

## MORPHOANATOMY OF ARGENTINIAN SPECIES OF *TESSARIA* (*ASTERACEAE-INUELAE-PLUCHINAE*)

M.E. Petenatti, E.M. Petenatti and L.A. Del Vitto  
Herbario UNSL / Proyecto 2-4-8702 CyT  
Facultad de Química, Bioquímica y Farmacia  
Universidad Nacional de San Luis  
Ejército de los Andes 950  
5700 San Luis, Argentina

**Keywords:** *Tessaria*, *Asteraceae*, *Tessaria absinthioides*, *T. dodoneaeifolia*, *T. integrifolia*, *T. ambigua*, *T. fastigiata*

### Abstract

*Tessaria* species are closely related, and three of them are used with therapeutical purposes in popular medicine, in Argentina: *Tessaria dodoneaeifolia* (reputed emmenagogue), *T. integrifolia* (antigonorrhic) and *T. absinthioides* (balsamic, and recently as hypocholesterolemiant). There are another two species (*T. ambigua* and *T. fastigiata*) from which any medicinal property or use is known. We carried out morphoanatomic studies for identification and effective quality control of the involved drugs, keeping in mind the importance that *T. absinthioides* has acquired.

### 1. Introduction

The Meso- and Southamerican genus *Tessaria* R. & P., that belongs to the Tribe *Inuleae*, Subtribe *Pluchinae* of the *Asteraceae*, is closely allied to *Pluchea* Cass. (Robinson and Cuatrecasas, 1973), from which is distinguished by their smaller number of male flowers in each capitulum and the scattered inward phyllaries. In accordance to Argentinian authors (Cabrera, 1939, 1978; Ariza Espinar, 1979), inhabits in Argentina 5 *Tessaria* species widely distributed: *Tessaria absinthioides* (H. & A.) DC., *T. ambigua* DC., *T. integrifolia* R. & P., *T. dodoneaeifolia* (H. & A.) Cabr., and *T. fastigiata* (Griseb.) Cabr.

Some of them are useful in popular medicine. *Tessaria dodoneaeifolia* is reputed emmenagogue (Martínez Crovetto 1981), *T. integrifolia* is used as antigonorrhic and *T. absinthioides* as balsamic (Toursarkissian, 1980). Recently, the use of sterile summits of *T. absinthioides* has acquired great importance both in domestic and homeopathic medicine, in Argentina, by reason of their hypocholesterolemiant properties. This study was carried out to improve the knowledge of the species of this genus from a morphoanatomy point of view, and to facilitate elements for an effective quality control as regards herbal remedies.

From a phytochemical point of view, this genus is rich in sesquiterpene lactones and flavonoids; thus, an eremophilane (tessaric acid) and three flavonoids (casticine, artemisine and chrysofenetone) were isolated from *Tessaria absinthioides*; other eremophilane (tenedodiol) and other eight flavonoids (erodyctiol, sakuranetin, luteolin, 7-O-methylerydactiol, 4',7-O-dimethylnaringenin, dihydroquercetin-3-acetate, 3-O-methylquercetin and 3,6-O-dimethylquercetagenin) were obtained from *T. dodoneaeifolia*; two flavonoids (casticine and artemisine), triterpenes and cathemone derivatives were taken out from *T. integrifolia*;  $\alpha$ -amyrin and three flavonoids (penduletin, 3,6,7-O-trimethylquercetagenin and artemisine) were isolated from *T. ambigua*; finally, six sesquiterpenes

(eudesmane derivatives) were obtained from *T. fastigiata* (Bohlmann *et al.*, 1977; Jakupovic *et al.*, 1985; Guerreiro *et al.*, 1990).

## 2. Materials and Methods

Morphologic and anatomic studies were carried out both on fresh and dry samples, herbaria specimens and herbal shop samples. Materials for anatomic studies (leaves and stems) were paraffin embedded, cut to freehand and with sliding microtome, stained with Safranin-Fast Green and mounted with DPX; other samples were dissociated with Jeffrey's method (Johansen 1940) or cleared by Dizeo's method (1973). For epidermis "peeling" or a treatment with potassium hydroxide was applied; histochemical tests were made with specific reactants (Lugol for starch, Sudan IV for fats and oils, ferric chloride-sodium carbonate for tannins, cresyl blue for mucilage and cupric acetate for calcium oxalate). The crystals were analyzed by means of an interferential phase contrast device. Herbarium material, histologic slides and commercial samples are preserved at Herbarium, Universidad Nacional de San Luis (UNSL). Their data are as follows:

*Tessaria absinthioides*. ARGENTINA, Prov. Mendoza: Dpt. Malargüe, Los Molles, 7.II.1996, L. Del Vitto, E. Petenatti & M. Petenatti 8623 (UNSL).- Commercial samples: UNSL-H 12, 162, 164 (mixture).

*Tessaria dodoneaefolia*. ARGENTINA, Prov. San Luis: Dpt. Belgrano: San Francisco, Quebrada de López, 28.I.1991. L. Del Vitto, E. Petenatti & M. Petenatti 5801 (UNSL).

*Tessaria integrifolia*. ARGENTINA, Prov. Entre Ríos, Dpt. Paraná: Paraná, w/d, J.M. Jozami s.n. (UNSL 6).

*Tessaria fastigiata*. ARGENTINA, Prov. Tucumán, Dpt. Trancas: El Cadillal, 3.IX.1987, L. Del Vitto & E. M. Petenatti 2179 (UNSL).

*Tessaria ambigua*. ARGENTINA, Prov. Entre Ríos, Dpt. Paraná: Paraná, w/d, J.M. Jozami s.n. (UNSL 5).- Prov. Catamarca, Dpt. Capital: Road to Las Pirquitas, 27.III.1995, C. Saravia-Toledo *et al.* 12915 (CTES).

## 3. Results

Because vegetative summits (stems and leaves) constitutes the majority of elements found in herbal shops samples, only these organs have been studied, and the results are the following.

### 3.1. Morphology characters

Leaves are variable in outline and margin; thus, *T. absinthioides* ones are obovate to narrowly obovate with large and scarce teeth on margin; while the leaves of *T. integrifolia*, *T. fastigiata* and *T. ambigua* are narrowly obovate, with an entire or lightly sinuate margin; finally, *T. dodoneaefolia* ones are narrowly obovate, too, but clearly dentate on the margin.

### 3.2. Anatomy

Sectioning leaves shows great differences among the entities: *T. absinthioides*, *T. integrifolia* and *T. ambigua* have an isolateral mesophyll with a single palisade layer towards both epidermis, while *T. dodoneaefolia* shows an isolateral mesophyll, too, but it is composed by several palisade layers; finally, in *T. fastigiata* is provided with dorsiventral mesophyll with several palisade layers toward the upper epidermis.

In order to the indument, *T. absinthioides*, *T. integrifolia* and *T. ambigua* are densely coated both by eglandular and glandular hairs; the eglandular ones are simple, pluricellular, appressed, while the glandular hairs are provided with a 2-4-celled trichopode and a pluricellular head; whereas, *T. fastigiata* shows eglandular, pluricelled hair with an elongate apical cell, not appressed, while the glandular ones are similar to the former entities; at last, *T. dodoneaefolia* is characterized by their glandular hairs included in crypta, with 1-2-celled trichopode and pluricelled head.

The cuticle is striate in *T. dodoneaefolia*, while is smooth in the other entities. Stomata are elevate and belongs to the anomocytic type in all entities.

Vascular bundles are protected by collenchyma - towards boths epidermis - and by sclerenchymatous casques, except in *T. absinthioides* in wich this casques are absent.

Finally, the stems present a chlorenchymatous hypodermis and some layers alternate with collenchyma. Vascular bundles are collateral and are disposed in a continuous stripe; extrafascicular bundles are present, too. No specific differences are found at caulinar level.

These results have evidenced important morphometric and histologic differences among analyzed entities; this fact will facilitates an effective quality control of these drugs.

### 3.3. Differential key of argentinian species of *Tessaria*

A.Obovate to narrowly obovate leaves. Midrib only with collenchyma. Eglandular appressed hairs. Isolateral mesophyll *Tessaria absinthioides*

AA.Ovate to narrowly ovate leaves. Midrib protected by collenchymatous and sclerenchymatous sheath. Glandular hairs absent, appressed or patent when presents.

B.Entire or sinuate leaf margin. Non striate cuticle. Isolateral or dorsiventral mesophyll.

C.Thickly appressed eglandular hairs. Isolateral mesophyll *T. integrifolia*

CC.Slackly patent eglandular hairs. Dorsiventral mesophyll *T. fastigiata*

BB.Strongly dentate leaf margin. Striate or non-striate cuticle. Isolateral mesophyll.

C.Glandular hairs included in crypta; eglandular absents. Striate cuticle. Several palisade layers *T. dodoneaefolia*

CC.Stipitate glandular hairs; eglandular abundant. Smooth cuticle. Single palisade layer. *T. ambigua*

### 4. References

- Ariza Espinar L., 1979. Contribución al conocimiento del género *Tessaria* (Compositae). *Kurtziana* 12-13: 47-62.
- Bolhmann F.; C. Zdero & M. Silva, 1977. *Phytochemistry* 16: 1302.
- Cabrera A.L., 1939. Las especies argentinas del género *Tessaria*. *Lilloa* 4: 181-189.
- 1941. Compuestas bonaerenses. *Revista Mus. La Plata (N.S.)* 4, Bot.: 1-450.
- 1963. *Tessaria*. In: A.L. Cabrera, *Fl. Prov. Buenos Aires* 6: 136-138, f. 34.

- 1971. *Tessaria*. In: M.N. Correa, Fl. Patagónica 7: 99-101, f. 87.
  - 1974. *Tessaria*. In: A.E. Burkart, Fl. Il. Prov. Entre Ríos (Argentina) 7: 301-304, f. 173-174.
  - 1978. *Tessaria*. In: A.L. Cabrera, Fl. Prov. Jujuy 10: 252-256, f. 108-109.
- Dizeo de Strittmatter C.G., 1973. Nueva técnica de diafanización. Bol. Soc. Argent. Bot. 15 (1): 126-129.
- Guerreiro E., M.J. Pestchanker, L.A. Del Vitto and O.S. Giordano, 1990. Sesquiterpenes and flavonoids from *Tessaria* species. Phytochemistry 29 (3): 877-879.
- Jakupovic J., L.N. Misra, T.V. Chau-Th,; F. Bohlmann & V. Castro, 1985. Cuauthemone derivatives from *Tessaria integrifolia* and *Pluchea symphytifolia*. Phytochemistry 24 (12): 3053-3055.
- Johansen D.A., 1940. Plant Microtechnique. McGraw-Hill, New York-London. 523 pp.
- Martínez Crovetto R., 1981. Plantas utilizadas en Medicina en el NO de Corrientes. Fund. Miguel Lillo, Tucumán. Miscelánea 69: 1-139.
- Robinson H. and J. Cuatrecasas, 1973. The generic limits of *Pluchea* and *Tessaria*. Phytologia 27: 277-285.