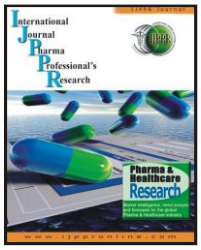
Available Online at www.ijppronline.in

International Journal Of Pharma Professional's Research

Review Article

PHARMACOGNOSTICAL & MEDICINAL IMPORTANCE OF ALOE: A REVIEW



ISSN NO:0976-6723

Rajesh Kumar Sharma*, Keshri Kishore Jha, Nishant Verma, Niraj Kumar Singh

Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh

Abstract

Aloe vera is used for medicinal purposes since rigvedic times. Health benefits of aloe vera include its application in wound healing, treating burns, protection against skin damage, intestinal problems, increasing high density lipoprotein, reducing low density lipoprotein, reducing blood sugar in diabetics, fighting acquired immune deficiency syndrome (AIDS), allergies and improving immune system. Aloe vera gel is extracted from its leaves and appropriate processing techniques are needed for preparation of the end products. The industries involved in processing of aloe vera need Government surveillance to ensure that the aloe vera products have beneficial bio-active chemicals as per claims of the manufacturers. Regulatory bodies also need to look into the safe and effective use of aloe vera products for food applications. The claims made for medicinal value of aloe products should be supported by authentic and approved clinical trial data. It is presumptive to mention that nutraceutical claims of aloe products made by the manufacturers are numerous. However, approved clinical evidences are available for lowering LDL, increasing HDL, decreasing blood glucose level, treating genital herpes and psoriases.

Keywords: - : Anand special, Marvel Rojana, Marvel Glory, Caffeine

Introduction

Aloe vera (*Aloe barbadensis miller*) is a plant, which belongs to the family of Liliaceae and is mostly succulent with a whorl of elongated, pointed leaves.[1, 2] The plant has a long history as a multipurpose folk remedy, and has been associated with myth, magic and medicine since pre-biblical times. Historical evidence indicates that A. vera originated in the warm, dry climate of Southern and Eastern Africa, and was subsequently introduced into Northern Africa, the Arabian Peninsula, China, Gibraltar, the Mediterranean countries, and the West Indies.[3, 4] An extremely promising strategy for cancer prevention today is chemoprevention, which is defined as the use of synthetic or natural agents (alone or combination) to block the development of cancer in humans. Plants, vegetables and herbs used in the folk and traditional medicine have been accepted currently as one of the main source of cancer chemoprevention drug discovery and development.[5]

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

Aloe gel has demonstrated wound healing [7], anti-inflammatory [8], antiviral [9], spermicidal[10], gastroprotective [11] and immune-stimulating [12] properties. Two distinct preparations of Aloe plants are most used medicinally. The leaf exudate (Aloe) is used as a laxative and the mucilaginous gel (A. vera) extracted from the leaf parenchyma is used as a remedy against a variety of skin disorders. [13]

Biological source

Aloe is the dried juice collected by incision, from the bases of the leaves of various species of aloe. Aloe perryi Baker Aloe vera or *Aloe Barbadensis* Mil and Aloe ferox. Family Liliaceae. [15]

Table no.1:-Common Vernacular Names: [14]

Bengali	Gherto-Kumari
Gujrati	Kumar pathu
Hindi	Musabhar
Kannada	Lolirasa
Malylam	Kumari-Kathavazha
Marathi	Korphad
Sanskrit	Ghirta Kumari
Tamil	Karibolan
Telugu	Musambaram

Geographical Source

Aloes are indigenous to East and South Africa, but have been introduced into the West Indies and into topical countries, and will even flourish in the countries bordering on the Mediterranena. [15]

Fig.1 Aloe vera

Table no.2:-Phytochemicals in Aloe vera

Class	Compound
Anthraquinones /anthrones	Aloe-emodin, aloetic-acid, anthranol, aloin A and B (or collectively known as barbaloin), isobarbaloin, emodin, and ester of cinnamic acid
Carbohydrates	Pure mannan, acetylated mannan, acetylated, glucomannan, glucogalactomannan, galactan, galactogalacturan, arabinogalactan, galactoglucoarabinomannan, pectic substance, xylan, and cellulose
Chromones	8-C-glucosyl-(2'-O-cinnamoyl)-7-O-methylaloediol A, 8-C-glucosyl-(S)-aloesol,8-C-glucosyl-7-O-methyl-(S)-aloesol,8-C-glucosyl-7-O-methylaloediol,8-C-glucosylnoreugenin, isoaloeresin D, isorabaichromone, and neoaloesin A
Enzymes	Alkaline phosphatase, amylase, carboxypeptidase, catalase, cyclooxidase, cyclooxygenase, phosphoenolpyruvate carboxylase, and superoxide dismutase
Inorganic minerals	Calcium, chlorine, chromium, copper, iron, magnesium, manganese, potassium, phosphorous, sodium, and zinc
Vitamins	B1, B2, B6, C, E, and folic acid
Miscellaneous, including organic compounds and lipids	Arachidonic acid, γ-linolenic acid, steroids (campesterol, cholesterol, β-sitosterol, triglycerides, triterpenoid, gibberellin, lignins, potassium sorbate, salicylic acid, uric acid, β-carotene, and choline
Amino acids	Alanine, arginine, aspartic acid, glutamic acid, glycine, histidine, hydroxyproline, isoleucine, leucine, lysine, methionine, phenylalanine, proline, threonine,
Proteins	Lectins and lectin-like substance
Saccharides	Mannose, glucose, L-rhamnose,

Pharmacology:

Antifungal effects: A hydroalcoholic extract of fresh *Aloe vera* leaves had a minimum fungicidal concentration (MFC) between 80 and 100mcL/mL against the mycelial growth of *Botrytis gladiolorum*, *Fusarium oxysporum* sp. *gladioli*, *Heterosporium pruneti*, and *Penicillium gladioli*.[16]

Anti inflammatory effects: Topical aloe's anti-inflammatory properties do not appear to interfere with wound healing, but rather increase wound tensile strength[17] possibly due to the fibroblast stimulating activity of mannose-6-phosphate.[18] In vivo, Aloe vera gel (97.5%) significantly reduced UV-induced erythema after 48 hours, being superior to 1% hydrocortisone in placebo gel. In contrast, 1% hydrocortisone in cream was more efficient than Aloe vera gel.[19]

Antineoplastic effects: Anti-leukemic and anti-mutagenic effects of aloe in vitro have been attributed to di (2-ethylhexyl) phtalate (DEHP).[20] Promotion of apoptosis has been reported in vitro as a possible anti-neoplastic mechanism.[21] Aloe appears to affect detoxification of reactive metabolites by liver and other organs.[22]

Antioxidant effects: Antioxidant properties have been attributed to aloesin derived from Aloe vera.[23,24,25] Based on cell-line research, APS-1, a polysaccharide from Aloe vera var. chinesis, also showed free radical scavenging and other antioxidant properties.[26]

Cardiovascular effects: Calcium isocitrate, isolated from *Aloe sponaria*, has been shown to be inotropic in rat and rabbit hearts.

Endocrine effects: Constituents of Kitachi aloe leaf pulp and skin have been found to stimulate beta-cells in diabetic mice, thereby lowering blood glucose levels.[27]

Radioprotective effects: Wang et al. suggested that aloe polysaccharides may have a radioprotective effect on non-malignant cells via its ability to modulate the cell cycle.[28,29]

Other effects: In a study of topical application for up two weeks, *Aloe barbadensis* Miller extracts increased the water content of the stratum corneum of the arms of human volunteers, although transepidermal water loss was not altered.[30]

Aloe latex: Aloe latex contains anthraquinone glycosides (aloin, aloe-emodin and barbaloin) that act as potent stimulant laxatives.[31,32,33,34,35,36] These water soluble glycosides are split by intestinal bacteria into aglycones, which are believed to exert a more powerful laxative effect than other herbs, including senna, cascara, or rhubarb root. One of these compounds, aloe-emodin-9-anthrone, has been shown to increase the water content in rat large intestines. This appears to be a more important cathartic mechanism than increased intestinal motility (which has also been proposed).[37,38]

Biological activities of Aloe vera leaf gel :

Anti-diabetic effects [48], Immunomodulatory effects[47], Anti-oxidant effects[49], Wound healing effects [50], Effect on gastric acid secretion and ulcers[51], Skin hydration effects[52] , Hepatoprotective activities [53], Antimicrobial activities.[53]

CONCLUSION:-

Aloe vera used as Antifungal, Anti-inflammatory, Antineoplastic, Antioxidant, Anti-diabetic etc. Aloe latex contains anthraquinone glycosides (aloin, aloe-emodin and barbaloin) that act as potent stimulant laxatives[40,41,42,43,44] It has been claimed that the polysaccharides in *A. vera* gel have therapeutic properties such as immunostimulation, anti-inflammatory effects, wound healing, promotion of radiation damage repair, anti-bacterial, anti-viral, anti-fungal, anti-diabetic and anti-neoplastic activities, stimulation of hematopoiesis and anti-oxidant effects[45] Several pre-clinical (in animals) and clinical (in humans) trials showed a blood glucose lowering effect for *A. vera* gel preparations in different forms (e.g. juice or as constituents in bread etc.), while other studies indicated that no change in glucose levels could be obtained. The differences in results of these *in vivo* studies can possibly be explained by differences in the way that the aloe mucilaginous gel was isolated and separated from the exudate anthraquinones. Furthermore, it is not always clear what constituent of the aloe leaf was tested in some studies, which makes it difficult to correlate the effect (or lack of effect) with the product tested. [48]

Referencecs:

1.Strickland FM, Kuchel JM, Halliday GM (2004). Natural products as aids for protecting the skin's immune system against UV damage. Cutis., 74(5): 24-28.

2.Beckford MM, Badrie N (2000). Consumer Acceptance of tropical wines from Aloe Vera (Aloe barbadensis) and cashew apples (Anacardium occidentale L.) in the british virgin islands. Foodservice. Res. Int., 12: 185-196.

3.Jassim SA, Naji MA (2003). Novel antiviral agents: A medicinal plant perspective. J. Appl. Microbiol., 95: 412-427.

4.Pribitkin ED, Boger G (2001). Herbal therapy: what every facial plastic surgeon must know. Arch. Facial. Plast. Surg., 3(2): 127-132.

5.Abdullaev, F.I., R.R.Luna, B.V.Roitenburd, A.J.Espinosa, Pattern of childhood cancer mortality in Mexico. Arch. Med. Res., 31: 526-31, (2000).

6.Reynolds, T. and A.C.Dweck, Aloe vera leaf gel: a review update. J. Ethnopharmacol., 68: 3-37. (1999).

7.Heggers J, et al. Beneficial effects of aloe in wound healing. Phytother Res. 7: S48–S52.

8. Vazquez B, et al. 1996. Anti-inflammatory activity of extracts from aloe vera gel. JEthnopharmacol. 55:69–75,(1993).

9.Saoo K, et al.. Antiviral activity of aloe extracts against cytomegalovirus. Phytother Res. 10:348–350,(1996).

10.Fahim MS, Wang M. Zinc acetate and lyophilized Aloe barbadensis as vaginal contraceptive. Contraception. 53:231– 236,(1996).

11.Danhof I. Potential benefits from orally- injested internal aloe vera gel. International Aloe Science Council Tenth Annual Aloe Scientific Semina; Irving, Texas,(1991).

12.Zhang L, Tizard IR. Activation of a mouse

macrophage cell line by acemannan: the major carbohydrate fraction from Aloe vera gel; Immunopharmacology. 35:119-28,(1996).

13.Capasso F, Gaginella TS (1997). Laxatives: a practice guide. Milan: Springer Italia.

14.Kokate C.K., Purohit S.B, Gokhale S.B, "Pharmacognosy" 45th edition, Nirali Pirkashan, 2010, page no. A15.

15.Shah Biren, Seth.A.K,"Text book of pharmacognosy and phytochemistry, 1st edition, sounders elseviesssd publication, 2010, page no.238-240.

16.Rosca-Casian, O., Parvu, M., Vlase, L., and Tamas, M. Antifungal activity of Aloe vera leaves. Fitoterapia 2007; 78(3):219-222.

17.Davis, R. H., DiDonato, J. J., Johnson, R. W., and Stewart, C. B. Aloe vera, hydrocortisone, and sterol influence on wound tensile strength and anti-inflammation. J Am Podiatr.Med Assoc 1994;84(12):614-621.

18.Davis, R. H., Donato, J. J., Hartman, G. M., and Haas, R. C. Anti-inflammatory and wound healing activity of a growth substance in Aloe vera. J Am Podiatr.Med Assoc 1994;84(2):77-81.

19.Reuter, J., Jocher, A., Stump, J., Grossjohann, B., Franke, G., and Schempp, C. M. Investigation of the anti-inflammatory potential of Aloe vera gel (97.5%) in the ultraviolet erythema test. Skin Pharmacol Physiol 2008;21(2):106-110.

20.Lee, K. H., Kim, J. H., Lim, D. S., and Kim, C. H. Anti-leukaemic and anti-mutagenic effects of di(2-ethylhexyl)phthalate isolated from Aloe vera Linne. J Pharm Pharmacol 2000;52(5):593-598.

21.Pecere, T., Sarinella, F., Salata, C., Gatto, B., Bet, A., Dalla, Vecchia F., Diaspro, A., Carli, M., Palumbo, M., and Palu, G. Involvement of p53 in specific anti-neuroectodermal tumor activity of aloe-emodin. Int J Cancer 10-10-2003;106(6):836-847.

22.Singh, R. P., Dhanalakshmi, S., and Rao, A. R. Chemomodulatory action of Aloe vera on the profiles of enzymes associated with carcinogen metabolism and antioxidant status regulation in mice. Phytomedicine 2000;7(3):208-219.

23.Yagi, A., Kabash, A., Mizuno, K., Moustafa, S. M., Khalifa, T. I., and Tsuji, H. Radical Scavenging Glycoprotein Inhibiting Cyclooxygenase-2 and Thromboxane A2 Synthase from Aloe vera Gel. Planta Med. 2003;69(3):269-271.

24.Singh, R. P., Dhanalakshmi, S., and Rao, A. R. Chemomodulatory action of Aloe vera on the profiles of enzymes associated with carcinogen metabolism and antioxidant status regulation in mice. Phytomedicine 2000;7(3):209-219.

25.Yagi, A., Kabash, A., Okamura, N., Haraguchi, H., Moustafa, S. M., and Khalifa, T. I. Antioxidant, free radical scavenging and anti-inflammatory effects of aloesin derivatives in Aloe vera. Planta Med 2002;68(11):957-960.

26.Wu, J. H., Xu, C., Shan, C. Y., and Tan, R. X. Antioxidant properties and PC12 cell protective effects of APS-1, a polysaccharide from Aloe vera var. chinensis. Life Sci 1-2-2006;78(6):622-630.

27.Yagi, A., Shibata, S., Nishioka, I., Iwadare, S., and Ishida, Y. Cardiac stimulant action of constituents of Aloe saponaria. J Pharm.Sci 1982;71(7):739-741.

28.Beppu H, Nagamura Y, and Fujita K. Hypoglycemic and antidiabetic effects in mice of aloe-arborescens miller var natalensis berger. Phytother Res 1993;7:S37-S42.

29.Wang, Z., Huang, Z., Wu, Q., Zhou, J., Zhu, X., Li, Q., and Liu, Z. [The modulating of aloe polysaccharides on the cell cycle and cycle regulating protein expression in X-ray irradiated non-malignant cells]. Zhong.Yao Cai. 2005;28(6):482-485.

30.Wang, Z. W., Huang, Z. S., Yang, A. P., Li, C. Y., Huang, H., Lin, X., Liu, Z. C., and Zhu, X. F. [Radioprotective effect of aloe polysaccharides on three non-tumor cell 47. lines]. Ai.Zheng. 2005;24(4):438-442.

31.De Witte, P. and Lemli, L. The metabolism of anthranoid laxatives. Hepatogastroenterology 1990;37(6):601-605.

32.Ishii, Y., Tanizawa, H., and Takino, Y. Studies of aloe. IV. Mechanism of cathartic effect. (3). Biol.Pharm.Bull. 1994;17(4):495-497.

33.Ishii, Y., Tanizawa, H., and Takino, Y. Studies of aloe. V. Mechanism of cathartic effect. (4). Biol.Pharm.Bull. 1994;17(5):651-653.

34.Honig J, Geck P, and Rauwald HW. Inhibition of Cl- channels as a possible base of laxative action of certain anthraquinones and anthrones. Planta Med 1992;58(suppl 1):A586-A587.

35.Koch A. Investigations of the laxative action of aloin in the human colon. Planta Med 1993;59:A689.

36.Krumbiegel G and Schulz HU. Rhein and aloe-emodin kinetics from senna laxatives in man. Pharmacology 1993;47(suppl 1):120-124.

37.Ishii, Y., Tanizawa, H., and Takino, Y. Studies of aloe. IV. Mechanism of cathartic effect. (3). Biol.Pharm.Bull. 1994;17(4):495-497.

38.Vats Manisha et al; Antimicrobial Activity of Stem Bark Extracts of *Nyctanthes arbortristis* linn. (Oleaceae) International Journal ofPharmacognosy and Phytochemical Research, 2009; 1(1): 12-14.

39.De Witte, P. and Lemli, L. The metabolism of anthranoid laxatives. Hepatogastroenterology 1990;37(6):601-605.
40.Ishii, Y., Tanizawa, H., and Takino, Y. Studies of aloe. IV. Mechanism of cathartic effect. (3). Biol.Pharm.Bull. 1994;17(4):495-497.
41.Ishii, Y., Tanizawa, H., and Takino, Y. Studies of aloe. V. Mechanism of cathartic effect. (4). Biol.Pharm.Bull. 1994;17(5):651-653.
42.Honig J, Geck P, and Rauwald HW. Inhibition of Cl- channels as a possible base of laxative action of certain anthraquinones and anthrones. Planta Med 1992;58(suppl 1):A586-A587.
43.Koch A. Investigations of the laxative action of aloin in the human colon. Planta Med 1993;59:A689.
44.Krumbiegel G and Schulz HU. Rhein and aloe-emodin kinetics from senna laxatives in man. Pharmacology 1993;47(suppl 1):120-124.
45.Ni, Y.; Tizard, I.R. Analytical methodology: the gel-analysis of aloe pulp and its derivatives. In Aloes The Genus Aloe; Reynolds, T., Ed.; CRC Press: Boca Raton, 2004; pp. 111-126.
46.Talmadge, J.; Chavez, J.; Jacobs, L.; Munger, C.; Chinnah, T.; Chow, J.T.; Williamson, D.; Yates, K. Fractionation of Aloe vera L. inner gel, purification and molecular profiling of activity. Int. Immunopharmacol. 2004, 4, 1757-1773.
47.Reynolds, T.; Dweck, A.C. Aloe vera leaf gel: a review update. J. Ethnopharmacol. 1999, 68, 337.
48.Cosmetic Ingredient Review Expert Panel. Final report on the safety assessment of Aloe andongensis extract, Aloe andongensis leaf juice, Aloe arborescens leaf extract, Aloe arborescens leaf juice, Aloe arborescens leaf protoplasts, Aloe barbadensis flower extract, Aloe barbadensis leaf, Aloe barbadensis leaf extract, Aloe barbadensis leaf juice, Aloe barbadensis leaf polysaccharides, Aloe barbadensis leaf water, Aloe ferox leaf extract, Aloe ferox leaf juice and Aloe ferox leaf juice extract. Int. J. Toxicol. 2007, 26, 1-50.
49.J. Photochem. Photobiol. B. 2001, 63, 132-140.
50.Langmead, L.; Makins, R.J.; Rampton, D.S. Anti-inflammatory effects of aloe vera gel in human colorectal mucosa in vitro. Aliment. Pharmacol. Ther. 2004, 19, 521-527.
51.Steenkamp, V.; Stewart, M.J. Medicinal applications and toxicological activities of Aloe products. Pharm. Biol. 2007, 45, 411-420.
52.Yusuf, S.; Agunu, A.; Diana, M. The effect of Aloe vera A. berger (Liliaceae) on gastric acid secretion and acute gastric mucosal injury in rats. J. Ethnopharmacol. 2004, 93, 33-37.
53.Dal'Belo, S.E.; Gaspar, L.R.; Berardo Goncalves Maia Campos, P.M. Moisturising effect of cosmetic formulations containing Aloe vera extract in different concentrations assessed by skin bioengineering techniques. Skin Res. Technol. 2006, 12, 241-246.

Correspondence Address:
Rajesh Kumar Sharma
Teerthanker Mahaveer College of Pharmacy,
Teerthanker Mahaveer University,
Moradabad, Uttar Pradesh
Email: rajeshsharma7529@gmail.com
Phone: +91-9452248988