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ELEMENTARY ANALYSIS OF *THESPESIA POPULNEA* FRUITS

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ABSTRACT

Elemental analysis of petroleum ether,chloroform,ethanolic and aqueous fruit extracts of *Thespesia populnea* (Malvaceae) revealed the presence of macronutrients such as Na , K , Ca, micronutrients such as Fe , Cu , Mn , Zn , Co and heavy metals like Ni, Cd, As, Pb and Hg by using the analytical techniques like AAS and flame photometer.

Key words: *Thespesia populnea*, Elements, AAS, Flame photometer.

INTRODUCTION

Medicinal plants have been the mainstay of traditional herbal medicine amongst rural dwellers worldwide since antiquity to date. The therapeutic use of plants certainly goes back to the Sumerian and the Akkadian civilizations in about the third millenium BC. Hippocrates (ca. 460–377 BC), one of the ancient authors who described medicinal natural products of plant and animal origins, listed approximately 400 different plant species for medicinal purposes. Natural products have been an integral part of the ancient traditional medicine systems, e.g. Chinese, Ayurvedic and Egyptian (Sarker & Nahar, 2007). Over the years they have assumed a very central stage in modern civilization as natural source of chemotherapy as well as amongst scientist in search for alternative sources of drugs. About 3.4 billion people in the developing world depend on plant-based traditional medicines. This represents about 88 per cent of the world's inhabitants, who rely mainly on traditional medicine for their primary health care. According to the World Health Organization, a medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi synthesis. Such a plant will have its parts including leaves, roots, rhizomes, stems, barks, flowers, fruits, grains or seeds, employed in the control or treatment of a disease condition and therefore contains chemical components that are medically active. These non-nutrient plant chemical compounds or bioactive components are often referred to as phytochemicals ('phyto'- from Greek - *phyto* meaning 'plant') or phytoconstituents and are responsible for protecting the plant against microbial infections or infestations by pests (Abo *et al*., 1991; Liu, 2004; Nweze *et al*., 2004; Doughari *et al*., 2009). The study of natural products on the other hand is called phytochemistry. The science of application of these indigenous or local medicinal remedies including plants for treatment of diseases is currently called ethno pharmacology but the practice dates back since antiquity (Doughari & Obidah, 2008; Doughari *et al*., 2009).

In modern medicine also, plants occupy a very significant place as raw materials for some important drugs, although synthetic drugs brought about a revolution in controlling different diseases. But these synthetic drugs are out of reach to millions of people, who live in remote places depending on traditional healers, whom they know and trust (Mumcuoglu *et al*., 1990)

Thespesia populnea Linn (Family – Malvaceae) is distributed mainly along the coastal regions throughout India, often planted as avenue tree. It grows to a

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maximum height of 18 metres. Fruits are globose or oblong brown capsules covered with minute peltate scales, pubescent, channelled along the back (Nadkarni, 1976).The bark is often fibrous and fissured in nature with grey to brown colours. The leaves are simple, alternate, long petiolate, cordate, entire, acuminate, prominent nerves 5 – 7 with peltate scales on one or both surfaces. The flowers are yellow with purple base, slowly changing to purple on withering (Warrier *et al*., 2001).

This plant is astringent, cooling and antidiahrroeal. The bark and fruits posses more curative properties. The bark is astringent and is prescribed in the Philippines in the form of a decoction for the treatment of dysentery. It is used in folk medicine as a poultice for external applications for the treatment of scabies, psoriasis and other skin ailments. The poultices prepared from fruits, flowers and leaves are also found to be useful in rheumatoid arthritis (Chatterjee & Pakrashi, 1994).

Earlier the plant has been studied for its antibacterial, antiviral, wound healing, anticancer (Johnson *et al*., 1999), antisteroidogenic activity (Kavimani, 1998) and for dermatitis (Housen *et al*., 1997). Aqueous extracts of fruits of this plant are reported for its wound healing activity (Nagappa & Binu cheriyan, 2001).

In the present study, the petroleum ether, chloroform, ethanol and aqueous extracts of fruits of *Thespesia populnea* (Linn) were screened for the elements present in them.

MATERIALS AND METHODS

Plant Material

The fruits of *Thespesia populnea* were collected from Kottayam district in Kerala, India in October 2006 and were authenticated by Mr.K G Sreekumar,Senior Research Officer, Pharmacognosy Unit, Govt Ayurveda Research Institute, Poojapura, Thiruvananthapuram, Kerala. A voucher specimen PC-03/2006 was submitted at Academy Of Pharmaceutical Science, Pariyaram Medical College, Kannur for future reference. Dried fruits were ground to a coarse powder, passed through sieve no 24 and stored in air tight container and used for further extraction.

Petroleum ether extract

The shade dried powdered fruits (500g) were exhaustively extracted with petroleum ether using a soxhlet apparatus. The extract was concentrated in vacuum to a syrupy consistency.

Chloroform extract

The shade dried powdered fruits (500g) were exhaustively extracted with chloroform using a soxhlet apparatus. The extract was concentrated in vacuum to a syrupy consistency.

Ethyl alcohol extract

The shade dried powdered fruits (500g) were exhaustively extracted with 95% ethanol using a soxhlet apparatus. The extract was concentrated in vacuum to a syrupy consistency.

Aqueous extract

The dried powders (24#) 100gm of the was taken in a 2000ml conical flask with 500ml of distilled water to which 10ml chloroform were added as a preservative. It was extracted up to 7 days with daily 2 hours stirring with the mechanical stirrer. After 7 days the extract was filtered through the muslin cloth and the marc was pressed and its filtrate dried in hot air oven at 45^0C to a semisolid mass. It was stored in airtight container in a refrigerator below 10^0C.

Elemental analysis

The raw drugs were washed with distilled water and dried at 120 $^\circ$ C in an electric oven till a constant weight is obtained. The dried material was then ground to powder. The powdered drug was washed into separate flasks and treated with 5ml HNO_3 side by side and 5ml of HNO_3 was also added into an empty flask, which served as blank. The flasks were covered with watch glasses and heated to reflux on an electric hot plate at 80 $^\circ$ C to 100 $^\circ$ C. after heating for one hour the contents of flask were treated with additional 5ml of HNO_3 followed by 2 ml of 30% H_2O_2 and gently faxed till the clear solution was obtained. Diluted with deionized water and filtered (Whatman 42) into volumetric flasks marked as sample solution.The elemental analysis of this digested samples was done by AAS and flame photometer at an appropriate wavelength,temperature and lamp-current for elements. The elements like Na, K, Ca, Fe, Cu, Mn, Zn, Co, Ni, Cd , As, Pb and Hg were analyzed (Gurdeep R. Chatwal, 2006).

RESULTS AND DISCUSSION

The percentage yield of ethyl alcohol extract was found to be 4.12 % and aqueous extract is 6.19 %.The yield of pet.ether and chloroform extracts found to be 2.28% and 2.12% respectively.

Sodium (Na), potassium (K) and Calcium (Ca) were quantified using a flame photometer, using standard protocol and the results are tabulated in Table No.1. Almost all the macronutrient content study, we didn't find much difference between raw drugs and extracts, thus showing that extraction process, has not affected the macronutrient levels. It revealed that the individual extract possess almost all the macronutrients similar to the raw drug. Na and K in plant act as osmolar agents and so the presence of a considerable amount of Na in the extract utilized for the formulation would be added advantage to the biological activity.

The micronutrient like Iron (Fe), Copper (Cu), Manganese (Mn), Zinc (Zn), Selenium (Se) and Cobalt (Co) on the raw material and extracts are given Table No.2, they were well within normal ranges. These elements act as antioxidants and help in tissue regeneration and cellular repair, which is an additional advantage of the study.

The toxic elements like Nickel (Ni), Cadmium (Cd), Lead (Pb), Mercury (Hg), Arsenic (As) and Chromium (Cr) were estimated and results are tabulated in Table No.3.

The concentrations of the essential elements appear to be lower which is within safety limit according to W.H.O. (1996). The lower concentration of nickel (Ni), cadmium (Cd), arsenic (As), lead (Pb) and mercury (Hg) is an indication of little or no toxicity of the plants as heavymetals which are known to cause cancer, liver and kidney problems (Ogugbuaja *et al*., 1997) .The elements (Mg, Ca, Cu, Mn) are used extensively in chemotherapy and are essential in human and animal health. Magnesium and calcium are known to help in bone and teeth development (Ogugbuaja *et al*., 1997).

Table 1. Macronutrients

Sl. No	RD	PETP	CETP	EETP	AETP
	Sodium (Na)				
1	136	134	132	135	134
	Potassium (K)				
2	271	267	263	264	261
	Calcium (Ca)				
3	86.5	84.2	85.2	84.6	84.1

RD: Raw drug; PETP: Petroleum ether extract of *T.populnea* ; CETP: Chloroform extract of *T.populnea*
EETP: Ethanol extract of *T.populnea* ; AETP: Aqeuous extract of *T.populnea*.

Table 2. Micronutrients

Sl. No	RD	PETP	CETP	EETP	AETP
	Iron (Fe)				
1	0.0830	0.0760	0.0720	0.0720	0.0694
	Copper (Cu)				
2	0.1604	0.1671	0.1585	0.1521	0.1664
	Manganese (Mn)				
3	0.0382	0.0382	0.0373	0.0420	0.0403
	Zinc (Zn)				
4	0.3226	0.3123	0.3115	0.3202	0.3396
	Selenium (Se)				
5	0.0116	0.0047	0.0067	0.0102	0.0097
	Cobalt (Co)				
6	0.0734	0.0635	0.0612	0.0683	0.662

RD: Raw drug; PETP: Petroleum ether extract of *T.populnea* ; CETP: Chloroform extract of *T.populnea*;
EETP: Ethanol extract of *T.populnea* ; AETP: Aqeuous extract of *T.populnea*.

Table 3. Toxic and heavy metals

Sl. No	RD	PETP	CETP	EETP	AETP
	Nickel (Ni)				
1	0.1974	0.2224	0.2160	0.1992	0.2181
	Cadmium (Cd)				
2	0.2969	0.3019	0.3081	0.3119	0.3111
	Lead (Pb)				
3	0.1311	0.1413	0.1387	0.1432	0.1372
	Arsenic (As)				
4	0.0171	0.0189	0.0196	0.0195	0.0185
	Chromium (Cr)				
5	0.1113	0.1334	0.1236	0.1174	0.1344

RD: Raw drug; PETP: Petroleum ether extract of *T.populnea* ; CETP: Chloroform extract of *T.populnea.*
EETP: Ethanol extract of *T.populnea ;* ETP: Aqeuous extract of *T.populnea.*

CONCLUSION

The fruits of *Thespesia populnea* belonging to family Malvaceae was taken for the present study and investigated for the elements. The elemental analysis shows the presence of sodium (Na), potassium (K), calcium (Ca), iron (Fe), copper (Cu), manganese (Mn), zinc (Zn), cobalt (Co), nickel (Ni), cadmium (Cd), arsenic (As), lead (Pb) and mercury (Hg) in the plant samples.

REFERENCES

Abo KA, Ogunleye VO, Ashidi JS. Antimicrobial poteintial of *Spondias mombin*, *Croton zambesicus* and *Zygotritonia crocea*. *Journal of Pharmacological Research*, 5(13), 1991, 494-497.

Chatterjee A and Pakrashi SC. The Treatise on Indian Medicinal Plants, Publications and Information directorate, New Delhi, 2, 1994, 188-190.

Doughari JH and Obidah JS. Antibacterial potentials of stem bark extracts of *Leptadenia lancifoli* against some pathogenic bacteria. *Pharmacologyonline*, 3, 2008, 172-180.

Doughari JH, Human IS, Bennade S, Ndakidemi PA, Phytochemicals as chemotherapeutic agents and antioxidants: Possible solution to the control of antibiotic resistant verocytotoxin producing bacteria. *Journal of Medicinal Plants Research*, 3(11), 2009, 839-848.

Gurdeep R Chatwal. Instrumental methods of analysis, 2nd ed., CBS Publishers and Distributers, New Delhi, 2006, 640.

Housen BM, Knight TE, Milbrodt M, *Thespesia populnea* dermatitis. *Am. J. Contact. Dermat*, 8(4), 1997, 225-228.

Johnson – Inbaraj J, Gandhidasan R, Murugesan R. Cytotoxicity and superoxide anion generation by some naturally occuring quinines. *Free.Radic. Biol.Med*, 1999, 1072-1078.

Kavimani S. Anti-steroidogenic activity of floral extract of *Thespesia populnea* corr. in mouse ovary. *Indian.J.Exp.Biol.*, 37(12), 1241-1242.

Liu RH. Potential synergy of phytochemicals in cancer prevention: mechanism of Action. *Journal of Nutrition*, 134(12 Suppl), 2004, 3479S-3485S.

Mumcuoglu KY, Miller J, Gofin R, Adler B, Ben-Ishai F, Almog R, Kafka D, Klaus S. Epidemiological studies on head lice infestation in Israel. I. Parasitological examination of children. *Int J Dermatol*, 29, 1990, 502–506.

Nadkarni KM. The Indian Materia Medica, 3rd ed., Popular Prakashan Pvt. Ltd., Mumbai, 2, 1976, 629-630.

Nagappa AN and Binu C. Wound healing activity of the aqueous extract of *Thespesia populnea* fruit. *Fitoterapia*, 72, 2001, 503-506.

Nweze EL, Okafor JL, Njoku O. Antimicrobial Activities of Methanolic extracts of *Trume guineesis* (Scchumn and Thorn) and *Morinda lucinda* used in Nigerian Herbal Medicinal practice. *Journal of Biological Research and Biotechnology*, 2(1), 2004, 34-46.

Ogugbuaja VO, Akinniyi JA, Abdulrahman FI and Ogarawu VC. Elemental Contents of Medicinal plants, A monograph, Department of chemistry faculty of science, University of Maiduguri, Maiduguri, Nigeria, 1997.

Sarker SD and Nahar L. Chemistry for Pharmacy Students General, Organic and Natural Product Chemistry, England: John Wiley and Sons, 2007, 283-359.

Warrier PK, Nambiar VPK and Ramankutty C. Indian Medicinal Plants, Orient Longman Ltd., Madras, 5, 2001, 281.

WHO Guidelines for elemental concentration, trace elements in health and human nutrition, 1996, 50 - 68.