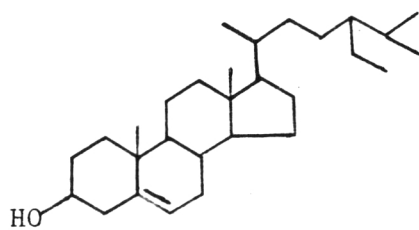
The structures of these steroids are shown below :



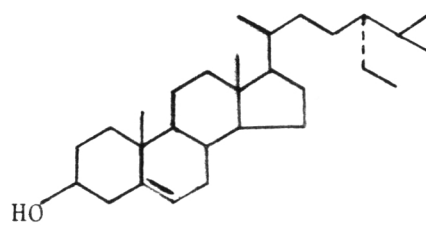
$\alpha$ -spinasterol



$\alpha$ -spinasterone



$\beta$ -sitosterol



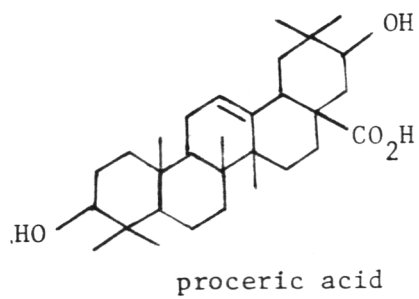
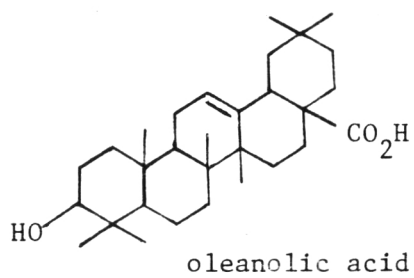
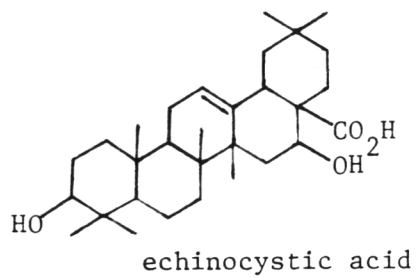
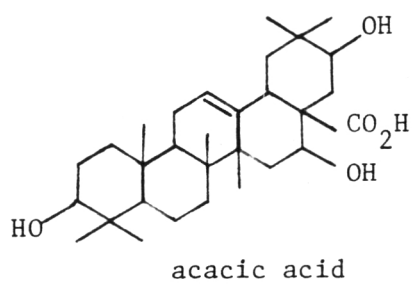
$\gamma$ -sitosterol

Table III Some triterpenoid saponins in *Albizia* genus

Species	Triterpenoid saponins	part	Ref.
<i>A. anthelmintica</i>	echinocystic acid	bark	16
<i>A. julibrissin</i>	echinocystic acid	bean valves	3
<i>A. lebbek</i>	echinocystic acid	not mentioned	17
		seeds, pericarp	18
		leaves	14
		Pods, seeds	19
	oleanolic acid	not mentioned	17
		beans	20
		seeds, pericarp	18
	acacic acid <sup>*</sup>	wood	21,22
<i>A. procera</i>	proceric acid <sup>*</sup>	not mentioned	17
		seeds	23
	oleanolic acid <sup>*</sup>	seeds	23
		roots	15
<i>A. amara</i>	echinocystic acid	seeds	24
<i>A. odoratissima</i>	acacic acid	seeds	25
<i>A. spitulata</i>	acacic acid	seeds	26

\* Their saponins exhibited spermicidal activity.

The structures of the above triterpenoid sapogcins are shown as follows :





### 3. PHARMACOLOGICAL ACTIVITIES

No work seems to have been done on the pharmacological activities of *A. julibrissin* although the spermicidal activity of some saponins<sup>(15,21,23)</sup> isolated from a few other species has been reported (see Table III).

During the course of our investigations, we found that crude methanolic extract of *A. julibrissin* stem bark exhibited uterotonic activity in mice. In addition, Dr. W.S. Woo of the Natural Products Research Institute, Seoul National University, Seoul, Korea, also found that the same extract showed the antiparasitic activity in the intestine, stimulated diuretic activity and improved the function of the liver.

Crude methanolic extract was partitioned between water and n-hexane and further such action between water and chloroform yielding hexane and chloroform soluble fractions which did not show uterotonic activity. However, the biologically active constituents can be extracted from water by n-butanol to afford pharmacologically active butanolic extract. (see Scheme I, page 11)

These preliminary results prompted us to investigate the butanolic soluble fraction both chemically and pharmacologically.