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Research paper

Expected benefits of administration of tannins extracted from *Acacia seyal* plants; a biochemical and traditional medicine overview

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Abstract

This study was focused on expected benefits of administration of tannins extracted from *Acacia seyal* pants. Tannins have been used throughout history for their pharmacological properties as part of plants and herbs in traditional medicine. Tannins are a heterogeneous group of polyphenols, secondary metabolites in plants synthesized in response to biotic and abiotic stress inducers. The phenolic rings and hydroxyl groups present in their chemical structures confer them antioxidant and protein-binding properties. Study results clearly showed the presence of tannins significantly ($p \leq 0.05$) in Acacia seyal plants, compared to control. There are many sources of tannins. Tannins, which are of great importance in traditional medicine can be extracted from numerous trees and small bushes rich in tannins.

Keywords: *Antioxidant; Bactericides; Nutrition; Pharmacological Properties; Phenolic.*

1. Introduction

Acacia seyal is generally collected from natural exudation without tapping but there is some evidence that it is applied in certain location in Sudan. In certain gum sources the natural exudates were noted as being darker in colour compared to gums obtained by tapping [7]. Tannins have been used throughout history for their pharmacological properties as part of plants and herbs in traditional medicine. Also, they have been extensively used since the 18th Century by leather manufacturers to improve leather resistance in the dyeing or tanning process, as they can precipitate gelatin adhered to animal skin and provide a brownish colour. Hence, the name of this group of phytochemicals [17]. It has also been reported alongside many other tannins to provide further oxidative and antimicrobial protection when added to foods [22]. In the same sense, several in vitro, in vivo and clinical studies researching the bioactive properties of tannins have been developed throughout the years [8]. Taking into account the mentioned properties of tannins, it may be possible to explain the effectiveness of tannin-rich medicinal plants used in traditional medicine while these medicinal properties are also related to the synergy of tannins with other bioactive polyphenols present in these plants [33]. Hydrolysable tannins contain a carbohydrate core (often glucose) esterified with gallic acid or ellagic acid. Condensed tannins (CT) are the most common tannin type found in forage legumes, trees and shrubs [25] and are oligomers or polymers of flavonoid units linked by carbon-carbon bonds [2] C can complex with numerous types of molecules including proteins, polysaccharides, and minerals [6]. The multiple phenolic hydroxyl groups of CT lead to the formation of complexes primarily with proteins and to a lesser extent with polysaccharides [5]. The antioxidant properties of tannins are widely utilized in the food and medical fields. In recent years, many studies have been conducted to identify the relevant antioxidant activity of tannins. Owing to its antioxidant capacity, such as preventing cardiovascular disease, cancer or osteoporosis, tannins have attracted much attention [20,28]. In a study by Phung et al., the extracts of Japanese chestnut exhibited the most remarkable DPPH-scavenging capacity. The results suggested that as a potential natural preservative agent, tannins provided promising antioxidant capacities [19]. A study determined the effects of the forage conservation method and condensed tannins (CT) from conserved forage on rumen fermentation and showed that CT from purple prairie clover (PPC) decreased protein degradation in vitro but had minimal effects on overall rumen fermentation [16]. CT from the leaves of F. altissima was also indicated to express superior antioxidant capacity [35]. At present, plant tannins have been proven to have antioxidant properties in different animals. A study in mutton showed that the colour stability of the longissimus dorsi muscle (LM) was extended by tannin supplementation, with lower changes in the hue angle in the treatment groups than in the control groups [9]. In Rex rabbits, adding tannic acid to the diet significantly increased the activity of serum total superoxide dismutase (T-SOD) and decreased the malondialdehyde (MDA) content [21]. Tannins are known bactericides because they react with proteins irreversibly, thus complexing within bacterial membranes, neutralizing their activity. As a consequence, tannin-based pharmaceuticals to cure intestine infections have long-time been marketed. They have effective anticaries properties. Tannins have also many applications for other pharmaceutical/medical uses but all these are targeted for future use rather than the present [3]. Tannins compound in general has good activity against bacterial growth &that is because these compounds contain titanic acid against some genus of diseased bacteria through the ability of these compounds to dissolve the fatty layer of diseased bacterial wall that causes leakage of cell fluid

out the cell &destroys it. And has the ability to consist the hydrogen bond between OH group in phenol compound, that includes tannic acid, nitrogen of amino acid in bacterial cell that lead to loss of this activity which leads to loss of vital action of cell & destroys it [1]. Studies have shown that tannins extracted from Euonymus Laxiforus, quebracho, chestnut and coffee husk had strong antioxidant activity [30,4]. It was found that extracts rich in pine bark tannins showed a high capacity to prevent lipid oxidation in liposome models [12]. Condensed tannins can prevent DNA damage [31]. The antioxidant activity of tannins can also improve intestinal health, reduce diarrhoea rate instead of ZnO, inhibit skin pigmentation and treat obesity [32]. Tannins have good antibacterial functions, such as Candida spp., Staphylococcus aureus and Pseudomonas aeruginosa. Guo, et al. reported that the bone model of hydroxyapatite (HA) without tannins showed no antibacterial activity, but the combination of HA and tannin to form citrate-based tannin-bridged bone composites showed antibacterial activity against Staphylococcus aureus with the minimum inhibitory concentration (MIC) of 5 mg/ mL [32]. The tannic-dimethyl sulfoxide solution had the strongest inhibitory effect on C. glabrata in Candida spp. Among the cariogenic bacteria, S. salivarius was the most sensitive to tannins [33]. Condensed tannins enhanced antioxidant capacity and hypoxic stress survivability but not growth performance and fatty acid profile of juvenile Japanese seabass [34].

2. Statistical analysis

Study results were statistically analysed in accordance to SPSS version 2021, Anova, One sample T – test.

3. Materials and methods

3.1. Natural material

The raw material, black acacia bark, was provided. A part of bark was milled with cutting mill (TECNAL - Willye TE 650) with 2.0 mm average particle diameter. In the solvent extraction with Soxhlet apparatus, dry natural material was employed. The dryer usedwas a BIOMATIC Equipment. The tannin was dried for 10 days at 36°C.

3.2. Solvent extraction process

Samples (50 g of dark acacia bark) were extracted with 500 mL of solvent for 24 h. The extracted solution was concentrated on a SAVANT Lyofilizator.

4. Results

Table 1: The concentration (mg/ g dw) of tannin in *Acacia seyal* bark extract.

One-Sample Test Test Value = 0				
			95% Confidence Interval of the Difference	
T	sig. (2-tailed)	Mean Difference	Lower	Upper
Control 27.348	0.000	82.2600	75.640	88.880
Extract 7.536	0.000	124.0475	87.816	160.279

- Results of (value ≤ 0.05) are considered significant.

5. Discussions

Table 1, clearly showed concentration (mg/ g dw) of tannin (significance of p≤0.05) in Acacia seyal bark extract, compared to control. Study results are confirmed by [10] who demonstrated that he leaves and the barks of Acacia seyal contain tannins (6.30%, 12.15% resp.). Tannins perform as bactericidal, fungicidal, antiviral, antitumor and molluscicidal. Also help in the healing of wounds, burns and inflammation by forming a protective layer on the damaged skin or mucosa (Simões, C.M.O., Schenkel, E.P., Gosmann, G., Mello, J.C.P., Mentz, L.A., Petrovick, P.R. 2001.Farmacognosia: da planta ao medicamento, 3ª ed. Editora da UFRGS/UFSC, Porto Alegre/Florianópolis.). Study results are confirmed by [23] who stated that the fraction rich in tannins from the crude extract of some species has anti-inflammatory and anti-ulcerogenic activities. Medicinal plants extracts resulted in increased marketing of tannins, which are of great therapeutic importance around the world [13,24]. Tannins act as antioxidant, antimicrobial or predator-deterrent (i.e., against helminths or herbivores) [14]. Study results are in agreement with [18] who stated that tannins determined on a molecular basis are the chemical, biological and pharmacological actions such as superoxide anion scavenging, apoptosis, antitumor, anti-EVB, anti-MRSA and anti-plasmin inhibitory activities, in addition to their fundamental activities, such as binding to proteins, large molecular compounds and metallic ions, and antioxidant activities. The isolation of bio-active stilbenoids, among which was a monomer piceatannol is regarded as responsible for the tannin activity of the bark extract of some trees [34], and various resveratrol oligomers, and also phlorotannins from brown algae, exemplified by monomeric eckol [27], expanded the field of tannins and related polyphenols to these groups of compounds in the last few decades. Various biological and pharmacological activities related to the health effects of tannins with a variety of chemical structures, including those of small molecular size, have been found [29]. Study results are confirmed by [36] who showed the inhibitory effect of plant tannins on many kinds of pathogenic viruses and their action pathways, as are the antiparasitic properties of plant tannins, besides the anti-inflammatory action of tannins and its mechanism and the function of plant tannins in antidiarrheal action and its influencing factors.

6. Conclusions

In this study it is concluded that tannins are of great importance in traditional medicine and can be extracted from numerous trees and small bushes. Tannins are of powerful many medicinal and pharmaceutical significance.

7. Recommendations

It is highly recommendation to achieve and fulfil the medicinal uses of tannins through increasing public awareness. Further studies to investigate more medicinal benefits of tannins are recommended.

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