A COMPARATIVE MACRO-AND MICROMORPHOLOGICAL 
STUDY OF THE STEMS AND LEAVES OF CERTAIN 
JASMINUM SPECIES CULTIVATED IN EGYPT.

S.M. El-Sayyad, S.A. Ross and N. A. El-Keltawi* 
Department of Pharmacognosy, Faculty of Pharmacy, & 
Department of Horticulture, Faculty of Agriculture, 
Assiut University, Assiut, Egypt.

The macro and micromorphological 
characters of the stems and leaves of 
Jasminum azoricum L., J. sambac Ait. 
C.V. double flower and J. sambac Ait. 
C.V. single flower were investigated in 
order to identify them both in entire 
and powdered forms as well as to diffe-
rentiate between them.

Jasminums are climbing or erect shrubs grown out of-
doors in tropical and temperate regions and in green 
houses.1-2 They constitute a complex of species which show 
considerable variation in relation to their flora and other 
characters4.

The genus includes many plants that are used medicin-
ally5,6. The leaves and roots of J. sambac Ait. (Arabian 
Jasmine, Nyctanthes sambac L.) are used as lactifuge and 
for eye-sore7.

From the laboratory investigations it was found that 
the three plants, J. azoricum L., J. sambac Ait. C.V. double 
flower (J. trifoliatum Hort.) and J. sambac Ait. C.V. single 
flower are rich in lactone glycosides, flavonoids and hexa-
hydralcohols8,9. J. azoricum L. and J. sambac Ait. were
found to be different in their components. While, both
the two varieties of *J. sambac* contain the same constitu-
teents but differ in quantity.

**Plant Materials:**

The samples of the plants were collected from the
Experimental Station of Horticulture, Faculty of Agri-
culture, Assiut Univ., and identified by Dr. N.A. El-
Keltawy, Assoc. Prof. of Horticulture. Fresh as well as
preserved samples (water: alcohol: glycerin mixture),
were used.

**Habitat:**

*J. azoricum* L.: is an evergreen climbing shrub with
terete branches and trifoliate leaves. Flowers are
grouped in loose cymes, white and sweet-scented.

*J. Sambac* Ait. is a sun-loving plant and thrives best
under relatively dry conditions. The plant grows as
erect shrubs, 1 to 1-3 metres in height. The double
flower variety shows thick fleshy pure white buds and
flowers and is exceedingly rich in perfume. The double-
ness is apparently achieved by fusion of a number of
flowers because of the large number of stamens.

The flowers of the three plants are grouped in termi-
inal cymes composed of a salveform corolla and cylindrical
tube. The fruits are bilobate berry.

The common method for their propagation is by cuttings
or layering.

The plants are shown in Fig 1.
MACROMORPHOLOGY

A. The stems: (Fig. 2A, B & C)

The main trunk of the three plants is cylindrical, hard, monopodially branched, growing ascendingly and reaching up to 5 cm in diameter. The plants bear cylindrical branches which are hairy and longitudinally striated. The internodes vary in length from 3.5 to 7 cm in J. azoricum, 3 to 4 cm in J. Sambac double flower and 5 to 6 cm in J. Sambac single flower. The surface of the stems is pale-brown rough and wrinkled. While, the older ones are rough and bear the scars of fallen leaves. The stems are odourless and with a bitter taste.

B. The leaves: (Fig. 2A, B & C)

The leaves vary in their characters between the three plants as follows: J. azoricum: (Fig. 2 A)

The leaves are compound, ternate, extipulate and opposite decussate. The leaflets are ovate-lanceolate with entire margin, acute elongated or tapering apex, symmetric base, hairy surface, coriaceous texture and long petiole. The leaf rachis is slender, yellowish-green and hairy. The terminal leaflets are larger than the lateral ones, measuring from 6 to 7 cm in length and about 3 cm in width, while the lateral from 3.5 to 4 cm in length and 1.5 to 2 cm in width.

J. Sambac: (Fig. 2 B & C)

Double flower: The leaves are simple arranged in alternate threes on the stems and branches. The lamina is ovate to spatulate with rounded apex and very
short stout petiole. They measure from 2.5 to 4.5 cm in length and 1.5 to 2.5 cm in width at its middle part.

**Single flower:** The leaves are simple, opposite-decussate, the lower older ones are smaller in size, ovate or spatulate. Ascendingly, the leaves become more larger, ovate or ovate-lanceolate with acute, tapering apex and showing axillary buds. They measure from 3 to 7.5 cm in length, 2.5 to 4.5 cm in width.

*J. sambac* leaves (the two varieties) are exstipulate, with entire margin, coriaceous texture, hairy surface and symmetric base. The leaves of the three plants are yellowish-green to dark green in colour, odourless and with a bitter taste.

**MICROMORPHOLOGY**

A- The Stems: (Fig. 3 A, B & C)

Transverse sections through the young stems are nearly circular and hairy. The outer epidermis is formed of one layer followed by a narrow parenchymatous cortex. The latter is lined internally by non-differentiated endodermis. The pericycle varies in the two species, in *J. azoricum* it is represented by interrupted bands of parenchyma and schlerenchyma while in *J. Sambac*, a continuous band of schlerenchyma is present. The phloem is soft and the xylem is radiating enclosing a parenchymatous pith.

The epidermal cells of the stems (Fig. 3 D, E & F) are usually isodiametric and covered with smooth cuticle. Stomata, if present, are ranunculaceous and rounded. Hairs are rare and non-glandular, unicellular, sometimes bicellular, elongated with rounded
ends and warty cuticle.

Table 1 shows the different variable histological characters of the epidermis of the stems.

The cortical parenchyma (Fig. 3 & 4) is lined externally by one row of hypodermal collenchyma in case of J. azoricum. The parenchyma is tangentially-elongated and contain starch granules as well as cluster crystals of calcium oxalate in J. sambac. The pericyclic sclerenchyma is represented by fibres in J. azoricum which are exceeded by stone cells in J. sambac, double and single flower. The fibres (Fig. 5) are elongated, showing comparatively wide lumina and narrow, pitted lignified walls. Stone cells (Fig. 4&5) are oval to rounded and with wide lumina and lignified pitted walls. Xylem vessels (Fig. 5) are usually solitary and show lignified pitted walls. Tracheids (Fig. 5) are elongated rectangular or with tapering ends and have pitted, lignified walls. Medullary rays are uni- or biseriate with elongated lignified, pitted cells. The pith is parenchymatous. The parenchyma show pitted lignified walls. Those of J. sambac contain cluster crystals of calcium oxalate.

Table 1 shows the differences between the histological characters of the stems.

In the old stems cork is formed. The cork cells are polygonal with lignified thick walls.

B- The leaves:

Transverse sections through the lamina (Fig. 6,7& 8D, E,F) are somewhat planoconvex with homogeneous mesophyll in J. azoricum and a non-homogeneous one in J. sambac with upper palisade of almost two rows. The palisade is interrupted in the midrib region by a zone of collenchyma
of one row which is lacking in \textit{J. azoricum}. Another zone is abutting on the lower epidermis of one or two rows in \textit{J. azoricum} and \textit{J. sambac} single flower and about 3 to 5 rows in \textit{J. sambac} double flower. The main vascular bundles are crescent-shaped showing a parenchymatous pericycle in case of \textit{J. azoricum} or an interrupted arc of parenchyma and schlerenchyma in \textit{J. sambac}. The pericyclic schlerenchyma is formed of stone cells and pericyclic fibres resembling those of stems. Xylem arcs are radiating showing mainly biseriate medullary rays and lignified spiral, pitted and scalariform vessels. Phloem is soft. The cortical parenchyma and spongy mesophyll contain starch granules exceeded by culster crystals of calcium oxalate in \textit{J. sambac}.

The epidermal cells (Fig. 8A, B & C): The upper and lower epidermal cells are polygonal, isodiametric with straight anticlinal walls and covered with smooth cuticle. Stomata are ranunculaceuous and hairs are non-glandular resembling those of the stems.

Significant differences in the histological characters of the leaves are recorded in Table 2.
Table 1: The significant differences in the main histological characters of the stems of *J. azorica*um* and *J. Sambac* (Double & single-flower)

<table>
<thead>
<tr>
<th>Character</th>
<th><em>J. azorica</em>um</th>
<th><em>J. Sambac</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>double-flower</td>
<td>single-flower</td>
</tr>
<tr>
<td>1- Epidermal cells</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walls</td>
<td>beaded</td>
<td>straight &amp; thick</td>
</tr>
<tr>
<td>Stomata</td>
<td>present</td>
<td>absent</td>
</tr>
<tr>
<td><em>Contents</em></td>
<td></td>
<td>slight curved Dr present in a higher level</td>
</tr>
<tr>
<td><em>Dimensions</em></td>
<td></td>
<td>CaOx. clusters</td>
</tr>
<tr>
<td>Length</td>
<td>32 - 64</td>
<td>64 - 104</td>
</tr>
<tr>
<td>Width</td>
<td>30 - 60</td>
<td>36 - 64</td>
</tr>
<tr>
<td>Height</td>
<td>24 - 28</td>
<td>24 - 28</td>
</tr>
<tr>
<td>Stomata (length)</td>
<td>48 - 50</td>
<td>48 - 52</td>
</tr>
<tr>
<td>Hairs (length)</td>
<td>160 - 290</td>
<td>160 - 360</td>
</tr>
<tr>
<td>2- Subep. Coll.</td>
<td>On row</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3- Cort. Par.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Dimensions</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>24 - 70</td>
<td>48 - 80</td>
</tr>
<tr>
<td>Width</td>
<td>32 - 40</td>
<td>24 - 36</td>
</tr>
<tr>
<td><em>Contents</em></td>
<td></td>
<td>Calcium Oxalate clusters</td>
</tr>
<tr>
<td>4- Pericycle</td>
<td>groups of fibres</td>
<td>continuous band of fibres and stone cells.</td>
</tr>
<tr>
<td><em>Dimensions</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibres (length)</td>
<td>400 - 500</td>
<td>480 - 520</td>
</tr>
<tr>
<td>Stone cells</td>
<td></td>
<td>440 - 480</td>
</tr>
<tr>
<td>Fibres (Length)</td>
<td>320 - 440</td>
<td>400 - 480</td>
</tr>
<tr>
<td>Tracheids (length)</td>
<td>80 - 100</td>
<td>100 - 110</td>
</tr>
</tbody>
</table>

*All the dimensions are in microns.*
A Comparative macro and micromorphological study of the stems and leaves of certain Jasminum species cultivated in Egypt

Table 2: The significant differences in the histological characters of the leaves of \textit{J. azoricum} and \textit{J. sambac}.

<table>
<thead>
<tr>
<th>Character</th>
<th>\textit{J. azoricum}</th>
<th>\textit{J. sambac}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>double flower</td>
<td>single flower</td>
</tr>
</tbody>
</table>

1—Epidermis

**Epidermal cells**

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>\textit{J. azoricum}</th>
<th>\textit{J. sambac}</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40 - 64</td>
<td>44 - 88</td>
</tr>
<tr>
<td>Length</td>
<td>20 - 34</td>
<td>40 - 72</td>
</tr>
<tr>
<td>Width</td>
<td>20 - 24</td>
<td>20 - 28</td>
</tr>
<tr>
<td>Height</td>
<td>36 - 48</td>
<td>40 - 80</td>
</tr>
</tbody>
</table>

**-L.ep.**

| Length             | 36 - 48              | 40 - 60           |
| Width              | 16 - 36              | 32 - 44           |
| Height             | 20 - 23              | 32 - 40           |

**Stomata**

| Length             | 40 - 42              | 28 - 30           |
| Hairs              |                      | 40 - 42           |

| Length             | 160 - 240            | 180 - 200         |

2—Mesophyll

| homogenous         | non - homogeneous    |

3—Pericycle

| parenchyma         | interrupted - - - - -schlerenchyma |

4—Vessels

| Diameter           | 28 - 60              | 28 - 32           |
|                   |                      | 28 - 36           |

5—Numerical values

| Stomatal Index     | Up. ep.              | 8.6                |
|                   | 1. ep.               | 14.3               |
|                   |                      | 11.5 - 12.5        |
|                   |                      | 14.9 - 15.1        |

| Stomatal Number    | Up. ep.              | 150 - 200          |
|                   | 1. ep.               | 350 - 400          |
|                   |                      | 300 - 330          |
|                   |                      | 250 - 300          |

| Vein termination Number | 5 - 6 | 4 - 5 | 4 - 4.5 |
| Vein islet Number      | 5 - 5.5 | 10 - 11 | 4 - 5 |

* All dimensions are in microns
Fig. 1- Photographs of Jasminums
A Comparative macro and micromorphological study of the stems and leaves of certain Jasminum species cultivated in Egypt.

Fig. 2 - The stems and leaves of J. azoricum, A. branch, B. sambac, C. double flower, D. single flower.

s., stem; l., leaf.
Fig. 3. Micromorphology of the stems of A. azoricum, double flower: X 18
B. embacum, single flower: X 18
C. embacum, single flower: X 210
D. embacum, single flower: X 210
E. embacum, single flower: X 210
F. embacum, single flower: X 210

con., cortex; ep., epidermis; h., hair; ph., phloem; st., stoma; xy., xylem.
A Comparative macro and micromorphological study of the stems and leaves of certain Jasminum species cultivated in Egypt

Fig. 4 - Detailed T.S. in the stems X 210

A. J. azoricum,
B. J. sambac double flower.
C. J. sambac single flower

cam., cambium; coll., collenchyma; cor., cortex; ep., epidermis;
m.n., medullary ray; p., pith; per.f., pericyclic fibres; ph., phloem;
st.c., stone cell; v., vessel; w.f., wood fibre.
Fig. 5 - Isolated elements of the stems

A. Cork; B. Epidermis; P. Parenchyma; M. Medullary Ray; C. Wood Fibre; V. Vessel; W. Tracheid; T. Trachea; Per. Pericyclic Fibres; S. Stone; Par. Pitted Parenchyma; PFT. Plectenchyma; St. Stone; C. Cork; E. Epidermis; P. Parenchyma; M. Medullary Ray

X 140
Fig. 7- Detailed T.S. in the midrib of the leaves X 210

A. *J. azoricum.*
B. *J. sambac,* double flower.
C. *J. sambac,* single flower.

c.a.ox., calcium oxalate; coll., collenchyma; cort.par., cortical parenchyma; h., hair; m.r., medullary ray; L.ep., lower epidermis; ph., phloem; st.c., stone cell; st., stomata; u.ep., upper epidermis; v., vessel.
REFERENCES


5) Ibn El-Bitar, Mofradat Al Adwiqa, Alaqzia Asharilah Press, Cairo, 201 (1890).

6) Ibn Sina; Fl-kanone Fil-Tebb, E.1 Halaby Co., Cairo, 334 (1868).


دراسة مقارنة للصفات المورفولوجية والتشريحية لسيفان وأوراق أنواع نباتات من جنس الياسمين

سامية محمد الصباغ، سمير أبي روس، نعيم القلتياوي
قسم العقاقير - كلية الصيدلة، قسم البياتين (الزينة) - كلية الزراعة
جامعة أسوان

في هذه البحث تم دراسة ثلاثة نباتات من جنس الياسمين وهي الغل بنوعيه.
زوجي وفردي الأزهار (الجاسمين ساماس آيت) وكذلك الجاسمين أورايزيم ال
وللنباتات التابعة لهذا الجنس عدة استعمالات طبية معروفة علاوة على الزيت الطيار.
ركز الأبحاث الموجودة في الأزهار وقد أثبتت الدراسات المعملية وجود جلوكوزيدات
لاكتونية وفلافونويدات وكذلك كحولات سداسية في أوراق وسيتان هذه النباتات ذات الطلب
العمري.

وقد أمكن وصف السيفان والأوراق كنامة وعلى هيئة مسحوق وكذلك المقارنة
بينهما لأمكانيات التعرف عليها وكذلك تعرفتها.

received in 6/4/1982 & accepted in 16/5/1982