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Phytochemical Studies of Medicinal Plant (Aloe Vera)

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Abstract

Aloe vera and Aloe ferox contain vast phytochemical classes including anthraquinones, chromones, anthrones, phenolic compounds, flavonoids, tannins, steroids, and alkaloids which contribute to their different pharmacological activities**. Aloe vera belongs to the family Liliaceae commonly known as Ghrit Kumari, is the ever known oldest and the most applied medicinal plant worldwide. Aloe Vera is used for vigor, wellness and medicinal purposes since rigvedic** times. Phytochemistry of Aloe vera gel has revealed the presence of more than 200 bioactive chemicals. Commercially, aloe can be found in pills, sprays, ointments, lotions, liquids, drinks, jellies, and creams, to name a few of the thousands of products available. In the present scenario, the aloe industry is blooming but the consumers are misguided leading to unfavorable outcome due to reasons like unawareness about its proper and adequate medicinal and health value, improper marketing and unavailability of processing units at farmer's level, misleading hyped advertisement in cosmetic and health products.

Introduction

The plants present in our surroundings help to not only clean our environment but also its plant products are rich sources of antioxidants as well as contain phytochemicals of medicinal uses. In India since ancient time we are highly depend on the plant products for prevention and cure of diseases. Allopathic medicines are not only expensive but also have many side effects. It is established fact that number of medicinally active phytochemicals are obtained from plants (Zong, Cao & Wang, 2012; Efferth & Koch, 2011). Extracts and phytochemicals obtained from the AzadirachtaIndica are used against many infectious metabolic diseases and cancer disease (Brahmachari, 2004; Ketkar & Ketkar, 2004). Dried Neem leaves are placed in cupboards to prevent the clothes from insects and also in stored rice (Jumpupto:a b c ,17 April 2006). Polyphenolic flavonoids extracted from fresh leaves of neem, Querestien and sitosterol shows antibacterial and antifungal activities (Govindachari et al,1998).Antifungal (Singh & Sastry,1997).

Active components with its properties:

Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.[4–6]

1. **Vitamins:** It contains vitamins A (beta-carotene), C and E, which are antioxidants. It also contains vitamin B12, folic acid, and choline. Antioxidant neutralizes free radicals.
2. **Enzymes**: It contains 8 enzymes: aliiase, alkaline phosphatase, amylase, bradykinase, carboxypeptidase, catalase, cellulase, lipase, and peroxidase. Bradykinase helps to reduce excessive inflammation when applied to the skin topically, while others help in the breakdown of sugars and fats.
3. **Minerals:** It provides calcium, chromium, copper, selenium, magnesium, manganese, potassium, sodium and zinc. They are essential for the proper functioning of various enzyme systems in different metabolic pathways and few are antioxidants.
4. **Sugars:** It provides monosaccharides (glucose and fructose) and polysaccharides: (glucomannans/polymannose). These are derived from the mucilage layer of the plant and are known as mucopolysaccharides. The most prominent monosaccharide is mannose-6-phosphate, and the most common polysaccharides are called glucomannans [beta-(1,4)-acetylated mannan]. Acemannan, a prominent glucomannan has also been found. Recently, a glycoprotein with antiallergic properties, called alprogen and novel anti-inflammatory compound, C-glucosyl chromone, has been isolated from Aloe vera gel.[7,8]
5. **Anthraquinones:** It provides 12 anthraquinones, which are phenolic compounds traditionally known as laxatives. Aloin and emodin act as analgesics, antibacterials and antivirals.
6. **Fatty acids:** It provides 4 plant steroids; cholesterol, campesterol, β-sisosterol and lupeol. All these have anti-inflammatory action and lupeol also possesses antiseptic and analgesic properties.
7. **Hormones:** Auxins and gibberellins that help in wound healing and have anti-inflammatory action.
8. **Others:** It provides 20 of the 22 human required amino acids and 7 of the 8 essential amino acids. It also contains salicylic acid that possesses anti-inflammatory and antibacterial properties. Lignin, an inert substance, when included in topical preparations, enhances penetrative effect of the other ingredients into the skin. Saponins that are the soapy substances form about 3% of the gel and have cleansing and antiseptic properties.

Preparation of Aloe vera gel powder

Aloe vera gel powder was prepared according to the method described by Saritha., et al. [7] with some modifications. Aloe vera fresh leaves were scraped with sterilized spoon to remove the gel. Then the gel was blended in an electric blender. The blended gel was freeze dried and stored prior to further use.

Extraction methods

Preparation of methanol extracts

One hundred gm of dried pods powder of Aloe vera were transferred into beaker and solution of methanol (500 ml) was added, then the contents of the beaker were left at room temperature for three days with constant shaking; the extract was filtered through filter paper, left to dry for one hour at room temperature. The residual weight was recorded and yield(%) was calculated.

Preparation of water extract

One hundred gm of Aloe vera powder were transferred into a beaker and then 500 mg of water and two drops of acetic acid were added. The contents of the beaker were left at room temperature for three days. The extract was filtered through filter paper and left to dry at room temperature. The residual weight was recorded and yield (%) was calculated.

Preparation of macerated extracts

One hundred gm of Aloe vera was extracted by macerate method by successively solvents hexane, dichloromethane and methanol at room temperature. The extraction process was repeated till the solvents became colorless. The extracts were then filtered using Whatman No.1 paper. The filtrates were concentrated in vacuum at 50oC ± 1 in a rotary evaporator to obtain the crude extracts [7]. Phytochemical screening of Aloe vera extracts

DPPH free radical scavenging activity

The antioxidant activity of Aloe vera gel freeze dried extracts (methanol extract, Dichloromethane extract and Hexane extract) was determined. Gallic acid and the standard compound BHA was measured in terms of hydrogen donating radical scavenging ability using the DPPH method. 0.1 ml of extract was added to 2.9 mL of methanol solution. After centrifugation, the supernatant is collected 50 µmol L-1 of DPPH solution is added. Kept in the dark for 45 minutes and the resulting decrease in absorbance at 517 nm were recorded against blank using a UV-Vis Spectrophotometer. Amongst test samples, MEAG and AEAG showed the maximum scavenging activity and hence were used for all the subsequent studies. The radical scavenging

activity on DPPH was expressed as, Scavenging effect (%) = [(Ao - A1)/Ao] x 100 Where Ao is the absorbance of control and A1 is the absorbance of sample extract or standard [7].

Results and discussion

Phytochemical screening of Aloe vera gel

The results for Phytochemical screening of Aloe vera gel extracts using different solvent in different polarity and were represented in table 1. It showed that main secondary metabolites presence in this plant. Aqueous and methanol maceration extraction methods revealed the presence of the flavonoid, glucoses, saponin and carbohydrates, however, methanol soxhlet extraction method was not revealed these compounds, and this may be due to the effect of heat on some phytochemicals compounds. Alkaloid and phenol were found in methanol maceration extract, but, was not revealed in Aqueous and methanol soxhlet extracts. In addition, tannins and Anthraquinone were present in all extracts. Moreover, Quinine is present in the methanol maceration, but it's not present in methanol soxhlet and Aqueous extracts. Results for the presence of tannins, saponin, Alkaloids, flavonoids and Glycosides in methanol maceration were agreed with those found by Priyanka and Srivastav [11]. While the results for sterols were disagreed with Priyanka and Srivastav [11] who reported the presence of sterols in methanol maceration extract. Results for the presence of saponin, Alkaloids and flavonoids in methanol maceration were agreed with those found by Darshan., et al. [12]. While the results for sterols were disagreed with Darshan., et al. [12] who reported the presence of sterols in methanol maceration extract in the screening process of sterol gave positive results which is disagreed with my results of sterol, were gave- negative results of all extracted.

Table 1:

General phytochemical screening of Aloe. Key: (+ + +)-: Strong, (+ +)-: Medium, (+)-: Weak, (-)-: Negative.

Test	Maceration Extraction Methanol	Soxhlet extraction Methanol	Aqueous
Alkaloid	+++	+	+
Tannins	+++	+++	+++
Phenol	+++	-	-
Sterol	-	-	-

Flavonoid	+++	++	+++
Glucoses	+++	-	-
Anthraquinone	+++	+++	+++
Protein	+	++	++
Saponines	+++	++	+++
carbohydrates	+++	++	+++

DPPH radical-scavenging activity of Aloe gel extracts

The results of solvents extraction and antioxidant activity for Aloe vera gel extracts are shown in table 3. It was found that methanol has achieved the highest extraction yield. Moreover, the methanol extract demonstrated the highest antioxidant activity comparedto hexane and dichloromethane. Saritha V., et al. [7] found that the methanol extract exhibited (94%) for antioxidant activity which is higher than the finding of this study. Because different regions. Saritha., et al. [7] the effect of antioxidants on DPPH radical scavenging was thought to be due to their hydrogen-donating ability.

Table- Anti-oxidant activity of Aloe vera gel.

Solvent Extraction yield % RSA-DPPH %	Solvent Extraction yield % RSA-DPPH %	Solvent Extraction yield % RSA-DPPH %
Hexane	3.58	26 ± 08
Dichloromethane	6.83	36 ± 58
Methanol	19.44	66 ± 48

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