Original Article

Medicinal Plants used as Anti-Acne Agents by Tribal and Non-Tribal People of Tripura, India

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ABSTRACT

Acne is a common disorder of pilosebaceous gland. It is a great challenge for the dermatologist for its complexity, prevalence and also huge range of clinical expression. Due to hormonal changes 99.5% of teenage boys and 83% of teenage girls are affected by acne which may continue throughout adolescence. Now-a-days different modern allopathic medicines viz., anti-inflammatory agents, antibiotics and comedolytic agents are developed for treatment purpose topically and systematically. But these have many side effects. Prolonged and excessive use of antibiotics may develop resistance in acne causing bacteria viz. *Propionibacterium acne* and *Staphylococcus epidermidis*. So to give relief from acne problems and also to minimize the side effects it is better to use herbal drugs than allopathic drugs. This article describes about different plants used starting from their name, their family, part used and active constituents.

Keywords: *Propionibacterium acne*, *Staphylococcus* epidermidis, Medicinal plants, Chemical constituents, Tripura.

INTRODUCTION

Acne is the most common disease among all skin problems which have three major forms *acne vulgaris*, *acne conglobata* and *acne rosacea*. *Acne Vulgaris* can be defined as a superficial skin disorder that mainly affects hair follicles and oil secreting glands of the skin. It affects 95 % of 16 year old boys 83% of 16 year old girls to some degree. The incidence of severity of acne is at 40% in 14-17 year old girls and 35% in boys aged 16-19[1]. *Acne conglobata* is more severe than any of the other forms as it forms cyst. *Acne rosacea* is a chronic acne-like eruption on the face mostly affects middle aged and older adult persons with a facial flushing[2].

From the onset of puberty acne affects both males and females. Keratin formation is taking place due to the

stimulation of testosterone from those cells that line the follicular canal and also enlargement of sebaceous glands occur which leads to produce more and more sebum. From these pimples are produced and the canals are blocked. If blockage is complete white head is formed and if it is not complete black head is formed. Blocked canals leads to overgrowth of acne causing bacteria. They release enzymes which break the sebum and induce inflammation[3].

Another reason of acne formation is the low concentration of 5-α-reductase, which converts the testosterone to a more potent form DHT[4]. Intestinal toxemia, where the toxins are absorbed from the intestine, may also leads to increase the toxic level in the blood which may be another reason for acne formation[5].

Necessity of natural product

Natural products from plant, animal and mineral sources have the capacity of treatment of different human diseases. It is estimated that about 80% people of developing countries use the natural products for different diseases. The allopathic drugs conventionally may cause lots of side effects. Excessive and prolonged use of drugs may lead to resistance in acne causing bacteria. The use of herbal medicine is becoming very popular due to toxicity and side effects of allopathic medicines. Medicinal plants play an important role in the development of potent therapeutic agents.

Area of survey

Tripura is the third small state of India located in the biogeographic zone of 9B- North-Eastern hills between 22˚56’ and 24˚32’ N latitude and between 90˚09’ and 90˚20’ E longitude. The total area of the state is 10,497.69 sq. Km. The forest covering area of the state is about 6292.681 sq. Km. Temperature ranges from 10-36˚c and the annual rainfall is 247.9 cm. The state consists of 8 districts. This state is rich in biological sources but these are decreasing gradually. The main occupation is agriculture and agricultural laborer and the main crops are paddy and vegetables etc.

Information was collected from either tribal or village *kavirajes*. In this 21st century also peoples are still dependent on the ethnomedicinal knowledge. Ethnomedicinal information was collected from the Tripuri, Reang, Noatia, Jamatia, Halam, Kuki, Chaimal and Uchai. Apart from the tribes, ethnomedicinal information was also obtained from *kavirajes*.

Mode of information collection

Information was learned from healers using semi-structured interviews with a questionnaire. Traditional healers were taken during daytime on field trips to areas where they usually collected plants, while at the same time survey interview questions were asked and information noted. The information collected included common name, part used, formulations, ailments for which the formulations were used, and dosages dispensed which are depicted in the table 1. Information was also collected about any particular season for collecting plants, plant parts used and whether combination of plants were used to treat any particular ailment or if any single plant was used to treat multiple ailments. The information was noted while in the field and later cross-checked with the healers in evening or night-time meetings. Evening or night-time meetings were usually conducted as group interviews in the presence of the healer, tribal or village elders and any other interested local persons (usually 10-15 people altogether). Informed consent was obtained from every healer prior to the interview. For the tribal healers, interviews were conducted with the help of an interpreter. In the cases of village healers, interviews were conducted in Bengali

language, which is spoken throughout Tripura (apart from the tribes).

RESULTS AND DISCUSSIONS

A total of 86 plants of ethnomedicinal importance belonging different families were collected. These plants are enumerated here along with their scientific and local names, family, parts used, mode of application. A note has been provided wherever necessary. All the above said plants have the capacity to cure the acne problems. These plants are used by the tribal and non-tribal people traditionally. All these plants also have other activities like anti-inflammatory, analgesic, cardio tonic etc. The activities of all these plants are due to presence of active constituents.

CONCLUSION

Many of the synthetic drugs are available in the market to cure the acne problems. But due to continuous use of the conventional synthetic drugs the microbes will develop resistance against the drug and these drugs have lots of side effects. However herbal drugs play an important role in the treatment of acne, without side effects, hence, they can be commonly used as alternative to synthetic medicine for acne.

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REFERENCES

1. Ebling FJG. Acne Vulgaris, Text book of Dermatology. 6th ed., 1998: 552-554.
2. Murray Michael ND, Joseph Pizzorno ND. Encyclopedia of Natural Medicine. 2nd ed., California: *Prima Publishing*; 1998: 191-197.
3. Mishra P, Patidar A, Gupta D, Agrawal S. Treatment of Acne with Herbal Remedie – *Calendula officinalis:* An Overview. *International Journal of Pharmaceutical & Biological Archives* 2011; 2(4):1020-1023.
4. Takayasu S, Wakimoto H, Itami S, Sano S. Activity of Testosterone-5-alpha-reductase in various tissues of human skin. *J Invest Dermatol* 1980; 74 (4): 187-91.
5. Juhlin L, Michaelson G. Fibrin microclot formation in patients with acne. *Acta Dermatol Venerol* 1983; 63: 538-540.
6. Patel KK, Mehta NJ, Dhandhalia NC, Bhanupriy AK, Shastri DH, Shelat PK *et al*. Development and Evaluation of Herbal Anti-Acne Formulation. *RJPBCS* 2012; 3 (3): 334-339.
7. Lee SJ, Chung HY, Maier CGA, Wood AR, Dixon RA, Mabry TJ. Estrogenic flavonoids from *Artemisia vulgaris* L. *J. Agric. Food Chem* 1998; 46: 3325-3329.
8. Manosroi A, Chankhampan, Jainonthee P, Manosroi J. Antiacne activity of the cream containing aromatic volatile oil from Thai Lanna medicinal plants entrapped in niosomes. *Journal of Thai Traditional & Alternative Medicine* 2008; 6 (2): 1.
9. Pandey C, Karadi RV, Bhardwaj LK, Sahu AK. Screening of selected Herbal plants for Anti Acne Properties. *Int. J. Drug Dev. & Res* 2012; 4 (2): 216-222.
10. Dey SK, Banerjee D, Chattapadhyay S, karmakar KB. Antimicrobial activities of some medicinal plants of west Bengal. *International Journal of Pharma and Bio Sciences* 2010; 1 (3), 1-10.
11. Vijayalakshmi A, Tripura A, Ravichandiran V. Development and Evaluation of Anti-Acne Products from Terminalia arjuna Bark. *Int. J. Pharm Tech Res* 2011; 3 (1), 320-327.
12. Pratchayasakul W, Pongchaidecha A, Chattipakorn N, Chattipakorn S. Ethnobotany and Ethnopharmacology of *Tabernaemontana divaricata*. *Ind J Med research* 2008; 127: 317-335.
13. Sawarkar HA, Khadabadi SS, Mankar DM, Farooqui IA, Jagtap NS. Development and

Biological Evaluation of Herbal Anti-Acne Gel. *Int. J. PharmTech Res* 2010; 2 (3): 2028-2031.
14. Traidej CM, Suvimol S, Veena N , Wandee G. Effect of *Garcinia mongostana* on inflammation caused by *Propionibacterium acnes*. *Fitoterapia* 2003; 78: 401-8.
15. Balakrishnan KP, Narayanaswamy N, Subba P, poornima EH. Antibacterial activity of certain medicinal plants against acne-inducing bacteria. *International Journal of Pharma and Bio Sciences* 2011; 2 (3): B-476- 481.
16. Athikomkulchai S, Watthanachai yingcharoen R, Tunvichien S, Vayumhasuwan P, Karnsomkiet P, Sae-Jong P *et al*. The development of anti-acne products from *eucalyptus globulus* and *psidium guajava* oil. *J Health Res* 2008; 22 (3): 109-113.
17. Qadan F, Thewaini AJ, Ali DA, Afifi R, Elkhawad A, Matalka KZ. The antimicrobial activities of *Psidium guajava* and *Juglans regia* leaf extracts to acne-developing organisms. *Am J Chin Med* 2005; 33: 197-204.
18. Takahashi T, Kokubo R, Sakaino M. Antimicrobial activities of eucalyptus leaf extracts and flavonoids from *Eucalyptus maculate*. *Lett Appl Microbiol* 2004; 39: 60-64.
19. Sahin F, Karaman I, Gulluce M, Ogutcu H, Sengul M, Adiguzel A. Evaluation of antimicrobial activities of *Satureja hortensis* L. *J Ethnopharmacol* 2003; 87: 61–65.
20. Patil B, Samuel G, Mirapurkar S, Mohan RK, Dasgupta D. Inhibition of Type 1 5α-reductase by Medicinal Plants Extracts. *IJRAP* 2011; 2 (3): 839-844.
21. Raynaud JP, Cousse H, Martin PM. Inhibition of Type 1 and Type 2 5α-reductase activity by free fatty acids, active ingredients of Pemixon. *J Steroid Biochem Mol Biol* 2002; 82: 233-9.
22. Kadri A, Zarai Z, Chobba IB, Békir A, Gharsallah N, Damak M, Gdoura R. Chemical constituents and antioxidant properties of *Rosmarinus officinalis L.* essential oil cultivated from South-Western Tunisia. *J. Med. Plants Res* 2011; 5(25): 5999-6004.
23. Manjunatha BK. Hepatoprotective activity of *Pterocarpus santalinus* L. f., an endangered medicinal plant. *Indian J Pharmacol* 2006; 38 (1): 25-8.
24. Manjunatha BK. Antibacterial Activity of *pterocarpus santalinus*. *Indian J Pharm Sci* 2006; 68: 115-116.
25. Sindhu RK, Upma, Kumar A, Arora S. Santalum album linn: a review on morphology, phytochemistry and pharmacological aspects. *Int. J. PharmTech Res* 2010; 2(1): 914-919.
26. Tilak JC, Adhikari S, Davasagayam TP. Antioxident Activity of *Plumbago zeylanica*, an Indian Medicinal Plant and it's Active ingredient Plumbagin. *Redox Rep* 2004; 9: 219-227.
27. Mukherjee KR, Fujimoto Y, Kanikawa K. 1-(u-hydroxyfattyacyl) glycerols and two flavols from *Cinnamomum camphora*. Phytochemistry 1994; 37(6): 1641-1643.
28. Mastura M, Nor Azha MA, Khozirah S, Rahmani M, Ali MA. Anticandidal and Anti-dermatophytic Activity of Cinnamomum Species Essential Oils. *Cytobios* 1999; 98: 17-23.
29. Obi RK, Nwanebu FC, Ndubuisi UU, Orji NM. Antibacterial qualities and Phytochemical Screening of oils of and *Brasica nigra*. *J Medicinal Plants Res* 2006; 3: 429-432.
30. Yarnell E, Abascal K. Dandelion (*Taraxacum officinale* and *T mongolicum*). Integrative Medicine 2009; 8(2): 35-38.
31. Umadevi P, Murugan S, Jennifer SS, Subakanmani S. Evaluation of antidepressant like activity of *cucurbita pepo* seed extracts in rats. *Int J Curr Pharm Res* 2011; 3 (1): 108-113.
32. Karpagam T, B.Varalakshmi, Bai JS, Gomathi S. Effect of different doses of *cucurbita pepo* linn extract as an anti-inflammatory and analgesic nutraceautical agent on inflamed rats. *International Journal of Pharmaceutical Research & Development* 2011: 3(3): 184-192.
33. Alhassan A, Mabrouk M, Idris R, Salawu E, Oyerinde A, Bauchi Z. Aqueous Extract of *Juglans Nigra* Prevents Lead Induced Testicular Toxicity in Rats. *Maced J Med Sci* 2010; 1857-5773.

34. Muhammad N, Saeed M, Awan AA. Khan H. Ethnomedicinal, phytochemical and pharmacological profile of genus *Viola*. *Phytopharmacology* 2012; 3(1): 214-226.
35. Kumar KM, Ramaiah S. Pharmacological importance of *echinacea purpurea*. *International Journal of Pharma and Bio Sciences* 2011; 2 (4): 304-314.
36. Sengul M, Ercisli S, Yildiz H, Gungor N, Kavaz A, Çetin B. Antioxidant, Antimicrobial Activity and Total Phenolic Content within the Aerial Parts of *Artemisia absinthum*, *Artemisia santonicum* and *Saponaria officinalis*. *IJPR* 2011; 10 (1): 49-56.
37. Khalil E, Esoh R, Rababah T, Almajwal AM, Muhammad H, Alu'datt. Minerals, proximate composition and their correlations of medicinal plants from Jordan. *J. Med. Plants Res* 2012; 6(47): 5757-5762.
38. Jena J, Gupta AK. *Ricinus communis* linn: a phytopharmacological review. *Int J Pharm Pharm Sci* 2012; 4 (4): 25-29.
39. Vispute S, Khopade A. *Glycyrrhiza glabra* linn. - "klitaka": a review. *International Journal of Pharma and Bio Sciences* 2011; 2 (3): 42-51.
40. Karmakar SR, Biswas SJ, Khuda-Bukhsh AR. Anti-carcinogenic Potentials of a Plant Extract *(Hydrastis canadensis)*: I. Evidence from *In vivo* Studies in Mice *(Mus musculus)*. *Asian Pacific Journal of Cancer Prevention* 2010; 11: 545.
41. Muley BP, Khadabadi SS, Banarase NB. Phytochemical Constituents and Pharmacological Activities of *Calendula officinalis* Linn (Asteraceae): A Review. *Trop J Pharm Res*, 2009; 8 (5): 455- 465.
42. Nishijima S, Kurokawa I, Katoh N Watanabe K. The Bacteriology of *Acne vulgaris* and Antimicrobial Susceptibility of *Propionibacterium acnes* and *Staphylococcus epidermis* isolated from acne lesions. *J Dermatol* 1994; 27: 318-323.
43. Hewitt HS, Whittle S, Lopez E, Weaver B. Topical Use of Papaya in Chronic Skin Ulcer Therapy in Jamaika. *West Indian Med J* 2000; 49: 32-33.
44. El-Kadi A, Kandil O. Effect of *Nigella sativa (*the black seed*)* on immunity. *Bul Islamic Med* 1986; 4: 344-348.
45. Robu S, Aprotosoaie AC, Miron A, Cioancă O, Stănescu U, Hăncianu M. *In vitro* antioxidant activity of ethanolic extracts from some *lavandula* species cultivated in romania. *Farmacia* 2012; 60 (3): 394-401.
46. Saeed S, Tariq P. In-Vitro Antibacterial Activity of Clove against Gram Negative Bacteria. *Pak J Bot* 2008; 40: 2157-2160.
47. Isaacs CE, Thormar H. The role of milk-derived antimicrobial lipids as anti-viral and anti-bacterial agents. *Adv Exp Med Biol* 1991; 310: 159-165.
48. Parmar N, Mukesh R. Medicinal Plants used as Anti-microbial Agents: A Review. *IJRP* 2012; 3 (1): 31-40.
49. Tamsyn TSA, Hili P, Naughton DP. Antioxidant and potential anti-inflammatory activity of extracts and formulations of white tea, rose, and witch hazel on primary human dermal fibroblast cells. *Journal of Inflammation* 2011; 8: 27.
50. Abbasi MA, Kausar A, Rehman AU, Saleem H, Jahangir SM, Siddiqui SZ *et al*. Preparation of new formulations of anti-acne creams and their efficacy. *Afr J Pharm Pharmacol* 2010; 4 (6): 298-303.
51. Himejima M, Kubo I. Antibacterial agents from the cashew *Anacardium occidentale*. *J Agric Food Chem* 1991; 39: 418–421.
52. Kubo I, Muroi H, Kubo A. Naturally occurring anti-acne agents. *J Nat Prod* 1994; 57: 9–17.
53. Nand P, Drabu S, Gupta RK. Phytochemical and anti-microbial screening of medicinal plants for the treatment of acne. *Indian J Nat Prod Resour* 2012; 3 (1): 28-32.
54. Singh D, Yadav P, Nayak S, Hatwar B. Anti-acne, preliminary phytochemical and physico-chemical investigation of *Saraca asoca* bark. *J Net Prod Plant Resour* 2012; 2 (1): 119-126.
55. Seevaratnam V, Banumathi P, Premalatha MR, Sundaram SP, Arumugam T. Functional properties of *centella asiatica* (l.): a review. *Int J Pharm Pharm Sci*. 2012; 4 (Suppl 5): 8-14.
56. Jakše M, Maršić NK. Comparison of asparagus (*Asparagus officinalis* L.) cultivars and the effect of covering beds. *Acta agriculturae Slovenica* 2005; 85 (2): 313-320.

57. Fatemeh K, Khosro P. Cytotoxic and genotoxic effects of aqueous root extract *of Arctium lappa* on *Allium cepa* Linn root tip cells. *Intl. J. Agron. Plant. Prod* 2012; 3 (12): 630-637.
58. Menghani E, Khan S, Soni M. Search for antimicrobial potentials from *simmondsia chinensis*. *IJPSR* 2012; 3(7): 2093-2097.
59. Gülçin I, Küfrevio˘glu OI, Oktay M, Büyükokuro˘glu ME. Antioxidant, antimicrobial, antiulcer and analgesic activities of nettle (*Urtica dioica* L.). *Journal of Ethnopharmacology* 2004; 90: 205–215.
60. Rai RV, Rajesh PS, Kim HM. Medicinal use of Coscinium fenestratum (Gaertn.) Colebr: An short review. *Orient Pharm Exp Med* 2013; 13: 1–9.
61. Chaudhary S. Antiacne activity of some indian herbal drugs. *International Journal of Pharma Professional's Research* 2010; 1 (1): 78-80.
62. Kumar GS, Jayaveera KN, Kumar CKA, Sanjay UP, Swamy BMV, Kumar DVK. Antimicrobial effects of Indian medicinal plants against acne-inducing bacteria. *Trop J Pharm Res* 2007; 6 (2): 717-723.

Table 1. List of anti-acne plants

Scientific name	Common name	Family	Part used	Active principle	Mode of application
Azadirachta indica[6]	Neem	Meliaceae	Leaves	Azadirachtin, meliantriol, salanin	Leaves are made as a paste with water and applied to the infected area.
Myristica fragrance[6]	Nut meg	Myristicaceae	Fruits	Myristic acid, d-pinene, limonene, d-borneol, l-terpineol	Crushed fruits are applied to the infected area after making paste with the water.
Artemisia vulgaris[7]	Mug wort	Asteraceae	Entire plant or dried leaves	Cineole, triterpines, flavonoid	Decoction of dried leaves or the entire plant is applied to prevent the acne.
Pisum sativum[7]	Pea	Fabaceae	Fruit	Lutin, linoeic acid, glutathione	Crushed peas are made into paste and used as face mask.
Cucurbita pepo[7]	Pump kin	Cucurbitaceae	Seed,	Linoleic acid	Seed oil, dried

			leaves, Roots		leaves or the infusions of root are used in acne treatment
Allium cepa[7]	Onion	Amaryllidaceae	Fruit	Methyl dithiopropane, allin	Juices of fruits are used.
Cymbopogon citratus Stapf[8]	Lemon grass	Graminae	Leaf, fruit	Citronellol, citral, myrcene	Essential oil produced from the useful parts are applied externally
Ocimum americana L[8]	Lime, hairy	Lamiaceae	Fruit, leaf	Flavonid	Decoctions are applied externally
Citrus hystrix DC[8]	Kaffir lime	Rutaceae	Fruit, rind	Citronellal, citronellol	Juice and rind are traditionally used as anti-acne agents.
Ocimum sanctum L.[8]	Kovil tulsi	Labiatae	Leaves	Linolenic acid	It's leaf oil used in the treatment of acne.
Ocimum basilicum L.[8]	Basil	Lamiaceae	Seed	Trepineol, citronellol, 1, 8-cineole	Seed extract are used as anti-acne agent
Curcuma aromatica[9]	Wild termaric	Zingiberaceae	Rhizomes	Homosesterpinoid, curcumin	Decoctions of rhizomes are applied to the infected area.
Curcuma amada[9]	Mango ginger	Zingiberaceae	Rhizomes	β-myrcene, α-asarone	Paste of the rhizomes is used to prevent acne.
Curcuma zedoaria[9]	Zedoary	Zingiberaceae	Rhizomes	Sesquiterpenes	Juice of rhizomes is applied to the infected area.
Adina cordifolia[9]	Haldina	Rubiaceae	Bark	Stigmasta-5,22-diene-3β-*O*-α-L-rhamnopyranosyl-(1 → 4)-β-D-xylopyranoside, α-amyrin,	Bark decoction is used to control acne.

				octacosanol, and naringenin-7-methylether-4′-*O*-α-L-rhamnopyranoside	
Andrographis paniculata[10]	Kalmegh	Acanthaceae	Leaf	Diterpinoid lactone, andrographine	Leaf juice is applied externally to the infected area.
Terminalia arjuna[11]	Arjun	Combretaceae	Bark	Saponine, alkaloid	Bark decoction is applied.
Tabernaemontana divariacata[12]	Tabernaemontana, milk wood	Apocynaceae	Leaf	Ibogaine, voacangine	Decoction of leaf is applied in the infected area.
Melaleuca alternifolia[13]	Tea tree	Myrtaceae	Leaf	Monoterpenes, sesquiterpines	Leaf oil are used to prevent acne
Aloe vera[13]	Aloe vera, ghritakumari	Xanthorrhoeaceae	Leaf	Anthraquinone C-glycosides, lectins	Leaf gels are applied in acne infected area.
Garcinia mongostana[14]	Purple mangosteen	Clusiaceae	Fruit	Polyphenol, tannin	Fruit juice is used as anti-acne agent
Vitex negundo[15]	Chaste tree	Verbenaceae	Leaves	Casticin, Chrysophenol D, lutiolin	Leaves extract are applied to relief from acne
Annona squamosa[15]	Sugar apple	Annonaceae	Seeds	Camphene, Camphor, Eugenol	Seed powder applied topically.
Terminalia chebula[15]	Yellow myrobalan	Combretaceae	Fruits without seed	Triterpine, chebullin, ellagic acid, Lutiolin, tannic acid	Fruit juice are applied on the skin
Eucalyptus globulus Labill[16]	Eucalyptus	Myrtaceae	Leaves	Caffeic acid, catechin	The paste of leaf are applied over the skin
Psidium guajava L.[16]	Guava	Myrtaceae	Leaves	Saponin combined with oleanolic acid, tannin	Leaf extract are useful anti-acne agents
Juglans regia[17]	Wal nut	Juglandaceae	Seed	Linoleic Acid,	Seed powers

				Linolenic Acid	are applied in infected skin
Eucalyptus maculate[18]	Eucalyptus	Myrtaceae	Leaves	*p*-hydroxycinnamic acid, 1,6-dicinnamoyl-*O*-D-glucopyranoside	Leaf juices are used as anti-acne agent.
Satureja hortensis[19]	Summer savory	Lamiaceae	Leaves	Thymol, p-cymene, γ-terpinene and carvacrol	Leaf decoctions are applied externally for relief purpose.
Embelia ribes[20]	False Black Pepper	Myrsinaceae	Leaf	Embelin	Leaf extracts are used for treatment purpose
Terminalia bellerica[20]	Bastard myrobalan	Combretaceae	Seeds	Tannin, ellagic acid, β-Sitosterol	Seed powder act as anti-acne agent
Thuja orientalis[21]	Thuja	Cupressaceae	Leaf	Camphor, α-thujine	Leaf extractions are applied on the acne infected area.
Rosamarinus officinalis[22]	Rosemary	Lamiaceae	Flower	α-Pinine, 1, 8-cineole, camphor	Essential oil extracted from the flower are used as anti-acne agent
Pterocarpus santalinus[23, 24]	Red sandal wood	Fabaceae	Leaves, stem, bark	Flavonoid	Powders of leaf, stem and bark are used in the infected area.
Santalum album[25]	Sandal wood	Santalaceae	Wood	α, β- santalol	Wood oil are used for said purpose
Plumbago zeylanica[26]	Chitrak	Plumbaginaceae	Root	Plumbagin	Root powders are used to give relief.
Cinnamomum camphora[27, 28]	Camphor, kapur	Lauraceae	Leaf	Cineole, lignans	Leaf oil applied to the infected area.
Taraxacum officinale[29, 30]	Dendilion, karanphool	Asteraceae	Leaf, root	Sesquiterpene lactones	Tea of leaf is used for relief from acne.
Curcubita	Pump kin	Cucurbitaceae	Seed, root	Linoeic acid	Oil of seeds

pepo[31, 32]					and root are applied over the acnes.
Juglans nigra[33]	Black walnut, akhrot	Juglandaceae	Leaf, bark, fruit	Ellagitannins	Tincture and decoction of the useful parts are applied externally.
Viola species[34]	Wild pansy, banafshah	Violaceae	Flowers and roots	Salicylate, rutin	The juice are used for treatment purpose
Echinacea purpurea[35]	Purple coneflower	Compositae	Roots and Rhizomes	Cichoric acid, echinacoside	Tincture and paste of the roots and rhizomes are applied thoroughly to the infected area.
Saponaria officinalis[36, 37]	Soapwort	Caryophyllaceae	Leaves, stem, root	Saponin	Decoctions of useful parts are applied to the infected area.
Ricinus communis[38]	Castor bean	Euphorbiaceae	Seeds	Ricinoleic acid, linoleic acid and stearic acid	Seeds powder is applied topically.
Glycyrrhiza glabra[39]	Licorice	Leguminosae	Roots and rhizomes	Glycyrrhizic acid, carbenoxolone	Root and rhizome extract are topically applied on the skin.
Hydrastis canadensis[40]	Golden seal	Ranunculaceae	Leaf, root	Hydrastine, berberine, hydrastinine	Decoctions are used over the infected area.
Calendula officinalis[41]	Calendula	Asteraceae	Flower	Triterpinoid ester, auroxanthin, lutein, saponin	Strong infusion is used to treat acne.
Coleus forskohlii[42]	Coleus	Lamiaceae	Leaf	Rosmarinic acid	Leaf extract are applied topically
Caraca papaya[43]	Papaya	Caricaceae	Fruits,	Danielone,	Extracts are

			seeds, peels leaves	lycopene	used in the infected area.
Nigella sativa[44]	Black cumin	Ranunculaceae	Flowers	Nigellone, melanthin,tannin	Flower decoctions are used for the said purpose.
Lavendula species[45]	Lavender	Lamiaceae	Flower	Linalool, linalyl acetate	It sooths the itching and also neutralizes the redness that is produced due to acne.
Syzygium aromaticum[46]	Clove	Myrtaceae	Whole plant	Eugenol, tannin, β-caryophyllin	It not only treats acne but also treat acne scars.
Cocos nucifera[47]	Coconut, naryal	Arecaceae	Nut	Lauric acid, capric acid, vit-E	Oil of nut are used for treatment purpose
Arnica montana[41]	Arnica	Asteraceae	Flower	Sesquiterpene lactones	Powders of flower are applied externally in the infected site.
Coriandrum sativum[48]	Dhania	Umbelliferae	Fruits	Terpene, pinine, volatile oil	It's juice mixed with turmeric powder and applied in the infected area.
Hamamelis virginiana L.[49]	Witch hazel	Hamamelidaceae	Bark, leaves	Hamamelitannins	Decoctions are used in the infected area
Mentha sylvestris[50]	Wild mint	Lamiaceae	Leaf, flower	Essential oil	Extracts are applied to cure from the disease.
Anacardium pulsatilla[51]	Cashew	Anacardiaceae	Fruit	Salicylic acids	The extracts are applied over the infected area

					and they can also take as food to prevent from the disease.
Podocarpus nagi[52]	Tree bard	Podocarpaceae	Flower, fruit	Totarol	Decoction are applied topically
Camellia sinensis[53]	Black tea	Thiaceae	Leaves	Epicatechin gallate	Leaves extract applied topically
Saraca asoca[54]	Ashoka	Caesalpiniaceae	Leaves	Glycoside, flavonoids, tannins and saponins	Juices are applied directly after filtration.
Centella asiatica[55]	Centilla	Apiaceae	Leaves	Saponin	Juice are applied on the infected area
Amaranthus hypochondriacus Linn.[33]	Amaranth	Amaranthaceae	Seeds and leaves	Saponin	Seed powder and leaf extracts are applied in the acne infected area.
Asparagus officinalis Linn.[56]	Asparagus	Liliaceae	Roots and seeds	Fructo-oligosaccharides, steroidal glycosides, β-sitosterol	Root decoction and seed powder are applied in the infected part.
Betula alba[33]	Birch	Betulaceae	Bark	Terpinoid, salicylic acid, flavon	Raw bark juices are applied directly after washing the infected area.
Arctium lappa Linn.[57]	Burdock	Asteraceae	Roots and leaves	Arctiopicrin, sesquiterpene	Juice of both parts are applied directly and remove after 10-12 min.
Simmondsia chinensis (Link.) C. Schneid[58]	Jojoba oil	Buxaceae	Seeds, leaves	Two major flavonoid constituents of the leaves are isorhamnetin 3-	Seed and leaf powders are applied over the disease covered area.

				Rutinoside (narcissin) and isorhamnetin 3,7-dirhamnoside	
Ledum groenlandicum Oeder[56]	Labrador tea	Ericaceae	Leaves	Tannic acid, arbutin, volatile oil	Juices are directly applied from when the disease starts.
Populus candicans Noench[33]	Poplar	Salicaceae	Leaves, barks, buds	Flavons, Phenols, catecol	Decoctions of these three are used to make artificial cover over the infected area.
Rheum officinale Baill[33]	Rhubarb	Polygonaceae	Root	Rhein, chrysophenol	Root juice is used to treat the disease.
Urtica dioica Linn.[59]	Stinging nettle	Urticaceae	Leaves	Flavonoid, Tannin, Volatile oil	Leaf juice can cure disease if it is used regularly after bath.
Chelidonium majus linn.[33]	Celandine	Papaveraceae	Whole plant	Isoquinoline alkaloid of proberberine, benzophenanthrene, protopine type.	All parts products used are applied over the disease area in various formulations.
Thymus Linn.[33]	Thyme	Lamiaceae	Leaves	Thymol, carvacrol	Decoctions are applied for cure from this microbial disease.
Coscinium fenestratum[60]	Wood turmeric	Menispermaceae	Whole plant	12,13-dihydro-8-oxo-berberine, berberine, oxyberberine	Various formulations are produced and applied over the infected area.
Quercus infectoria[61]	Nut galls	Fagaceae	Gall	Tannin, gallic acid, ellagic acid	After preparing the suitable formulation this is applied to the

					infected area.
Hemidesmus indicus[62]	Indian Sarsaparilla	Apocynaceae	Leaves	p-methoxy salicylic aldehyde, sterols, and pregnane glyco side	Leaf extracts are used to cure this disease.
Eclipta alba[62]	Bhringraj	Asteraceae	Whole plant	Alkaloids, flavonoids, triterpenoids	The whole plat products are applied directly in the infected area.
Curcubito pepo[62]	Pumpkin	Cucurbitaceae	Fruit and flower	Oleic acid, linoleic acid, cucurbitacins B, D, E, G	The juices are applied in the microbe infected topical area.
Tephrosia purpurea[62]	Fish Poison, Wild Indigo	Fabaceae	Leaf, seed, root	prenylated flavonoid, sesquiterpene	Extracts are used to cure the disease.
Mentha piperita[62]	Peppermint	Labiatae	Flower, leaf	Menthone, menthyl acetate, volatile oil	Juices of both the parts are applied directly in the infected area.
Pongamia pinnata[62]	Indian Beech, Karanj	Legununosae	Leaves, Roots, Bark, seeds	Oleic acid, stearic and palmitic acids	Their juice are used to treat the disease
Symplocos racemosa[62]	Lodhra	Symplocaceae	Bark	Loturine, Loturidine, colloturine	Decoctions are used to prevent from the said disease.
Euphorbia hirta[62]	Barokhervi	Euphorbiacea e	Root and also dry herbs	Afzelin, quercitrin, and myricitrin, rutin	Decoction of all these are used in such kind of skin disease.
Tinospora cordyfolia[62]	Guduchi	Menispermac eae	Leaf, root	diterpene compounds, polyphenols, and polysaccharides, including arabinoga lactan polysacchari de	Extracts of leaf and root are applied over the infected area.
Thespesia populnea[62]	Tulip	Malvaceae	Leaf, root, seed, flower	Glycosides, Flavonoids, Tannins, Sterols, Triterpenoids	Juices are used for treatment purpose.

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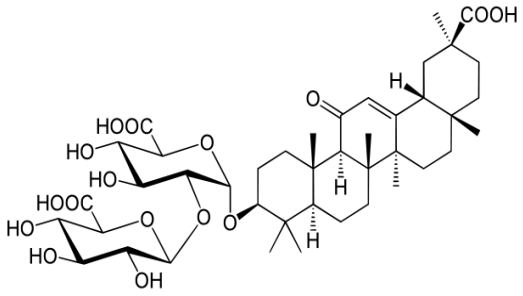
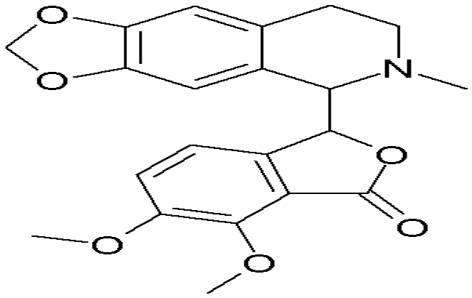
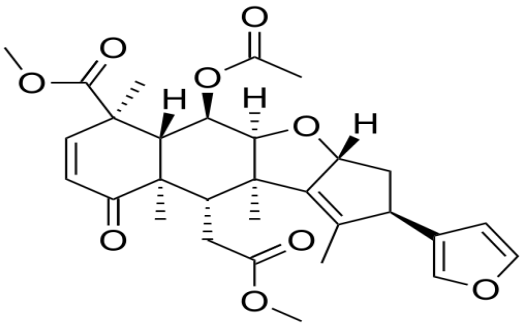
Jasminum officinale[62]	Jasmine	Oleaceae	Flower	Benzyl acetate	Essential oil which is derived from the useful parts is used in dermatology.



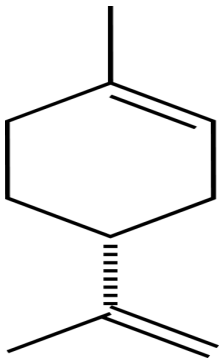
Glycyrrhizic acid



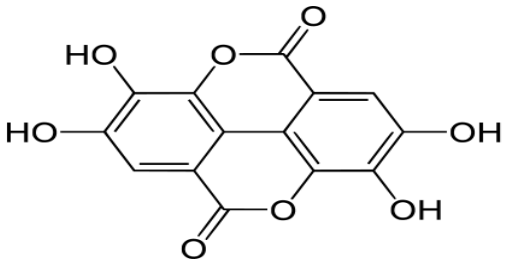
Hydrastine



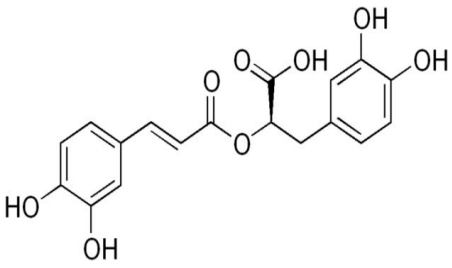
Nimbin



Limonene



Ellagic acid



Rosmarinic acid

Figure 1. Chemical structures of various phytoconstituents