

## **A Study of Patenting Activity in *Aloe vera***

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(Received 28 March 2002)

The article studies *Aloe vera* based patents searched in the United States Patent and Trademark Office (USPTO) database, European Patent Office (EPO) database and EKASWA database of the patents notified for opposition of the Technology Information, Forecasting and Assessment Council (TIFAC), India. Out of the total 102 patents found in the databases, more than 60% of the patents were owned by the US inventors and firms, followed by China, Korea and Germany, which had less than 10 patents each. India did not have any patent. The maximum number of patents pertained to skin care and treatment of skin diseases, followed by those having a wide range of pharmaceutical uses, extraction and isolation of chemical substances, industrial processes, food and beverages, and machinery and equipment used for processing of *Aloe vera* plant. There is no domination of any company or group of companies in patenting.

The renewed interest in the traditional medicine has resulted into a plethora of activities in science and technology all over the world. Researchers in many countries seem to have taken clues from the ancient knowledge documented in the ancient texts or traditional practices followed in the ancient societies or tribal and folk medicines, and attempted to develop a regime of new healthcare system which has come to be termed as “alternative system of health care”. R&D in plant-based research being carried out in many countries, including the developed world, has led to enhanced patenting activity.

The new plant-based products, patented or otherwise, have become

popular due to peoples’ disillusionment with the modern system of healthcare mostly on the ground of perceived or scientifically established so-called side effects of consuming the allopathic drugs or such allied curative methods.

*Aloe vera* is one such plant, which is known to possess a wide spectrum of medicinal and therapeutic properties scientifically established by the modern scientific practitioners<sup>1</sup>. The properties and medicinal uses of this plant have been mentioned in Indian ancient texts including *Bhav Prakash Nighantu*<sup>2</sup> and *Sharngadhar Samhita*<sup>3</sup>. *Homoeopathic Materia Medica*<sup>4</sup> also mentions a wide range of therapeutic uses of *Aloe socotrine*, a species closely related to

*Aloe vera*. This plant is in the priority list of medicinal plants for inclusion of documented information in our ancient texts into the digital form in the proposed Traditional Knowledge Digital Library (TKDL) database<sup>5</sup>. The priority being given for digitalizing its information itself indicates the importance of this plant for medicinal and allied purposes.

A wide variety of aloe-based products are being sold in the market all over the world including India. It is a popular

plant and has the potential for use in a wide spectrum of health problems. Thus there is potential for market growth for *Aloe vera* based products. All these factors have led to the formation of International Aloe Science Council<sup>6</sup>, a non-profit organization in USA. It encourages R&D in *Aloe vera*, certifies raw material and products and generally serves all the facets of aloe industry.

The term 'Aloe', used in medicine, stands for the dried juice, which flows



*Aloe vera*

from the transversely cut bases of the large leaves of various species belonging to the genus. Various uses of *Aloe vera* mentioned in the literature are given in Appendix I.

In view of the above, scientists have focused their research on this plant and a number of *Aloe vera* based patents have been granted. This article aims to study the patenting activity as reflected by the patents granted by USPTO<sup>8</sup>, EPO<sup>9</sup> and EKASWA<sup>10</sup>, database of patents notified for opposition, of the Patent Facilitating Cell, TIFAC, New Delhi.

#### Data and Methodology

The patents were searched from the databases of USPTO, EPO (up to 2001) and EKASWA (01-01-1995 to 30-6-2001). The search was made in the title and abstract using the keywords "*Aloe vera*", "*Aloe barbadensis* Mill" and other botanical synonyms like "*Aloe ferox* Miller", "*Aloe perryi* Baker", "*Aloe socotrine*", "*Aloe perfoliata* Linn", "*Aloe zangibar*", "barbados aloe", "*Aloe chinensis* Baker"; "*Aloe curacao*", "*Aloe vulgaris* Lam", in these databases. However, the search yielded results, only with the key words *Aloe vera*; *Aloe barbadensis* and Barbados aloe.

The search in the USPTO database yielded 106 patents, 104 patents with the keyword "*Aloe vera*" and two patents with the keyword "*Aloe barbadensis*". The EPO database yielded 205 patents, 188 patents with the keyword "*Aloe vera*", twelve with the keyword "*Aloe barbadensis*" and five with the keyword

"Barbados aloe". No patent was found in the EKASWA database.

The patents, which surfaced in the search merely owing to the presence of the searched keyword "*Aloe vera*" and its other synonyms but were not actually relevant, were excluded from the study. In the USPTO database, out of 106, only 60 patents were *Aloe vera* based innovations. All these patents were found in the EPO as well. In addition to this, 42 other relevant patents were found in EPO. Therefore, out of the total 311 patents found in both the databases, only 102 patents were found to be *Aloe vera* based innovations. The first pages of these patent documents and their abstracts were examined to gain an insight into the patenting activity including the ownership of the patents, the countries that have been active in patenting and the nature of the patents.

#### Patenting Activity

The distribution of the patents granted in blocks of nine years suggests that the patenting activity in *Aloe vera* has gradually gained momentum during the last decade as the number of patents rose to eight times of those obtained during 1975-83 (Table 1). Among the 102 patents, 60 were held by USA, followed by China (9), Korea (8), Germany (7), two each by Canada and Spain. Argentina, Brazil, Cuba, Denmark, France, Italy and Japan held one patent each. Information about assignee's country was not available in respect of seven patents.

**Table 1—Patenting activity as reflected in USPTO and EPO**

Countries	1975-83	1984-92	1992-2001	Total
USA	3	17	40	60
China	0	0	9	9
Korea	0	0	8	8
Germany	0	1	6	7
Canada	0	0	2	2
Spain	2	0	0	2
Others	0	1	6	7
NA*	4	2	1	7
Total	9	21	72	102

NA—information about assignee's country was not available

The first US patent on *Aloe vera* was obtained in the year 1979 and thereafter there was a gap of three years. Subsequently, almost every year the US innovators have obtained US patents and their numbers increased gradually. China, the next most significant country started obtaining patents in the year 1997 namely twenty years after the first US patent was taken, and within a period of five years it had nine patents to its credit. Korea was active only for a period of three years from 1995 to 1997 during which it obtained eight patents.

About 60% of the innovations were individual efforts (Table 2). However, in the US in larger number of patents two or more inventors had joined hands in the inventive activity.

#### ***Country of Origin of Inventors and Assignees***

More than 80% of the inventors and 66% of the patentees in the USPTO database belonged to US. However, inventors and patentees from other countries like Germany, UK, Korea, Denmark, China, Canada and Argentina also figured but they all held one patent

**Table 2—Indicators of team work**

S No	No of inventors	USPTO	EPO	Total
1	Not available	0	3	3
2	One	35	25	60
3	Two	19	4	23
4	Three and above	6	10	16
Total		60	42	102

each except for the Germany which had two patents.

In the EPO database, however, a larger number of inventors were from China, Korea and Germany. In the case of China which had nine patents, except for one patent, all other patents were held by the inventors themselves whereas in the case of Korea which had eight patents, except for one patent held by the inventor, the rest were held by various firms. The US firms were the next largest patent owners in the EPO.

#### ***Patents and Assignees***

Table 1 indicates that there is a marked rise in the patenting activity during the last decade. Except for Spain that has altogether stopped patenting since 1983, there is rise in the activity in respect of all other countries.

Out of the 102 patents, 50 patents were held by individual inventors. Out of these 50, American inventors held 29, and the remaining 21 were held by the individual inventors from Argentina, Brazil, Canada, China, France, Germany, Italy, Japan and Korea. The remaining 52 patents did not indicate any clear pattern of ownership except for Carrington Lab Inc, USA that had eight patents and Pacific Co Ltd, Korea that held five patents. In addition to this, other, named Alfatec Pharma GmbH, Germany; Universal Pharma Inc,

USA; Drypers Corp, USA; Colorplast, USA; and Univera Pharma Inc, USA; Homacare Iberica S A Spain had two patents each. The remaining 39 patents were held by 28 different firms, half of which were from the US.

Seven individual inventors held more than one patent to their credit. Two from the US and one from China had three patents each. Two American and two Chinese inventors had two patents each. All other individuals had one patent each.

#### Technological and Innovation Trends

More than 50% of the patents on *Aloe vera* were product patents and 15% were process patents, rest of the patents were on the extraction and isolation of chemical substances or active principles. The nature of some of the innovations could not be clearly determined, therefore these were put into process as well as product category. A few patents pertained to machinery and equipment developed for a variety of purposes for processing *Aloe vera* plant (Table 3). The percentage of product patents was higher (63%) in USPTO as compared to that in EPO (40%).

These patents relate to skin care products, pharmaceuticals, food and beverage, extraction and isolation, industrial processes and, machinery and equipment. A glimpse of the dominant nature and use of some of these technological and innovation trends are discussed and summarized in the following paragraphs.

#### Skin Care and Treatment

Out of 102 patents analysed, the maximum number of patents (34)

**Table 3—Nature of patents**

S.No	Nature of patents	USPTO	EPO	Total
1	Product	38	17	55
2	Process	6	10	16
3	Extract / Isolation	8	5	13
4	Process / Product	2	9	11
5	Machinery and Equipment	6	1	7
Total		60	42	102

pertained to technological developments and innovations that focus on skin protection, care and treatment of skin diseases, etc.

European patent DE 19754206 claimed composition for relieving symptoms associated with neurodermatitis. It is a cosmetic skin care composition for relief in irritation and itching associated with neurodermatitis and eczema. Another patent entitled "Lip balm composition", a topical composition having improved healing properties and particularly a lip balm for healing clapped, cracked, sun-burned and wind-burned lips. US patent 5616347 claims chlorine dioxide skin medicating compositions for preventing irritation. It is claimed to reduce skin irritation, which is caused by chlorine dioxide exposure to the skin. US patent 5266318 is a skin therapeutic mixture containing cold processed *Aloe vera* extract with yellow sap and aloin removed. It is a non-toxic therapeutic mixture useful for treatment of irradiated skin, open sores, wounds and abrasions.

A mixture containing *Aloe vera* extract, which is useful for certain disorders such as acne, psoriasis, burns, pimples, blackheads, and open sores is claimed in US patent 4857328. A dermatological composition for treating acne and similar

skin lesions is provided in US patent 4593046. US patent 4708873 claims a method of chemically deriding ulcerated necrotic tissue of the skin and/or mucous membrane. It promotes the healing of the lesion. *Aloe vera* ointment (US patent 4725438) is claimed to be useful in treating skin irritation and promoting the healing of wounds. The preferred embodiment comprises a mixture of the raw gel of the *Aloe vera* plant.

Gel containing *Barbadensis*, intended for the treatment of the skin with acne as well as for moisturizing of the epidermis is claimed by European patent FR 2555445, this gel also has bactericidal and soothing properties. European patent EP 919220 claims a hair treating preparation for use as a component in hair dyeing and bleaching and for use in hair conditioning. The preparation can also be used for treating skin conditions such as a rash and eczema. European patent WO 9526198 entitled "metal complexes of aloe extracts for skin and hair", claims that the composition protects irritated or damaged skin from further oxidative and biochemical damage. It accelerates the healing of burns and surgical wounds, increases the size of the hair follicles and the rate of hair growth.

Another shade of invention disclosed a moisturizing and therapeutic glove, which includes a thin layer of *Aloe vera* coated uniformly on inside surface of the glove. *Aloe vera* soothes hand during the wearing of the glove. Another patent provided method of making absorbent articles such as disposable diaper, feminine hygiene products or incontinent adult articles containing *Aloe vera* on the

surface of the article contacting the wearer's skin to reduce rash. US patent 5945090 claims a quick drying, water-proof and anti-perspiration, sunscreen preparation which after application is soft and dries rapidly. It comprises a sunscreen with UVA and UVB component. Another innovation discloses protective hand lotion of *Aloe vera* gel and vitamin E gel which protects the hands from irritating material and provides softened and smoothly textured skin. Water-soluble dry foam, which easily dissolves in water leaving no adverse residue on the skin, is claimed in another patent.

A few inventions related to shaving creams and after shave treatment compositions claiming to reduce irritation of the skin and other skin problems associated with shaving.

US patent 4302443, a non-irritating anti-perspirant, prevents irritation in most persons sensitive to the metallic salts. Another patent discloses a long life deodorant composition lasting up to seven days for foot odour and up to about fifteen days for underarm odour.

US patent 4178372, hypoallergenic stabilized *Aloe vera* gel is useful for application to facial area and is a substantial improvement over established *Aloe vera* gel. Another patent on gel containing natural aloe discloses a cosmetic composition with anti acne and moisturizing properties.

Some patents disclosed skin and hair treatment compositions comprising *Aloe vera* extracts, processes for preparing cosmetic products intended for elimination of dandruff, hair tonics, hair

lotions and hair shampoos; they alleviate itching of the scalp, prevent hair loss and also accelerate hair growth. An adhesive agent for application to human or animal skin, preferably for use in connection with ostomy or incontinence appliances is provided in US patent 6171594. Such adhesives prevent or alleviate skin problems.

### **Pharmaceuticals**

There are 29 innovations under this category. European patent DE 19853998 claims use of *Aloe vera* extracts for the treatment and prevention of herpes, stomatitis and skin irritation caused by UV light. Claims also included for oral and rectal formulations containing the extract. US patent 4585656 claims treatment of herpes, herpes simplex, herpes varicella, and herpes zoster by topical application. European patent EP 627223 provides topical composition with therapeutic and cosmetic activity containing *Aloe vera* and modified natural collagen.

A method and product that exhibits increased anti-inflammatory and wound healing activity is disclosed in US patent 5487899. Wound healing accelerated by systemic administration of bioactive polysaccharide derived from *Aloe vera* is claimed in US patent 5468737. Another invention is a process for stabilizing the clear gel of *Aloe vera* leaves to provide a durable preparation preserving the therapeutic qualities of the fresh gel. It relieves pain and promotes healing of internal and external wounds.

US patent 6309675 gives therapeutic composition including plantain and *Aloe*

*vera* for treatment of arthritis and other afflictions. Cell growth-stimulating product containing aloesin (a compound of *Aloe vera*) as an active ingredient, especially for epidermal cells and hepatic cells is disclosed in another patent. US patent 6013259 is related to ophthalmic solution for the treatment of dry eye syndrome, inflammations, ulcerations, alkaline or acid burns, infections, and cataracts. Ophthalmic UV absorptive emollient, US patent 4788007, claims to shield eye retina by topical application of gel in the eye.

Patents also included on *Aloe vera* food having medicinal and health care functions of beautifying face, delaying senility, benefiting stomach, improving immunity and treating rheumatism, constipation and enterogastric diseases.

*Aloe* white spirit (patent nos CN 1206744 and CN 1205359) is made by strong distilled liquor, aloe juice, and aloe fresh juice and cooked juice. These are claimed to have wide ranging therapeutic effects for diseases such as constipation, diarrhoea, hemorrhoids, rheumatism, dizziness, headache, gastric ulcer, duodenal ulcer, neuralgia, tumour, common cold, hypertension, asthma, cold syndrome and also possesses health-care action for softening blood vessel, delaying senility and reducing fat. European patent CN 1175460 discloses *Aloe vera* emulsion, a health care beverage prepared from *Aloe vera* of America. Its health care functions include improving immunity, resisting cancer, and senility and cure chronic diseases, inflammation and habitual constipation.

Composition for regenerating and strengthening animal and human organism, the body's defence system and the skin, composed of aloe active substances is divulged in another patent. European patent DE 3447572 divulges a method for processing barbados aloe bee product that helps in resisting diseases. Method of using *Aloe vera* as a biological vehicle for the delivery of drugs is claimed in US patent 5708038. The invention also provides method of treating symptoms and diseases mediated by hormonal deficiencies or amenable to treatment by hormones using *Aloe vera* as a biological vehicle.

US patent 5288492 claiming decongestant composition containing *Aloe vera* provides composition and method of treatment of symptoms associated with respiratory disorders.

US patent 529434 claims an improved medicated tooth gel or paste, which cures and prevents the formation of lesions and aphthous ulcers and other minor ailments of the oral mucosa. *Aloe vera* gel toothpaste (US patent 5294434) claims to be useful in preventing gingivitis, controlling plaque and stimulating the growth of new tissues while reducing the hazards of bacterial contamination. Treatment of damaged fish tissue by a composition containing *Aloe vera* extract are claimed in US patent 4500510 and European patent CA 1220721. Some other patents pertained to germicides, sanitation kit and method for promoting hygiene, providing broad-spectrum disinfecting activity.

### ***Extraction and Isolation***

There were 12-patented inventions pertaining to extraction, isolation, and identification of active substances from *Aloe vera*. US patent 5929051 pertains to extraction, isolation and identification of aloe pectins from gel and rind cell wall fibres of *Aloe vera*. This gel is used as a matrix for strong pharmacological substances and also for antigen and antibody precipitation reaction. A pectic substance used as a growth factor stabilizer and a delivery vehicle has been isolated from *Aloe vera*. Bioactive factors produced, separated and isolated from either an *Aloe vera* leaf or a product derived and processed from aloe leaf, such as *Aloe vera* gel, freeze dried *Aloe vera* gel extract, utilizing different sizing processes are claimed in US patent 5902796. Compounding or mixing of two or more bioactive factors from aloe at various concentration ratios have been used to obtain a new bioactive factor having desired optimal additive or synergistic effects.

*Aloe* gel is extracted by trimming and removing the rind and aloin layer from the leaf, remaining gel is digested under ultraviolet radiation at ambient temperature to produce a biologically sterile chemically stable extract of composition having characteristic similar to fresh *Aloe vera* juice (US 3878197). Several processes are disclosed for extracting the chemical substances from the leaves of the aloe plant. A base formulation for the production of *Aloe vera* containing topical products including counter irritation formulations



based on aloe juice has also been described.

Cinnamoyl-C-glycoside, a chromone from *Aloe barbadensis*, is found in very small amount in leaves; when concentrated to the desired level it exhibits anti-inflammatory activity. An invention also related to an anti-oxidant phenolic compound *Aloe barbadensis* and methods for isolating phenolic compounds has been patented. European patent CU 22397 discloses the procedure for the preparation of injectable anti-viral and immuno-activating extract of *Aloe barbadensis*.

#### **Food and Beverages**

There were 10 inventions pertaining to the development of food and beverages from *Aloe vera*. These innovations included:

- (i) Aloe active beverage, claimed to nourish face, invigorating the function of stomach, tones kidney, endowed with anti cancer and anti-senility properties. The curative results for rheumatic disease, disease of nervous system, digestive system and circulatory system were also claimed. Enhancement of immuno-competence and prevention of diseases were other claims made;
- (ii) Barbados aloe wine and its production process: Health care wine using American aloe possesses the function of nourishing face and invigorating kidney, nourishing stomach, resisting cancer and decelerating ageing. It has good therapeutic effect for curing rheumatism,

dermatosis, constipation and enterogastric diseases;

- (iii) A product which includes creatine and *Aloe vera* extract for human beings and improves their intestinal health has been claimed in US patent 6168802. The composition is a drink either constituted from a dry powder or liquid form. Also disclosed is the method to increase the stability of the drink or semi liquid;
- (iv) Method for producing ready to pour frozen concentrated clarified juice, fruit juice and high solids fruits products, processing method for concentrating *Aloe vera* and concentrated juice of *Aloe vera*;
- (v) European patent CN 1295796 claims the processing method of dried barbados aloe tea which has brisk smell and bright colour;
- (vi) Bean curd mixed with hulled jelly like content of *Aloe vera* is good for maintaining health;
- (vii) European patent JP 9009904 claims the production of *Aloe vera* gel which is added in the preparation of beverages and food like jam, jelly, noodles, etc to obtain food with excellent medicinal effects.

#### **Industrial Processes**

Ten patents related to industrial processes included: (i) processing method for fermentation of *Aloe vera* gel;(ii) method for processing stabilized *Aloe vera* gel from the whole *Aloe vera* leaf through a series of filtration steps ;(iii) method to increase colourfastness of stabilized *Aloe vera* gel; (iv) controlled

temperature process for manufacturing of improved stabilized *Aloe vera* gel. It exhibits greater shelf life; (v) preparation process of *Aloe vera* gel liquid; (vi) production of agricultural, chemical free, dried *Aloe vera* jelly preservable for a long time; (vii) process for preparing *Aloe vera* containing tablet; (viii) shaped articles containing plant extracts in particular pellets and their pharmaceutical or cosmetic use. They are shelf stable and their cosmetic and pharmacological properties are substantially unchanged in comparison to the native extracts.

#### ***Machinery and Equipment***

There were seven mechanical innovations that related to the development of devices useful for the purpose of processing the plant leaf, extraction of uncontaminated gel from the leaves of the plant, apparatus for washing the leaves, *Aloe vera* plant gel separator and aloe peeling and squeezing machines.

#### **Conclusions**

More than one hundred *Aloe vera* based patents have been obtained all over the world as reflected from the search carried out in USPTO and EPO database. EKASWA search did not yield any patent. The patenting activity seems to have gained momentum during the last decade. American researchers and firms with more than 60% patents to their credit have established a leading edge over other countries active in *Aloe vera* based research. No company or group of companies or individuals seem to dominate the scene.

Absence of any patent to the credit of Indian scientists and institutions indicates that either the Indian researchers have not been directing their efforts in this direction or they have not attempted to obtain the patent.

More than half (53%) patents were product patents whereas the rest were process patents (15%), extraction, isolation and identification of chemical substances (12%), process/product patents (10%) and the rest related to the machinery and equipment for processing the plant.

Out of 102 patents, 34 related to a wide spectrum of skin care purposes and treatment of skin diseases. About three fourths of these patents were owned by American firms or inventors. Twenty-nine patents were related to other pharmaceutical uses. The US inventors and firms owned more than half of the patents. China, Germany and Spain had five, three and two patents respectively.

Patents also related to identification, extraction and isolation of chemical substances from the whole plant leaf or gel. The majority of the patents were owned by Carrington Lab Inc, USA, University of Texas and two other US firms.

Innovations in the area of food and beverages pertained to concentrated juices, wines, and food having therapeutic properties. All the patents in this field were held by USA, China and Korea.

The patenting activity in case of industrial processes focused on manufacturing processes of *Aloe vera* gel, tablets, pellets and colour stabilizer etc. These ten patents were held by USA,

Korea and Germany. Majority of the patents in machinery and equipment were held by the US inventors and two by Chinese inventors.

A number of clues for carrying out research on skin, pharmaceuticals, food and beverages relating patents seem to have emanated from the ancient texts. For example *Bhav Prakash Nighantu*<sup>2</sup> mentions the efficacy of this plant in skin diseases, piles, liver and spleen ailments, etc. Also Wealth of India database<sup>7</sup> documents a large number of therapeutic uses including some of those for which claims have been made in the patents.

A number of traditional medicines namely, Kumari-asav, Kumari-pak, Kumari-lavan, Kumarika-vati, Rajpravartini-vati, etc. are being manufactured in India by a number of pharmaceutical companies since long. Preparation and uses of these products are listed in classical ayurveda texts.

In addition to this, there was a large number of other patents in these areas which were excluded from this study where *Aloe vera* has been used as one of the constituents in varying proportions.

### Acknowledgement

My sincere thanks are due to Dr Gian Singh, Scientist, National Institute of Science Communication, New Delhi, who despite his hectic schedule spared time to go through the manuscript and offered valuable suggestions.

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**Appendix I—Uses of *Aloe vera***


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Type	Use	Reference		
			Carbuncles	7
			Ointment	7
Aloe	Laxative	2, 7	Lotion	7
	Eye troubles	2	Shampoos	7
	Vitalizer, nourishing	2	Cosmetic creams	7
	Cough and fever	2	Gel	Dentifrice
	Liver enlargement	2		Cosmetic lotion for softening skin
	Spleen enlargement	2		Prevent gingivitis
	Burn injuries	2		Controls plaque
	Skin troubles	2		Stimulates growth of new tissues
	Blood purifier	2		Reduces hazards of bacterial contamination
	Improves digestion	7		In high concentration inhibits growth of human cancer cells
	Early stages of TB	7		Burn injuries
	Dyspepsia	7		Prevents progressive dermal ischaemia caused by burns, frost bite, electrical injuries
	Uterine disorder	7		Inhibits AIDS virus
	Rectal fissures	7		Suppresses tumour formation
Juice of	Indigestion	2	Extract	Aids skin
Leaves			of leaves	Gastrointestinal and general healing
	Liver ailments, jaundice	2,7		Inhibit growth of mycobacterium tuberculosis
	Spleen ailment	2,7		Anti-fertility or abortifacient activity
	Wound healing	2, 7	Extract	Abortifacient activity
	Treating burns	7	of fresh	
	Trophic ulcers	7	leaves	Thickens Haemorrhoidal congestion of stomach and spleen
	Eye trouble	7	d juice	Prolapsed uterus
	X-ray burns	7		Crushed Topical application on guinea worm infection
	Dermatitis	7	leaves	
	Anti-inflammatory activity	7	Poultice	Rheumatic joints
	Disorder of the skin	7	of leaves	
	Amenorrhoea	7	Powder	Diabetes
	Piles	7, 2	of leaves	
	Mild anti tumour activity	7		
	Atonic dyspepsia	7		
	Thins bronchial secretions in acute bacterial trachibronchitis	7		
Pulp of	Rock bruises	7		
leaves				
	Sun burns	7		
	Boils	7		

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 2 — Bhav Prakash Nighantu, 7 — Wealth of India
 

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