



Vol. 4 no. 2, pp. 59-63 (September 2007)

<http://www.ajol.info/journals/jpb>

Journal of
**PHARMACY AND
BIORESOURCES**

Pharmacognostic Studies on the Stems of *Argemone mexicana* Linn. (Family Papaveraceae)

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Received 11th March 2007

Abstract

Macroscopical, microscopical, chemo-microscopical and quantitative studies on the leaves of *Argemone mexicana* Linn (Fam. Papaveraceae) were carried out. Morphologically, the stem is of variable size, mostly light green in colour. There was presence of white substances (wax) at the surfaces and it's prickly in nature. Yellow sap exudes from the stem immediately after an incision. Microscopically, Features of interests observed were the presence of anomocytic stomata which is few in number, starch grains, fibres and xylem vessel thickening are of types, these are annular, spiral, reticulate and scalariform. On the aspect chemo-microscopical studies, cellulose, starch grains, lignins, tannins, prisms calcium oxalate crystals were observed. Quantitative determinations of the stems revealed on the average moisture contents (9.7 % w/w), ash-value (8.5% w/w), acid-insoluble ash (4.5% w/w) alcohol-soluble extractive (8.0% w/w) water-soluble extractive value, (15.0 % w/w) These results could serve as a guide in the identification and preparation of a monograph of the plant.

Keywords: Macroscopy; Microscopy; Chemomicroscopy; *Argemone mexicana* L.

Introduction

Argemone mexicana Linn belongs to family Papaveraceae, it's a herb with milk sap and prickly stems and leaves. The leaves are somewhat irregularly pinnatilobed and serrate, glaucous, the edge crisped undulate, each spinose. The plant flowers are sessile yellow and showy up to 6cm broad, mature plant grows up to 61-91cm (Wagner *et al.*, 1999). The plant is native of South America particularly Mexico and West Indies (Stone, 1970). It is however, found in Northern Nigeria, such as Sokoto and Kano, as well as in Oshogbo in Southern Nigeria (Hutchinson,

1954). The family Papaveraceae (poppy family) is made up of herbs or rarely, shrubs or trees that usually have milky or coloured sap. Most members of this family occur in temperate and cold regions of the world and they constitute plants that have great medicinal and economic values such plants include the opium poppy *Papaver somniferum* in which morphine alkaloid was isolated and this alkaloid is ranked as most effective pain killer of plant origin (Booth and MacDonald, 1992).

In Northern Nigeria, *A. mexicana* Linn. is locally known in Hausa as "Kaki

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ruwan Allah, Karanko or Kwarkwaro (Man *et al.*, 2003). The Hausa traditional healers use a grounded leaf on swollen area of skin against inflammation of skin (Oral communication with Dan Magori). The plant contains alkaloids, flavonoids, tannins, sterols and terpenes (Quinn-Beatie, 2002). In Tanganyika, the seed is reported as producing a degree of intoxication resembling that of *Cannabis sativa* L (Raymond, 1939). The aim of this study is to establish microscopical, macroscopical, chemo-microscopical and quantitative standards on the stems of the plant.

Experimental

Plant collection and identification: The stem of *A. mexicana* Linn was collected in December, 2005 at Tudun Wada, Zaria, Kaduna State and the botanical identification was carried out by herbarium keeper (Mallam A.U. Gallah) of Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria. A voucher specimen was kept at the Herbarium and the specimen voucher number was 2439.

Macroscopical examination: The macroscopical features of the stems were observed with naked eyes and in some cases with the aid of a hand lens. These features are described fully by adopting the terminologies given by Brain and Turner (1975).

Microscopical examination: Microscopical examination of the whole and powdered stems of the plant materials were used. Longitudinal and transverse sections of the stems were made from the whole stems. Surface preparation which is made from peel of the epidermis were also made, the sample preparations were observed under the compound microscope at x400 magnification (Evans, 1996).

Chemomicroscopical examination: Chemo-microscopical studies was carried out on the powdered stems to detect the presence of

cellulose, tannins, mucilage, resin, proteins, fat and oils, cutin e.t.c., as outlined by Balbaa *et al.* (1976).

Quantitative evaluation: Moisture content of the powdered stem of *A. mexicana* Linn was determined as a loss on dry method and other quantitative determinations which include ash value, acid-insoluble ash, alcohol soluble and water soluble extractive values were deduced by using the method described by Brain and Turner (1975).

Results

Macroscopic examination: Macroscopically, the stem is of variable size, mostly light green in colour. There was presence of white substances at their surfaces. The stem is also prickly in nature and yellow latex exudes from the surfaces after an incision or when the plant was injured. Other macro-morphological characteristics are given in Table 1.

Microscopic examination: The result of the microscopic examination showed the powdered stem to reveal the following features: polygonal epidermal cells, xylem vessels, phloem fibers, laticifers, calcium oxalate crystals and starch grains (fig. 1). Microscopical structures made from the peel of epidermis showed it to possess elongated polygonal cells and very few numbers of stomata (fig. 2). Transverse and longitudinal sections of the stem show it to possess an arrangement of tissues typical to any dicotyledonous plant in the following order, from the outer it is made up of epidermis, collenchyma, parenchyma, phloem, and finally pith at the innermost layer (fig. 3). More details of the microscopic studies are also given in table 2

Chemomicroscopic examination: The details of these results are given in Table 3.

Quantitative evaluation: The results of the 4. quantitative determinations are given in Table

Table 1: Macro-morphological features of the stems *A. mexicana* Linn

Feature	Observation
Average size	0.7 cm
Color	Green-light green
Fracture	Short
Fractured surface	Short
Shape	Straight
<i>Sensory characters of the powdered stem</i>	
Surface	Outer – light green; Inner – white with striations and furrows
Odour	slightly spicy
Texture	Prickly
Taste	slightly bitter
Colour	Grey

Table 2: Microscopic features of the stems of *A. mexicana* Linn

Diagnostic characters	Type
Stomata	Anomocytic
Fibers	non-lignified
Xylem vessels	annular, reticulate and scalariform
Calcium oxalate crystals	Prismed
Starch grains	Oval

Table 3 : Chemomicroscopical studies of the powdered stems of *A. mexicana* Linn

Constituents	Inference
Cellulose	+
Lignin	+
Fat and oil	+
Tannins	+
Mucilage	-
Calcium oxalate crystals	+
Protein	+
Cutin and suberin	-
Starch grains	+

Key: (+) = present; (-) = absent

Table 4: Results of the Quantitative Determinations of the Stems of *A. mexicana* Linn

Evaluative parameters	Mean (% w/w) ^a
Moisture contents	9.7
Ash value	8.5
Acid-insoluble ash	4.5
Alcohol soluble extractive	8.0
Water soluble extractive	15.0

^a Mean value of five counts

Discussion

The macro-morphological features of the stems showed it to be of variable size, light green in colour with powdered like white substances at their surfaces and yellow sap exudes immediately after an incision, this view was supported by Watson and Dallwith

(1992) who reported that most members of the family Papaveraceae are characterized by the possession of laticifers (milk sap) which is articulated anatomizing (usually, the juice is yellow or red) located in the leaves, stems, roots, flowers or fruits.

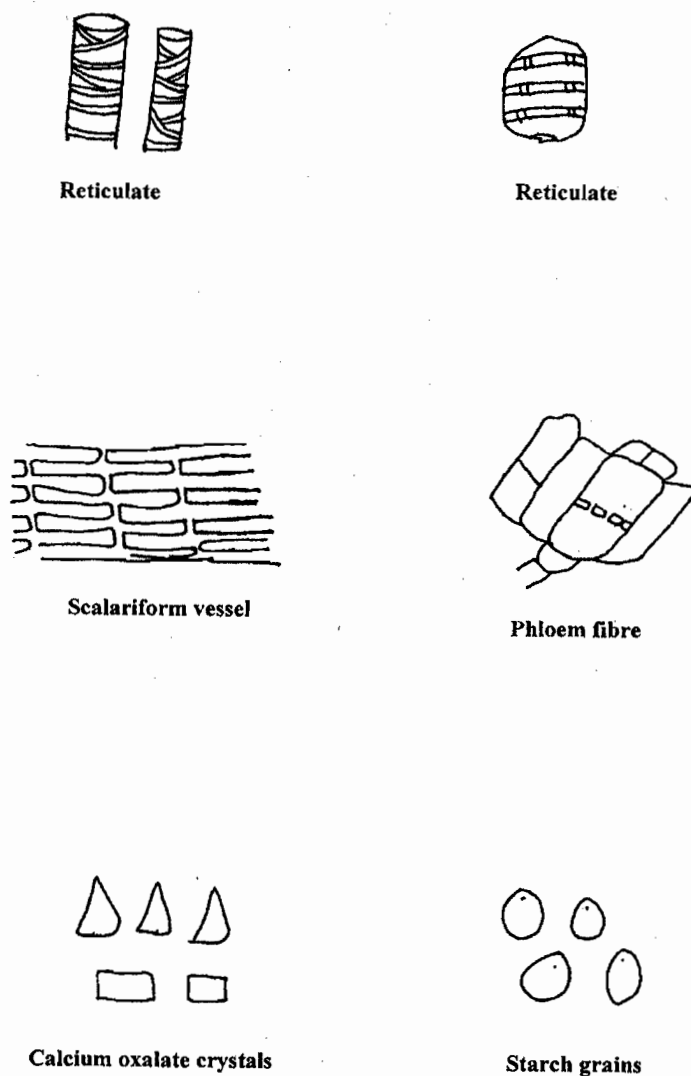


Figure 1: Microscopical features of the powdered stems of *A. mexicana* Linn (x400)

Transverse section through the stem revealed the arrangement of vascular tissues typical of the dicotyledonous plants and this indicated that the plant has organized vascular structure. The appearance of anomocytic type of stomata in the epidermis of the stem can also serve as a diagnostic feature common to some members of the family Papaveraceae. Chemo-microscopic and phytochemical

examinations revealed the presence of chemical constituents such as flavonoids and tannins, which confirmed the earlier report that some members of the family Papaveraceae contained alkaloids, glycosides, and flavonoids (Quinn-Beatie, 2002, Marbry *et al* 1968).

On the aspect of quantitative parameters, the moisture content (9.7 % w/w)

seem to be lower than necessary not to support the growth of micro-organisms that may consequently lead to the deterioration of the crude vegetable drugs when compared with documented values in the pharmacopoeia, for example Digitalis leaf, 6.0 % w/w, Acacia, 15.0 % w/w (British Pharmacopoeia, 1980). The total ash (8.5 %w/w), acid insoluble (4.5 %w/w) could serve as a standard in determining the amounts of residual substances not volatilize when the drug is ignited (African Pharmacopoeia, 1986). The results of the extractive values indicated that the chemical constituents in the leaves were more soluble in water (15.0 % w/w) than in alcohol (8.0 % w/w). These studies were intended to establish a monograph on the stems of the plant.

Conclusion

In these studies, the Pharmacognostic parameters of the stems of *Argemone mexicana* Linn was carried out, which determine the macroscopic, microscopical, chemomicroscopic and quantitative parameters of the plant, these results would aid in the identifications and preparation of a monograph of the plant.

Acknowledgement

The authors wish to thank the effort of Mallam Ibrahim Mohammed of Pharmacognosy Department, for providing the plant materials as well as Mallam U.S Gallah of the Herbarium section of the Department of Biological Sciences, Ahmadu Bello University, Zaria, for identifying and authenticating the plant for this studies.

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