



Physicochemical Profile of Acacia Catechu Bark Extract – An in Vitro Study

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ABSTRACT

Introduction: Acacia catechu has a great importance due to its medicinal properties. It is a historical plant, which has been extensively used in folk medicine especially in Asia. The bark of this plant is powerful 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. After that, the dried sample was grounded in a grinding mill. The obtained powder was used for physicochemical 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 be 1.67 & 6.26 %. The percentage weight of loss on drying or moisture content was found to be 7.245%. The found extractive values were tabulated for different solvent systems. Ethanol 95 % showed 2.436 %. **Conclusion:** Acacia catechu was characterized based on the physicochemical parameters. Therefore, the current study has presented helpful information on the quality of these herbal materials to verify authenticity, safety and effectiveness prior to incorporation in pharmaceutical formulations.

Key Words: Acacia Catechu, Bark Extract, Physicochemical Parameters, Herbal Materials.

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INTRODUCTION

For centuries, plants and plant products have been used for treating various ailments. Traditional medical specialists are still extensively using various therapeutic trees and their products to treat several illnesses in their everyday 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 that is also named pea family or legume family because of the existence of single chambered legume in all species of this family. The size of Acacia catechu willd ranges from small to medium, and it can extensively found all over Asia. This plant is mainly originated from Pakistan, India, Thailand and Bangladesh. It possesses polyphenolic components, tannins, alkaloids, carbohydrates, flavonoids, and the seeds of this plant are good sources of

protein [2]. Various parts of the plant including 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 to have anti-pyretic, anti-inflammatory, anti-diarrhoeal, hypoglycaemic, hepatoprotective, anti-oxidant and anti-microbial activities including anti caries and anti-plaque activity [3]. Bark of Acacia catechu contains alkaloids and many other very potent active components which show anti-microbial activity, so it is used for management of wounds and burns because it acts as a disinfectant which reduces the chance of infection at the site of the wound [4].

The emergence of diseases which are without proper cure, and the improvement of scientific knowledge about the herbal medicines as important treatment alternatives has increased the necessity to find therapeutic agents derived

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from plant species. Therefore, the quality and safety of herbal preparations are also of great concern [5]. The quality of plant materials or preparations is of great importance to verify the standard of research on herbal medicines. Recently, the use of herbal medicines has increased, and the herbal medicines' market has been expanded globally, therefore safety has become a concern for both health authorities and the public all over the world. Temperature, humidity and the extent of rainfall during pre-harvesting and post-harvesting periods as the environmental factors, and also handling practices and the storage conditions of crude and processed medicinal-plant materials can affect microbial contamination of medicinal herbal plants. The therapeutic activity of the products can be reduced or even inactivated by existence of microbial contaminant in non-sterile pharmaceutical products, leading to the potentially adverse effects on patients taking the medicines [6].

The Indian system of medicine, chiefly including Ayurveda, Siddha and Unani, is one of the oldest holistic management system with comprehensively documented remedies. Ayurveda which provides natural ways to treat diseases and improve healthcare, is a part of cultural heritage of India, and is extensively venerable for being unique and globally accepted [7]. Unluckily, the standardization and quality control have not been vividly clarified for the preparation of Ayurvedic medicines. Up to now, the quality control parameters and the method of its evaluation are missing in most of the ayurvedic formulations [8]. Therefore, the standardization is necessarily required as an important step for establishing a constant biological activity, a consistent chemical profile, or plainly a quality assurance program for producing and manufacturing herbal drugs [9].

In order to increase the purity and safety of the products, the basic hygiene during preparation, the standardization of some physical characteristics such as moisture content and pH, and microbiological contamination levels are needed to be observed.

Hence, this study aimed 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 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 ethanol, at 65°C, for 1 h. After 1 h of extraction, the extract was filtered and collected. The marc, an insoluble residue was extracted repeatedly with 10 L of ethanol, 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) were 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 physicochemical analysis and extraction using solvents.

Determination of Moisture (Loss on drying):

Procedure:

- Weighed about 1.5g of the powdered drug into a tarred porcelain dish
- Dried 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 it got free from carbon. The crucible was cooled and weighed. The percentage of total ash was measured considering the air-dried substance. The formula used for determination of total ash value was:

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

$$\frac{\text{-----}}{Y} \%$$

X= weight of empty dish

Y= weight of the drug taken

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

Determination of Acid Insoluble ash:

Ash obtained from the total ash was boiled with 25ml of 2N HCl for a few minutes, and filtered through an ash less filter paper. The filter paper was transferred into a tarred silica crucible, and incinerated at 450°C in a muffle furnace until got free from carbon. The crucible was cooled and weighed. The 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, and incinerated at 450°C in a muffle furnace until got free from carbon. The crucible was cooled and weighed. The percentage of water-soluble ash was assessed with reference to air-dried substance [10-15].

RESULTS:

Table 1. Physicochemical analysis of Acacia catechu bark extract.

| S.No. | Physicochemical 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 |

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 drugs. 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. found The found extractive values were tabulated for different solvent systems. Ethanol 95 % showed 2.436 %.

DISCUSSION:

Herbal preparations like herbal medicines, herbal teas, herbal oils etc. may have the plant material as the starting material. Nowadays, in developing countries, a large number of people are unable to afford pharmaceutical drugs, so they continue to use their own systems of indigenous medicine that are mainly plant-based, because of their safety comparing to that of synthetic drugs. Based on the reports of World Health Organization (WHO), 70–95% of the world population specially in developing countries, use traditional, complementary, alternative, or non-conventional medicines for their healthcare [16].

The constant effectiveness that manufacturers should use to ensure the consistency of their products can be verified by the standardization. The sum of all the factors which

contribute directly or indirectly to the safety, efficacy and acceptability of the product demonstrates the quality of herbal drugs [17, 18].

Hence, it is essential to develop scientific and clinical research to scrutinize the safety, quality and effectiveness of these herbal therapies.

The standards which have been established preliminarily and physicochemically provide important information about further investigations, and facilitate recognizing the formulations in routine industrial production. The test for percentage of moisture content (loss on drying) determines both water and volatile matter. The amount of materials remaining after ignition is determined by considering the amount of total ash. Acid insoluble ash measures the amount of silica existing especially in sand and siliceous matter. To evaluate the consistency of nature and the amount of chemical constituents present in drugs, the extractive values are used [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 were adopted from quality control analysis of various Acacia catechu formulations.

Therefore, the current study has presented helpful information on the quality of these herbal materials to verify the authenticity, safety and efficacy prior to incorporation in pharmaceutical formulations.

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