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Physicochemical profile of Acacia catechu bark extract – An In vitro study

Trishala A [1], Lakshmi T*[1], Rajeshkumar S[1]

Undergraduate student ,Department of Pharmacology, Saveetha Dental College and Hospitals, Saveetha University , SIMATS, India
Associate Professor ,Department of Pharmacology ,Saveetha Dental College and Hospitals, Saveetha University , SIMATS, Chennai, India
Email : lakshmi@saveetha.com

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ABSTRACT:

Introduction: Acacia catechu has a great importance due to its medicinal properties. It is a historical plant; widely used in traditional medicine especially in Asia. The bark of this plant is strong antioxidant, astringent, anti-inflammatory, anti-bacterial and antifungal in nature. It is used as mouthwash for mouth, gum, sore throat, gingivitis, dental and oral infections. It is also helpful in numerous women related problems. It also has abundant anti-microbial properties. This study aims at evaluating the physicochemical profile of Acacia catechu bark extract in order to make optimum use of the extract for therapeutic purposes.

Materials and methods: The plant material of *Acacia catechu* was shade dried at a temperature range of 20° to 30° C for about 2 weeks. The dried sample was then powdered in a grinding mill. The obtained powder was used for physico chemical analysis and for extraction using solvents.

Results: Ash value was found to be 12.7%. Acid insoluble & soluble content of the plant material was found to 1.67 & 6.26 %. The percentage weight of loss on drying or moisture content was found to be 7.245%. Extractive values found, are tabulated for different solvent systems. Ethanol 95 % showed 2.436 %.

Conclusion: Acacia catechu was characterized on the basis of the physicochemical parameters. The present work will, thus, provide helpful information on the quality of these herbal materials to ensure genuineness, safety and efficacy prior incorporation in pharmaceutical formulations.

INTRODUCTION:

For centuries, plants and plant products have been used for treating various ailments. Several medicinal trees and their products are still widely used by the traditional medical practitioners for curing various diseases in their day to day practice. Various parts of the plants such as roots, stems, bark, gum, leaves, fruits, seeds and flowers are used for medicinal purposes.(1)Acacia catechu belongs to family Fabaceae which is also called pea family or legume family due to presence of single chambered legume in all species of this family. Acacia catechu willd is a small to moderate sized plant widely distributed throughout Asia. The main origin of this plant is Pakistan, India, Thailand and Bangladesh. It contains polyphenolic components, tannins, alkaloids, carbohydrates, flavonoids and seeds of this plant are good sources of protein.(2) Various parts of the of the plant leaves, bark, heartwood possess diverse pharmacological actions for management of various disorders. The pharmacological activities in various parts of the plant has been extensively studied. The plant extract has been reported reported to have anti-pyretic, anti-inflammatory, anti-diarrhoeal, hypoglycaemic, hepatoprotective, anti-oxidant and anti-microbial activites including anti caries and anti plaque activity.(3) Bark of Acacia catechu contain alkaloids and many other very potent active components which shows anti-microbial activity so management of wounds and burns it also acts as a disinfectant which reduces the chance of infection at the site of the wound.(4)The increasing search for therapeutic agents derived from plant species is justified by the emergence of diseases, yet without proper treatment, and the growth of scientific knowledge about the herbal medicines as important treatment alternatives. Therefore, the quality and

safety of herbal preparations are also of great concern.(5) To ensure the standard of research on herbal medicines, the quality of the plant materials or preparations is of utmost importance. With the ever increasing use of herbal medicines and the global expansion of the herbal medicines market, safety has become a concern for both health authorities and the public in many countries. Microbial contamination of medicinal herbal plants can be influenced by environmental factors such as temperature, humidity and extent of rainfall during pre-harvesting and post-harvesting periods, handling practices and the storage conditions of crude and processed medicinal-plant materials. The presence of microbial contaminant in non sterile pharmaceutical products can reduce or even inactivate the therapeutic activity of the products and has the potential to adversely affect patients taking the medicines.(6)The Indian system of medicine, mainly comprising of Ayurveda, Siddha and Unani, is one of the oldest holistic management system with thoroughly documented remedies. Ayurveda, a part of cultural heritage of India, is widely respected for its uniqueness and global acceptance as it offers natural ways to treat diseases and promote healthcare.(7) Unfortunately, standardization and quality control have remained grey areas in the preparation of Ayurvedic medicines. Till date, most of the ayurvedic formulations are lacking in their defined quality control parameters and method of its evaluation.(8) On this background, standardization is an important step for the establishment of a consistent biological activity, a consistent chemical profile, or simply a quality assurance program for production and manufacturing of a herbal drug.(9)In order to improve the purity and safety of the products, observation of basic hygiene during preparation, standardization of some physical characteristic such as moisture content, pH and microbiological contamination levels are desirable.Hence this study aims at evaluating the physicochemical profile of Acacia catechu bark extract in order to make optimum use of the extract for therapeutic purposes.

MATERIALS AND METHODS:

Plant material:

Plant collection and extract preparation:

Acacia catechu bark (ACB) was collected during the month of December 2015 from Hosur, Tamil Nadu, India, authenticated by Green Chem Lab, Bengaluru, Karnataka, India. Barks were shade dried and was milled to fine powder. This bark powder was passed through 100 mesh sieve, and 2.5 kg of powdered ACB were extracted with 10 L of ethanolic, at 65°C, for 1 h. After 1 h of extraction, the extract were filtered and collected. The marc, an insoluble residue was extracted repeatedly with 10 L of ethanolic, twice. The extract was evaporated in a Buchi rotary evaporator (Switzerland) at 65°C, to obtain 150 g of powder extract. The w/w yield of the prepared extract was 6%.

Chemicals:3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium Bromide (MTT), dimethyl sulfoxide (DMSO) was purchased from Sigma Chemical Co. India. The other chemicals used in this study were purchased locally and were of analytical grade.

Physicochemical analysis: The plant material of Acacia catechu was shade dried at a temperature range of 20° to 30° C for about 2 weeks. The dried sample was then powdered in a grinding mill. The obtained powder was used for physico chemical analysis and for extraction using solvents.

Determination of Moisture (Loss on drying):

Procedure:

➢ Weighed about 1.5g of the powdered drug into a tarred porcelain dish.

➢ Dried it in the oven at 100°C or 105°C.

Cooled in desiccators and the loss in weight was recorded as moisture

Determination of Total ash value:

About 2gm of powdered drug was weighed accurately into a tarred silica crucible. Incinerated at 450°C in a muffle furnace until free from carbon. The crucible was cooled and weighed. Percentage of total ash was calculated with reference to air-dried substance. Determination of total ash value formula:

Total ash value of the sample = $\frac{100\ (Z-X)}{Y}$ %

X= weight of empty dish

Y= weight of the drug taken

Z= weight of the dish + ash (after complete incineration).

Determination Acid Insoluble ash:

Ash obtained from the total ash was boiled with 25ml of 2N HCl for a few minutes. Filtered through an ash less filter paper. The filter paper was transferred into a tarred silica crucible. Incinerated at 450°C in a muffle furnace until free from carbon. The crucible was cooled and weighed. Percentage of

acid insoluble ash was calculated with reference to air-dried substance.

Determination of Water soluble ash:

Ash obtained from the total ash was boiled with 25 ml of distilled water for a few minutes and filtered through an ash less filter paper. The filter paper was transferred into a tarred silica crucible. Incinerated at 450°C in a muffle furnace until free from carbon. The crucible was cooled and weighed. The percentage of water-soluble ash was calculated with reference to air-dried substance.(10-15)

RESULTS:

S.No.	Physiocochemical parameters	% W/W
1)	Ash value	
	Total ash % w/w	12.7
	Acid insoluble ash % w/w	1.67
	Water soluble ash % w/w	6.26
2)	Extractive value % w/w	
	Ethanol 95%	2.436
3)	Loss on drying	7.245

Table 1: Physicochemical analysis of Acacia catechu bark extract.

Physicochemical analysis of *Acacia catechu* bark:

The authentication of the plant material was proved through the physicochemical characteristics of the plant material. The results for physicochemical parameters are shown in the table 1.Ash value is an important quantitative tool used to determine the authenticity and purity of drug. It was found to be 12.7%. Acid insoluble & soluble content of the plant material was found to 1.67 & 6.26 %. The percentage weight of loss on drying or moisture content was found to be 7.245%.The less value of moisture content could prevent bacterial, fungal or yeast. Extractive values found, are tabulated for different solvent systems. Ethanol 95 % showed 2.436 %.

DISCUSSION:

Herbal preparations like herbal medicines, herbal teas, herbal oils etc. may be having the plant material as the starting material. Now a days in developing countries, large number of people are unable to afford pharmaceutical drugs and they continue to use their own systems of indigenous medicine that are mainly plant based, because of their safely comparing to that of synthetic drugs. According to World Health Organization (WHO); traditional, complementary, alternative, or non-conventional medicines are used by 70–95% of global population particularly in developing countries for their healthcare.(16)Standardization is the code of conduct in order to ensure the consistent efficacy that manufacturers should use to ensure consistency of their products. The quality of herbal drugs is the sum of all factors which contribute directly or indirectly to the safety, effectiveness and acceptability of the product.(17,18)Hence it is essential to develop scientific and clinical search to investigate the safety, quality and efficacy of these herbal therapies. Established preliminary and physicochemical standards give important information for further investigations and facilitate the identification of formulations in routine industrial production. The test for percentage of moisture content (loss on drying) determines both water and volatile matter. Total ash measures the amount of materials remaining after ignition. Acid insoluble ash measures the amount of silica present especially, sand and siliceous matter. Extractive values are useful for evaluation consistency of nature and amount of chemical constituents present in drug.(19)Considering the importance of these physicochemical parameters, *Acacia catechu* was characterised by evaluating water soluble

extractive, ethanol soluble extractive, total ash content, acid insoluble ash and loss on drying at 105 °C.

CONCLUSION:

Acacia catechu was characterized on the basis of the physicochemical parameters. The analytical specifications were established for the product with respect to quality based raw materials.(20) This study may serve as standard reference and the standard operating procedures to be adopted for quality control analysis of various Acacia catechu formulations.The present work will, thus, provide helpful information on the quality of these herbal materials to ensure genuineness, safety and efficacy prior incorporation in pharmaceutical formulations.

REFERENCES:

1) Monu, Milind Parle, Renu Kadian, Kalish Sharma. phytopharmacology of acacia catechu willd: a review. World Journal of pharmacy and pharmaceutical sciences. Volume 3 Issue 11. 1380-1389. 2014.

2) Muhammad Anis Hashmat, Rabia Hussain . A review on Acacia catechu willd. Interdisciplinary journal of contemporary research in business. May.Vol 5, Issue 1. 593-600. 2013.

3) Alam, G,. Singh, M, P,. & Singh A,. Wound healing potential od some medicinal plants. International Journal of Pharmaceutical Sciences and Research. 9(1):136-45. (2011).

4) Thangvelu Lakshmi, Rajendran Ramasamy, Rathinam Thirumalaikumaran. Preliminary phytochemical analysis and invitro anti-oxidant, FTIR spectroscopy, Anti-diabetic activity of Acacia catechu ethanolic seed extract. Pharmacognosy journal. Vol 7,Issue 6, 356-362. Dec 2015.

5) Abba, D., Inabo, H. I., Yakubu, S. E., & Olonitola, O. S. Contamination of herbal medicinal products marketed in Kaduna Metropolis with selected pathogenic bacteria. African Journal of Traditional, Complementary and Alternative Medicines, 6, 70-77. (2009).

6) Marcelo Gonzaga de Freitas Araújo and Taís Maria Bauab. Microbial Quality of Medicinal Plant Materials. Chapter 4. (Online) Available from http://dx.doi.org/10.5772/51072.

7) P.K. Mukherjee, P.J. HoughtonEvaluation of herbal medicinal products - perspectives of quality, safety and efficacy. Pharmaceutical Press, Royal Pharmaceutical Society of Great Britain, UK pp. 3-12.(2009).

8) N. Sahoo, P. Manchikanti, S. DeyHerbal drugs: standards and regulation. Fitoterapia, 6 (81) pp. 462-471. (2010).

9) S.G. Bhope, D.H. Nagore, V.V. Kuber, P.K.Gupta, M.J. PatilDesign and development of a stable polyherbal formulation based on the results of compatibility studies. Pharmacogn Res, 3 (2) pp. 122-129, (2011).

10) Lakshmi T, Ezhilarasan D, Vijayaragavan R, Bhullar SK, Rajendran R. Acacia catechu ethanolic bark extract induces apoptosis in human oral squamous carcinoma cells. J Adv Pharm Technol Res;8:143-9. 2017.

11) Lakshmi T, Aravind Kumar S. Preliminary phytochemical analysis &in vitro antibacterial activity of Acacia catechu Willd Bark against Streptococcus mitis, Streptococcus sanguis & Lactobacillus acidophilus. Int J Phytomed;3:579-84. 2011.

12) Lakshmi T, Ezhilarasan D, Upendra N, Vijiyaragavan R. Acacia catechu ethanolic seed extract triggers apoptosis of SCC-25 cells. Pharmacogn Mag. [Epub ahead of print]. [DOI: 10.4103/pm.pm_458_16]. 2017.

13) Li X, Wang H, Liu C, Chen R. Chemical constituents of Acacia catechu. Zhongguo Zhong Yao Za Zhi 2010;35:1425-7.

14) Ismail S, Asad M. Immunomodulatory activity of Acacia catechu. Indian J Physiol Pharmacol;53:25-33. 2009.

15) Ray D, Sharatchandra KH, Thokchom IS. Antipyretic, antidiarrhoeal, hypoglycaemic and hepatoprotective activities of ethyl acetate extract of Acacia catechu Willd. in albino rats. Indian J Pharmacol;38:408-13. 2006.

16) Ansari S.H. Standardisation of crude drugs. Essentials of pharmacognsy. 1st edition, 06;14, 581. 2005.

17) A.D.B. Vaidya, T.P.A. DevasagayamCurrent status of herbal drugs in India: an overview J Clin Biochem, 41 (1) pp. 1-11 . (2007).

18) Sagar Bhanu, P.S.Zafar, Panwar R. Herbal drug standardization. The Indian pharmacist. May 4(35): 19-22. 2005.

19) Sangeeta Mukhia,Anindya Bosea, Purnendu Panda. Physicochemical and chromatographic characterization of Samasharkara Churna. Journal of ayurveda and integrative medicine. Volume 7, Issue 2, April–June ,Pages 88-99. 2016.

20) El Askary, Hesham. Issa Marwa, Dine Riham et al. Microscopical, physicochemical and nutritional characterisation of three herbal hepatoprotectives. World journal of pharmacy and pharmaceutical sciences, 3(5): 1430-1446.