A QUALITATIVE AND QUANTITATIVE COMPARISON OF THE QUINOLIZIDINE ALKALOIDS OF THE FASCIATED AND NORMAL STEMS OF *SOPHORA SECUNDIFLORA*

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Fasciations are a malformation of a plant's anatomical parts, which may be likened to a cancer or a somatic mutation (1). In the process of becoming fasciated, the plant stem undergoes rapid growth along one plane to form a fan-shaped structure. The result of this accelerated growth is a new growth on the stem, which may weigh ten to fifty times more than the new growth on a normal stem. The rapid growth in fasciated stems appears to be uncontrolled and may affect the composition of the secondary metabolites present in that organ. Because fasciation does not occur in all the stems on a single plant, a comparison of the alkaloids of fasciated and normal stems from the same plant would indicate whether there are qualitative and/or quantitative differences between the two stem types. Genetic, seasonal, and population variability would not be encountered. Any difference noted in the alkaloid composition would, therefore, be attributed solely to the fasciation phenomenon.

EXPERIMENTAL

PLANT MATERIAL.—Fasciated and normal stems of *Sophora secundiflora* (Ort.) DC. were collected from the same plant on the campus of the University of Texas at Austin in the fall of 1978 and 1979, air-dried at room temperature, and processed immediately after drying. Voucher specimens are deposited in the herbarium at the University of Texas at Austin.

EXTRACTION, ISOLATION AND IDENTIFICATION OF ALKALOIDS.—Standard procedures for the extraction and isolation of alkaloids were employed (2-4). Identification was accomplished by color-reaction tests, mp, uv, ir, ms, pmr, and co-tlc, co-gc, co-gc/ms with reference compounds. Both stem types were found to contain cytisine, sparteine, anagyrine, *N*-methylcytisine, 5,6-dehydrolupanine, rhombifoline, lupanine, epi-lupinine, *N*-acetylcytisine, and *N*-formylcytisine. The latter two alkaloids were previously unreported in this species. Two alkaloids previously reported in the seeds (2,3) were not detected in the stems (thermopsine and 11-allyl cytisine).

QUANTITATIVE DETERMINATION.—Identical amounts of fasciated and normal stem material were extracted, partitioned, made to volume, an internal standard, oxosparteine, added and analyzed by gc/ms. Full details of the isolation and identification of the compounds are available on request to P.I.C.

RESULTS

As indicated in Table 1, the observed decrease in alkaloid content in the fasciated stem could be attri-

TABLE 1. Comparison of Alkaloid Content between Normal and Fasciated Sems of *Sophora secundiflora*

Compound	Area under the curve relative to internal standard, oxosparteine		Decrease (%)
	Normal stem	Fasciated stem	
Oxosparteine	100.00	100.00	—
Cytisine	102.79	70.51	31.40
Sparteine	28.50	27.87	0.02
Anagyrine	7.91	4.85	38.70
N-methylcytisine	5.36	1.43	73.30
Rhombifoline	3.61	1.15	31.80
Δ5,6-dehydrolupanine	2.42	2.25	0.07
N-formylcytisine	1.67	1.02	38.10
Lupanine	0.87	0.50	42.50
N-acetylcytisine	[a]	—	—
Epi-lupinine	—	—	—

[a]Concentration too low to detect

buted to the accelerated growth of this organ. During this period, the plant stem would be principally engaged in the production of structural tissue with a resulting decrease in the production of secondary compounds. Alternatively, a change in tissue morphology might result in a reduction in the relative proportion of alkaloid storage cells.

Two new alkaloids for this species (*N*-formylcytisine and *N*-acetylcytisine) were found in both stem types.

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CONSTITUENTS OF *JASMINUM AZORICUM*

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Jasminum azoricum L. (Oleaceae) is a climbing, evergreen shrub indigenous to the Canary Islands (1) and cultivated in Egypt as an ornamental. Several species of *Jasminum* have been used medicinally (2), and a number of them have been examined for their secondary chemical constituents (3-8). In the current literature, nothing could be found concerning the chemical constituents of *J. azoricum*. In this communication, we report the isolation and identification of three iridoids, four flavonoids, two alcohols, three terpenoids, and five fatty acids from the leaves of *J. azoricum*.

The leaf chemical constituents show considerable variation from those reported to be present in other closely related species of *Jasminum* growing in Egypt (6,7).

EXPERIMENTAL

General experimental procedures.—Uv spectra were recorded in MeOH on Unicam SP 1750, pmr spectra in CD_3OD at 90 MHz and ms at 70 eV on AEI MS 90 spectrophotometers. Adsorbents were from E. Merck. Standard methods for identification of flavonoids were applied (10,11).

Full details of the isolation and identification of the compounds are available on request to the senior author.

Plant material.—The plant was collected in March 1981, from the Experimental Station of the Faculty of Agriculture, Assiut University, Egypt.

Extraction and fractionation.—Dried, powdered leaves (2.5 kg) of *J. azoricum* were successively extracted with petroleum ether and 90% aqueous EtOH. The petroleum ether extract (37 g) was saponified with 1 liter of 30% alcoholic KOH for 2 h. The unsaponifiable material (2.95 g) was fractionated over alumina (120 g) to yield α-amyrin (58 mg, mp 183-186°, acetate mp 225-227°), β-amyrin (21 mg, mp 197-198°, acetate mp 201-203°), ceryl alcohol (23 mg, mp 80-82°, acetate mp 66-68°) and β-sitosterol (42 mg, mp 135-138°, acetate mp 125-127°).

The methyl esters of the fatty acid mixture (9) were analyzed by glc on 10% polyethylene glycol adipate supported on chromosorb W. The following fatty acids were detected and estimated: linoleic (43.0%), oleic (21.6%), palmitic (27.8%), myristic (0.8%), lauric (1.2%), unknown (2.4%), and unknown (3.2%).