MEDWIN PUBLISHERS
Committed to Create Value for Researchers

Journal of Natural & Ayurvedic Medicine
ISSN: 2578-4986

Herbal Expectorants for the Pandemic Period and Beyond: A Review

Nayagam JR*, George S and Sagna A

Department of Botany, Union Christian College, India

***Corresponding author:** Justin R Nayagam, Department of Botany, Union Christian College, Aluva- 2, Kerala, 683102, India, Tel: 9446207353; Email: drjustinrnayagam@gmail.com

Review Article

Volume 4 Issue 3

Received Date: June 06, 2020

Published Date: July 09, 2020

DOI: 10.23880/jonam-16000254

Abstract

As the ongoing COVID 19 pandemic has become a global health crisis and it mainly affects respiratory tract. An effort for presenting the traditional expectorants of the herbal medicine gains its attention, which is promising for the world population from the plant genetic resources to reduce the pressure on pharmacy for medicine. Herbal expectorants are proved to be environmentally safe and are available in around any habitats. Forty eight species of plants used traditionally as expectorants from six continents are included in the present study. Plant parts used its dosage forms, bioactive compounds having expectorant activities are evaluated in the study. *Abies webbiana* Lindl. belongs to gymnosperm, *Adiantum capillus-veneries* L. is a pteridophyte and 42 others are flowering plants. These plants were distributed and used as herbal expectorants in different continents of the world except Antartica. Forty two species studied are distributed in Asia, thirteen species in Europe, six species from South America, five species in Africa and three species each in Australia and North America. Distribution pattern with respect to different continent is considered, which an added attraction is. During this dreadful situation people can rely on herbal expectorants to subside respiratory infections and increase immunity.

Keywords: Herbal Expectorants; COVID-19; Traditional Expectorants

Introduction

The initial symptoms of COVID-19 patients include were fever, myalgia, sore throat and dry cough which are common to any acute respiratory virus infection. Pneumonia was consistent with the manifestation of lower respiratory tract infections. By contrast, upper respiratory tract symptoms were less common in these patients. Non-specific symptoms included dizziness, diarrhoea, vomiting, headache, and generalised weakness [1].

Chloroquine, a widely-used anti-malarial and autoimmune disease drug, was reported as a potential broad-spectrum antiviral drug [2]. Remdesivir is an adenosine analogue, which incorporates into nascent viral RNA chains and results in pre-mature termination [3]. It was repoted that remdesivir and chloroquine are highly effective in the control of 2019-nCoV infection in vitro [4]. Azithromycin added to hydroxychloroquine was significantly more efficient for virus elimination [5]. Development of its preventive and treatment is still an ongoing process by scientists from all over the world. It is in this contest an effort for presenting the traditional expectorants of the herbal medicine gains its attention, which is promising for the world population when enough quantity of medicine is not available. When world is in the hands of terrifying infection, people with mild symptoms can exist with herbal solutions.

Herbal Expectorants

Forty eight species of plants used traditionally as expectorants in different parts of the world are critically avaluated and presented in Table.1. Among these species *Abies webbiana* Lindl. belongs to gymnosperm, *Adiantum*

capillus-veneries L. is a pteridophyte and rest other species are flowering plants that include six monocot speceis belong to four families and forty species are dicotyledons from twenty six families. These plants are distributed and used as herbal expectorants in different continents of the world except Antartica. Forty two species studied are distributed in Asia, thirteen species in Europe, six species from South America, five species in Africa and three species each in Australia and North America. *Eucalyptus globulus* Labill. is widely distributed in all the six continents either by natural occurance or by way of cultivation. *Marrubium vulgare* Linn. and *Origanum majorana* Linn. are scattered in three continents; Africa, Europe and Asia, while *Borago officinalis* Linn. is distributed in South America, Europe and Asia. Other species are limited to one or two continent in distribution and used as herbal expectorants.

Herbal drugs in crude form or in polyherbal formulations for the treatment of cough are better alternatives of modern cough drugs [6]. Decoctions or infusions of different parts of the plants studied are used individually or in combinations to cure cough, sore throat, bronchitis, asthma and other respiratory tract problems. In *Dorema ammoniacum, Liquidambar orientalis* and *Styrax benzoin,* stem exudates are used as expectorant. Researches on herbal medicines have reported that bio active components like saponin, alkaloids, flavonoids, terpinoids and phenolic compounds are used in the treatment of cough [7]. Terpinoids and flavonoids are found to be major bio active compounds having expectorant action in the selected plant species. Phenols, alkaloids and saponins are also components of these plants involved in cough remedies. Limonene an expectorant is a monoterpene present in three plants *Carum carvi*, *Melaleuca leucadendron* and *Zingiber officinale.* Flavanoid luteolin is a cough suppresser isolated from *Anisochilus carnosus, Ficus carica* and *Mucuna monosperma*. *Cressa cretica, Eucalyptus globulus* and *Ficus carica* contain flavonoid quercetin which is an expectorant theraputic. Flavonoid rutin has an expectorant activity obtained from *Brunella vulgaris, Tussilago farfara* and *Viola tricolor*. *Origanum majorana* and *Thymus serpyllum* yield natural terpinoid thymol with expectorant property. Bio active components of the plants included in the present study shows there relevance to be used as expectorant in folk medicines.

SL No	Botanical Name	Common Name	Family name	Distribution-continent/ country	Part and Form of use as expectorant	Bioactive chemicals detected	Reference
1	*Abies webbiana*Lindl.	Indian Silver	*Pinaceae*	Asia – India	Dried leaves - powdered leaves along with the juice of *Adathoda vasica* and honey	Flavonoids, biflavonoid glycosides and phytosterols.	[8]
2	*Acacia concinna*(Willd.) DC.	Indian Acalypha	*Euphorbiaceae*	Asia – India	Leaves - Decoction	Saponin, lupeol, aspinasterol, acacic acid lactone, hexacosanol and aspinasterone	[9]
3	*Adiantum capillus-veneries* L.	American Maidenhair Fern, Venus Hair, Rock Fern.	*Adiantaceae*	Asia – India	Leaves - Decoction is filtered and honey or sugar is added; Infusion	Flavonoid, glucosides, terpenoids, adiantone, isoquercetin, astragalin, kaempferol	[10-12]

4	*Allium cepa*Linn.	Onion	*Liliaceae/Alliaceae*	Asia – India	Bulb - Decoction, infusion, fresh juice, raw, cooked, or roasted bulb	Thiosulphinates, cepaenes	[13]
5	*Amygdalus persica*Linn.	Peach tree	*Rosaceae*	Asia – China, Korea, Japan, India	Bark, seeds, leaves	Amygdalin	[14-19]
6	*Anisochilus carnosus* Wall.	Karpuravalli (Folk name-southern region)	*Labiatae/ Lamiaceae*	Asia – India	Leaves and stem - Fresh juices of leaves mixed with sugar and gingelly oil; Leaves and stems in infusion	Glucosides of luteolin and apigenin.	[13,20]
7	*Barleria prionitis* Linn.	Common Yellow Nail Dye Plant	*Acanthaceae*	Asia – India	Leaves and dried stem bark	Glycosides such as 6-O-trans-p-coumaroyl-8-O-acetylshanzhiside, barlerin and acetylbarlerin	[13,21]
8	*Blumea balsamifera*DC.	Ngai Camphor	*Compositae/ Asteraceae*	Asia – India	Leaves - Infusion	Borneol, caryophyllene, ledol phytol, caryophyllene oxide, guaiol.	[22]
9	*Boerhavia diffusa*Linn.	Horse-purslane, Hogweed	*Nyctaginaceae*	Asia – India	Whole plant -Infusion	Phenolics glycosides, terpenoids, rotenoids,	[23,24]
10	*Borago officinalis*Linn.	Borage, Cow's Tongue Plant	*Boraginaceae*	South America - Argentina; Europe - Spain - Canary Island; Asia	Leaf, dried pedicel, dried flowers - Leaf and dried flower infusion; decoction of the dried pedicels	Gamma linolenic acid, ascorbic acid, lycopsamine, supindine viridiflorate, pyrrolizidine alkaloid	[12,25-28],
11	*Brunella vulgaris*Linn.	Self-heal	*Labiatae/ Lamiaceae*	Europe - Germany; Asia – India, Turkey	Aerial aprts, infloresence - infusions mixed with honey	Flavonoids,rutin.	[29-31]
12	*Carum carvi* Linn.	Caraway	*Umbelliferae/ Apiaceae*	Europe; Asia	Seeds	Volatile oil consisting of carvone (40-60%), and limonene	[32, 33]

13	*Cassia occidentalis*Linn.	Coffee Senna, Foetid Cassia, Negro Coffee	*Cealsalpiniaceae*	Sout America -Peruvian Amazon	Seeds and flower - seeds brewed into a coffee-like beverage; flower infusion	Physcion and its glucosides, emodin, betasitosterol and sennosides	[34-36]
14	*Centipeda orbicularis*Lour.	Sneezewort	*Compositae / Asteraceae*	Australia; Asia - India	Leaves and wood ash - pituri	Flavonoids, sesquiterpenes and amide	[18,37]
15	*Cephaelis ipecacuanha* (Brot.) A. Rich.	Ipecac, Ipecacuanha	*Rubiaceae*	America; Asia-India	Roots and rhizome - Extract	Emetine, cephaeline, ipecacuanhic acid, and nauseating ethereal oil.	[38,39]
16	*Cheiranthus cheiri* Linn.	Wall-flower, Gilli Flower	*Cruciferae / Brassicaceae*	Europe; Asia	Leaves , flowers and seeds	Glycosides and cherinine (a glucoside of the digitalis group)	[13,18,40,41]
17	*Cinnamomum camphora*(Linn.) Nees & Eberm.	Camphor tree.	*Lauraceae*	Asia - China, Japan	Wood and leaves - Infusion	Camphor, safrol, linalool, eugenol	[42,43]
18	*Cordia myxa*Roxb. non Linn.	Sabestan Plum	*Boraginaceae*	Asia - India	Fruits	Alkaloids, flavanoids, coumarins	[44,45]
19	*Cressa cretica*Linn.	Rudanti, Rudantikaa, Rudravanti (Ayurvedic)	*Convolvulaceae*	Asia - Bahrain, India	Whole plant	Alkaloid, β sitosterol, scopoletin, quercetin glycosides, umbelliferone	[46]
20	*Curcuma amada*Roxb.	Mango-ginger, Wild Turmeric	*Zingiberaceae*	Asia - India	Rhizome	Curcuminoid	[41,47]
21	*Datisca cannabina* L.	False hemp	*Datiscaceae*	Asia - Iraq, Nepal, India	Whole plant - Decoction	Flavonoids (datiscin and datiscanin)	[48,49]
22	*Dorema ammoniacum* D. Don.	Ammoniacum, Gum ammoniac	*Umbelliferae / Apiaceae*	Europe; Northern Asia - Siberia; Asia - India, Iran	Gum-resin	Amino-resinol,ferulene ,coumarins and Ammoniacum	[18,50,51]
23	*Eriobotrya japonica* Lindl.	Loquat, Japanese Medlar	*Rosaceae*	Asia - China, India	Dried leaves - Ingredient in Shini-seihai-to and Biwayo-to	Flavanoid componds	[52,53]

24	*Eucalyptus globulus*Labill.	Blue-Gum tree, Australian	*Myrtaceae*	Europe -Italy, France; Australia; S. America - Venezuela; N. America - Jamaica and Guaremala; Asia	Leaves, root bark - Infusion and decoction	Crystallized resin, cymenes, terpenes, flavonoids -quercetin, tannins, volatile oils	[29,54,55]
25	*Ficus carica* Linn.	Common Fig	*Moraceae*	Africa - Morocco; Asia - India	Leaf - Infusion and decoctions	Bergapten, quercetin, luteolin, and 4 ‘,5’-dihydropsoralen	[56]
26	*Glycyrrhiza glabra*Linn.	Licorice, Liquorice	*Papilionaceae / Fabaceae*	Africa; Asia - India	Underground stem and root	Glycyrrhizin, Glycosides -glycyrrhizol, glabrins A and B	[57,58]
27	*Hibiscus mutabilis*Linn.	Cotton-Rose, Chinese-Rose, Confederate Rose	*Malvaceae*	Asia - Bangladesh, China	Flower	Quercetin, kaempferol, betulinic acid, hexyl stearate, tetratriacontanol, nonacosane	[18,59,60]
28	*Iris germanica*Linn.	Orris, Iridis Rhizome, German Iris	*Iridaceae*	Africa - Morocco	Root - Infusion	Irigenin S, iriside A, stigmasterol (I), irone, irilone, irigenin, iridin	[61]
29	*Lilium candidum*Linn.	Madona Lily, Annunciation Lily, White Lily	*Liliaceae*	Europe - Romania; Asia - Anatolia, India	Bulb and flower - Infusion	Jatropham and etioline	[62,63]
30	*Liquidambar orientalis*Mill.	Fragrant Maple	*Altingiaceae / Hamamelidaceae*	Asia - Turkey, Anatolia	Resin from trunk	Cinnamic acid, cinnamin acid esters, cinnamyl cinnamate (styracin), phenylpropyl cinnamate; triterpene acids; vanillin; styrene	[13,64]
31	*Lobelia inflata*Linn.	Indian Tabacco, Pukeweed	*Campanulaceae/ Lobeliaceae*	North America	Leaves - used in teas and tinctures	Lobeline, Lobelachrin, Lobelia acid.	[65]
32	*Marrubium vulgare*Linn.	Horehound	*Labiatae / Lamiaceae*	Africa - Algeria; Europe; Central Asia	Whole plant - combined with other herbs such as *Inula helenium* L. and *Glycyrrhiza glabra* L.	Marrubiin	[66,67]

33	*Melaleuca leucadendron*Linn.	Cajeput tree, Swamp Tea tree, White Tea tree	*Myrtaceae*	Asia - Burma, Cambodia, Thailand, Malay, Indonasia; Australia	Essential oil	Terpenoids, nerolidol, limonene, benzaldehyde, valeraldehyde, and dipentene	[68-70]
34	*Morus alba*Linn.	ChineseWhite-Mulberry	*Moraceae*	Asia - Turkey, China, India	Root bark, fruit	Phenolic compounds, triterpinoids and a glyceride	[71,72]
35	*Mucuna monosperma*DC.	Kaakaandolaa (Ayurveda)	*Papilionaceae / Fabaceae*	Asia - Nepal, Andaman	Seeds	Luteolin, acacetin	[73]
36	*Myroxylon balsamum*Harms.	Tolu Balsam tree	*Leguminosae*	S. America - Colombia, Venezuela, Peru	Essential oil - used in cough syrups and pills	Benzoic acid and Cinnamic acid	[74-76]
37	*Origanum majorana*Linn.	Sweet Marjoram.	*Labiatae / Lamiaceae*	Asia - Iran; Africa - Morocco; Europe	Seeds , aerial parts, branches - Infusion	Thymol, rosmarinic acid, caffeic acid; and triterpenoids	[13,61,77]
38	*Pilocarpus microphyllus*Stapf.	Jaborandi	*Rutaceae*	South America - Brazil	Leaves	Pilocarpine	[78]
39	*Pimpinella anisum*Linn.	Anise, Aniseed	*Umbelliferae / Apiaceae*	Asia - India, Turkey	Seeds - powder and decoctions; used in traditional tea	Volatile oil, coumarin, β amyrin, stigmasterol, flavonoid glycosides	[27,79]
40	*Polygala chinensis*auct. non Linn.	*Senega*	*Polygalaceae*	Asia - India, Andaman	Root and leaves - Decoction of roots; infusion of leaves	Senegin	[13,80,81]
41	*Saponaria officinalis*Linn.	Bouncing Bet, Soapwort	*Caryophyllaceae*	Europe - Romania; Asia - Turkey	Leaves, root and rhizome - Decoction prepared from leaves; Infusion of root and rhizome	Saporubrinic acid and Saponin	[13,27,82,83]
42	*Scindapsus officinalis*Schott.	Ayurvedic-Gajakrishna, Hastipippali, Gajapippali	*Araceae*	Asia - India, Andaman	Whole plant - used in medicated oils; Decoction of green leaves	Scindapsin A and B	[10,13,84,85]

43	*Styrax benzoin* Dry.	True Gum Benzoin, Sumatra Benzoin or Gum Benjamin	*Styraceae*	South-East Asia and East Indies	Stem exudates	Cinnamic, benzoic and sumaresinolic acid esters	[86,87]
44	*Thymus serpyllum*Linn.	Mother-of-thyme, Wild Thyme	*Labiatae / Lamiaceae*	N. America - Britain; Asia - India, Nepal	Aerial parts - combining it with other plants like *Tussilago farfara* L., or *Marrubium vulgare* L.	Thymol	[88-90]
45	*Tussilago farfara*Linn.	Coughwort, Coltsfoot, Asses' Foot	*Compositae / Asteraceae*	Europe - Italy, Balkans; Asia - India, Nepal	Aerial parts, leaves and flowers - Infusion	Chlorogenic acid, isochlorogenic acid A, B and C, 3,5-dicaffeoylquinic acid, and rutin	[91,92]
46	*Viola odorata*Linn.	*Sweet violet*	*Violaceae*	Europe; Asia - Iran, India	Roots	Volatile oil, salicylic acid methyl ester, saponins, alkaloids.	[18,92,93]
47	*Viola tricolor*Linn.	Heartsease, Wild Pansy	*Violaceae*	Europe; Asia, Turkey	Aerial parts - Infusion	Rutin, violin and salicylic acid	[18,27,92]
48	*Zingiber officinale* Rosc.	Ginger	*Zingiberaceae*	Asia - India	Rhizome - Juice mixed with honey; Boil ginger in milk	Zingiberene, camphene, ß-pinene, myrcene, limonene, 1,8-cineole , ß-phellandrene.	[94,95]

Table 1: List of Plant Species Used as Expectorants from Different Parts of the World and Key Source of Information.

Conclusion

Based on the present understanding of novel coronavirus pathogenesis and symptoms known so far, an attempt has been made to enunciate the various medicinal herbs from the plant genetic resources in different continents of earth. The plants and its parts, which are used as its decoctions and infusions and their combinations could be done as a treatment benefit for COVID-19 patients and those with seasonal flu and health issues. This may also increase immunity of the patients and provide resistance and safety of them against the viral infection.

References

1. Shi H, Han X, Jiang N, Cao Y, Alwalid O, et al. (2020) Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. The Lancet Infectious Diseases 20(4): 425-434.

2. Yan Y, Zou Z, Sun Y, Li X, Xu KF, et al. (2013) Anti-malaria drug chloroquine is highly effective in treating avian influenza A H5N1 virus infection in an animal model. Cell research 23(2): 300-302.

3. Warren TK, Jordan R, Lo MK, Ray AS, Mackman RL, et al. (2016) Therapeutic efficacy of the small molecule GS-5734 against Ebola virus in rhesus monkeys. Nature 531(7594): 381-385.

4. Wang M, Cao R, Zhang L, Yang X, Liu J, et al. (2020) Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) *in vitro*. Cell research 30(3): 269-271.

5. Gautret P, Lagier JC, Parola P, Meddeb L, Mailhe M, et al. (2020) Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non-randomized clinical trial. Int J Antimicrob Agents.

6. Jahan Y, Mahmood T, Bagga P, Kumar A, Singh K, et al. (2015) Future prospects of cough treatment; herbal medicines v/s modern drugs. Int J Pharm Sci Res 6: 3689-3697.

7. Chakraborty R, Biplab De ND, Sen S (2013) Antitussive, expectorant activity of Marsilea minuta L., an Indian vegetable. J Adv Pharm Technol Res 4(1): 61-64.

8. Watt G (1883) Economic products of India. The superintendent of Government Printing, India, pp: 652-653.

9. Dineshkumar B, Vigneshkumar P, Bhuvaneshwaran SP, Mitra A (2010) Phyto-pharmacology of Acalypha indica: A Review. International Journal of BioSciences, Alternative and Holistic Medicine 1(2): 27-32.

10. Savithramma N, Sulochana C, Rao KN (2007) Ethnobotanical survey of plants used to treat asthma in Andhra Pradesh, India. J Ethnopharmacol 113(1): 54-61.

11. De Natale A, Pollio A (2007) Plants species in the folk medicine of Montecorvino Rovella (inland Campania, Italy). J Ethnopharmacol 109(2): 295-303.

12. Hammond GB, Fernandez ID, Villegas LF, Vaisberg AJ (1998) A survey of traditional medicinal plants from the Callejón de Huaylas, Department of Ancash, Peru. J Ethnopharmacol 61(1): 17-30.

13. Khare CP (2007) Indian Medicinal Plants: An Illustrated Dictionary. 1st Edn, Springer Science, New York, pp: 82-83.

14. Mhaskar KS, Blatter E, Caius JF (2000) Kirtikar and Basu's Illustrated Indian Medicinal Plants: Their Usage in Ayurveda and Unani Medicines. Vol 10, Sri Satguru Publications.

15. Kirtikar KR, Basu BD (2001) Indian medicinal plant, International Book Distributors, 2nd [Edn.], Dehradun.

16. Lim TK (2012) Edible medicinal and non-medicinal plants, vol. 4 - Fruits, Springer Science & Business Media, London, UK, pp: 492-509.

17. Gaur RD (1999) Flora of the district Garhwal North West Himalayas, Transmedia, Srinagar Garhwal, pp: 227.

18. Gairola S, Gupta V, Bansal P, Singh R, Maithani M (2010) Herbal antitussives and expectorants - A review. International Journal of Pharmaceutical Sciences Review and Research 5(2): 5-9.

19. Sang S, Kikuzaki H, Lapsley K, Rosen RT, Nakatani N, et al. (2002) Sphingolipid and other constituents from almond nuts (PrunusamygdalusBatsch). J Agric Food Chem 50(16): 4709-4712.

20. Sirsi M, Natarajan S, Tirunarayanan M, Murthy PS (2013) Studies on Indian Medicinal Plants: Pharmacological actions & antibacterial activity of Anisochilus carnosus [No Labiatae]. Journal of the Indian Institute of Science 37(2): 98.

21. Chopra RN, Nayar SL, Chopra IC (1956) Barleria prionitis Linn. In: Glossary of Indian medicinal plants. Council of Scientific and Industrial Research Publication. New Delhi, India, pp: 33-34.

22. Ruangrungsi NIJSIRI, Tantivatana PAYOM, Tappayuthpijarn PIMOLWAN, Borris RP, Cordell GA (1985) Traditional medicinal plants of Thailand vi. Isolation of cryptomeridiol from Blumea balsamifera. Sci Asia 11(1): 47.

23. Kumar M, Bussmann RW, Mukesh J, Kumar P (2011) Ethnomedicinal uses of plants close to rural habitation in Garhwal Himalaya, India. Journal of Medicinal Plants Research 5(11): 2252-2260.

24. Nayakpranati, Thirunavoukkarusu M (2016) A review of the plant Boerhaaviadiffusa: itschemistry, pharmacology and therapeutic potential. The journal of Phytopharmacology 5(2): 83-92.

25. Anesini C, Perez C (1993) Screening of plants used in Argentine folk medicine for antimicrobial activity. J Ethnopharmacoly 39(2): 119-128.

26. Darias V, Bravo L, Barquin E, Herrera DM, Fraile C (1986) Contribution to the ethnopharmacological study of the Canary islands. J Ethnopharmacol 15(2): 169-193.

27. Ugulu I, Baslar S, Yorek N, Dogan Y (2009) The investigation and quantitative ethnobotanical evaluation of medicinal plants used around Izmir province, Turkey. J Med Plant Res 3(5): 345-367.

28. Leung AY, Foster S, (1996) Encyclopedia of common natural ingredients- Used in food, drugs and cosmetics. 2nd [Edn.], A Wiley- Interscience Publication. USA, pp: 98 -99.

29. Garnier G, Bezanger-Beauquesne L, Debraux G (1961) Resources Medicinales de la Flore Française (Medicinal Resources of French Flora); Vol I & II, Vigot Freres, Paris, pp: 1115.

30. Yesilada E, Honda G, Sezik E, Tabata M, Goto T, et al. (1993) Traditional medicine in Turkey IV. Folk medicine in the Mediterranean subdivision. J Ethnopharmacol 39(1): 31-38.

31. Bai Y, Xia B, Xie W, Zhou Y, Xie J, et al. (2016) Phytochemistry and pharmacological activities of the genus Prunella. Food chemistry 204: 483-496.

32. Chevallier A (1996) The Encyclopedia of Medicinal Plants. Dorling Kindersley. London.

33. Robert T, Rodney Y (2014) Essential Oil Safety 2nd [Edn.], Churchill Livingstone, pp: 483-647.

34. Rutter RA (1990) Catalogo de Plantas Utiles de la Amazonia Peruana.Instituto Linguistico de Verano, Yarinacocha, Peru.

35. Longman O (1996) Indian Medicinal plants, 1st [Edn.], Vol. 1, Orient Longmanpvt ltd., Anna Salai, Chennai, pp: 488.

36. Al-Snafi Ali (2015) The Therapeutic Importance of Cassia occidentalis-An Overview. Indian Journal of Pharmaceutical Science & Research 5(3): 158-171.

37. Latz PK (1995) 'Bushfires and bushtucker', IAD Press, Alice Springs, Northern Territory.

38. Gupta R (1971) Ipecac a promising subsidiary crop for north-eastern plantation regions. Indian Farming 21: 19-21.

39. Solis PN, Lang'at C, Gupta MP, Kirby GC, Warhurst DC, et al. (1995) Bio-active compounds from Psychotria camponutans. Planta medica 61(1): 62-65.

40. Evans WC, Evans D, Trease GE (2002) Trease and Evans' pharmacognosy. Edinburgh: WB Saunders.

41. Kirtikar KR, Basu BD (1984) Indian Medicinal Plants. Vol 4, Lalit Mohan Basu, Allahabad, India, pp: 2422.

42. Asmaa SS, Ayman FA, Souria DM, Fawzia S (2012) Protective Effect of Cinnamomum Camphora Leaves Extract Against Atrazine Induced Genotoxicity and Biochemical Effect on Mice. Journal of American Science 8(1): 1-1.

43. Yeung Him-Che (1985) Handbook of Chinese Herbs and Formulas. Institute of Chinese Medicine, Los Angeles.

44. Rechinger KH (1997) Cordia. Flora Iranica. Graz: Akademische Durck-u Verlangsantalt 48: 6.

45. Matias EFF, Alves EF, do Nascimento Silva MK, de Alencar Carvalho VR, Coutinho HDM, et al. (2015) The genus Cordia: botanists, ethno, chemical and pharmacological aspects. Revista Brasileira de Farmacognosia 25(5): 542-552.

46. Rizk AFM, El-Ghazaly GA (1995) Medicinal and poisonous plants of Qatar (p. 101). Qatar, UAE: Scientific and Applied Research Centre, University of Qatar.

47. Ravindran PN, Pillai GS, Divakaran M (2012) Other herbs and spices: mango ginger to wasabi. Woodhead Publishing Limited.

48. Al-douri NA (2000) A survey of medicinal plants and their traditional uses in Iraq. Pharmaceutical biology 38(1): 74-79.

49. Ijaz S, Perveen A, Kousar S, Ghaffar N (2019). Physico-chemical and Preliminary Phytochemical Study of Seeds of Datisca cannabina Linn (Datiscaceae) from Himalaya Region in Pakistan. Pharmaceut Reg Affairs 8(1): 1-4.

50. Langenheim JH (2003) Plant resins: chemistry, evolution, ecology, and ethnobotany (No. 620.1924 L275p). Oregon, US: Timber Press.

51. Thomson AT (1830) The London Dispensatory,apreactical synopsis of MateriaMedica, Pharmacy, and Therapuetics. London, pp: 361.

52. Wu YX, Jian TY, Lv H, Ding XQ, Zuo YY, et al. (2018) Antitussive and expectorant properties of growing and fallen leaves of loquat (Eriobotrya japonica). Revista Brasileira de Farmacognosia 28(2): 239-242.

53. Hamada A, Yoshioka S, Takuma D, Yokota J, Cui T, et al. (2004) The effect of Eriobotrya japonica seed extract on oxidative stress in adriamycin-induced nephropathy in rats. Biol Pharma Bull 27(12): 1961-1964.

54. Loi MC, Maxia L, Maxia A (2005) Ethnobotanical comparison between the villages of Escolca and Lotzorai (Sardinia, Italy). Journal of herbs, spices & medicinal plants 11(3): 67-84.

55. Konoshima T, Takasaki M (2002) 12 Chemistry and bioactivity of the non-volatile constituents of eucalyptus. Eucalyptus: the genus Eucalyptus, pp: 269.

56. Fatiha BA, Ouafae B, Souad S, Jamila D, Allal D, et al. (2017) Ethnobotany Study of Medicinal Plants Used in the Treatment of Respiratory Diseases in the Middle Region of Oum Rbai. International Journal of Environment, Agriculture and Biotechnology 2(4): 1460-1468.

57. Chitale PK (1997) A comparative study of Ayurveda and treatment by indian drugs. Indian Books Centre-Sri Satguru Publications.

58. Gupta R (2016) Yastimadhu (Glycyrrhiza glabra)–an important plant of Ayurvedic system of medicine. J Med Plants Stud 4(4): 30-31.

59. Rahman AHMM, Gondha R (2014) Taxonomy and Traditional Medicine Practices on Malvaceae (Mallow Family) of Rajshahi, Bangladesh. Open Journal of

Botany 1(2): 19-24.

60. Raut DN, Mandal SC, Pal SC (2014) Phytochemical and pharmacological overview of Hibiscus mutabilis Linn. Int J Pharm Res Bio Sci 3: 236-241.

61. El-Hilaly J, Hmammouchi M, Lyoussi B (2003) Ethnobotanical studies and economic evaluation of medicinal plants in Taounate province (Northern Morocco). Journal of Ethnopharmacology 86(2-3): 149-158.

62. Gazi JFP (2000) Alkaloids from the bulbs of Lilium candidum L. of Turkish origin. J Fac Pharm Gazi 17(1): 25-28.

63. Papp N, Sali N, Csepregi R, Toth M, Gyergyak K, et al. (2019) Antioxidant potential of some plants used in folk medicine in Romania. Farmacia 67(2): 323-330.

64. Yesilada E, Sezik E, Honda G, Takaishi Y, Takeda Y, et al. (1999) Traditional medicine in Turkey IX:: Folk medicine in north-west Anatolia. J Ethnopharmacol 64(3): 195-210.

65. Stansbury J, Saunders PR, Zampieron E (2013) The use of lobelia in the treatment of asthma and respiratory illness. Journal of Restorative Medicine 2(1): 94-100.

66. Boudjelal A, Henchiri C, Siracusa L, Sari M, Ruberto G (2012) Compositional analysis and in vivo anti-diabetic activity of wild Algerian Marrubium vulgare L. infusion. Fitoterapia 83(2): 286-292.

67. Lodhi S, Vadnere GP, Sharma VK, Usman M (2017) Marrubium vulgare L.: A review on phytochemical and pharmacological aspects. Journal of Intercultural Ethnopharmacology 6(4): 429-452.

68. Pujiarti R, Ohtani Y, Ichiura H (2011) Physicochemical properties and chemical compositions of Melaleuca leucadendron leaf oils taken from the plantations in Java, Indonesia. J Wood Sci 57: 446-451.

69. Khan SS (2015) Exotic arboreal plants of Bhopal, their therapeutic potential and Conservation. Indian J Applied & Pure Bio 30(1): 89-95.

70. Fall R, Ngom S, Sall D, Sembène M, Samb A (2017) Chemical characterization of essential oil from the leaves of Callistemon viminalis (DR) and Melaleuca leucadendron (Linn.). Asian Pacific Journal of Tropical Biomedicine 7(4): 347-351.

71. Yamatake Y, Shibata M, Nagai M, (1976) Pharmacological studies on root bark of mulberry tree (Morus alba L.). The Japanese Journal of Pharmacology 26(4): 461-469.

72. Baytop T (1999) Türkiyede bitkiler ile tedavi. *İstanbul* Eczacılık Fakültesi Yayınları, Istanbul, pp: 444.

73. Khory NR, Katrak NN (1999) Materia medica of India and their therapeutics 380. BDH Printers, New Delhi.

74. Rose J (2002) Herbs Used as Oils/EO Used From Herbs©.

75. Rizzini CT, Mors WB (1995) Botânica Econômica Brasileira. Ambito Cultural.

76. Van Wyk BE, Wink M (2018) Medicinal plants of the world. CABI. Briza Publications, pp: 230.

77. Bahmani M, Khaksarian M, Rafieian-Kopaei M, Abbasi N (2018) Overview of the therapeutic effects of Origanum vulgare and Hypericum perforatum based on Iran's ethnopharmacological documents. Journal of Clinical and Diagnostic Research 12(7): 1-4.

78. Vieira RF (1999) Conservation of medicinal and aromatic plants in Brazil. Perspectives on new crops and new uses, pp: 152-159.

79. Muller-Limmroth W, Frohlich HH (1980) Effect of various phytotheraputic expectorants on mucociliary transport. Fortschr Med 98(3): 95-101.

80. Sekharan R, Jagadeesan M (1997) An ethnobotanical survey of javvadhu hills, tamil nadu. Ancient science of life 16(3): 206.

81. Singh MK, Arya M, Bharti KA, Singh K (2018) Exploration of some folk medicinal herbs in forest fringe villages of Assam (India): A study amid Nagaon and Golaghat districts. Journal of Pharmacognosy and Phytochemistry 7(1): 2362-2368.

82. Tita I, Mogosanu GD, Tita MG (2009) Ethnobotanical inventory of medicinal plants from the South-West of Romania. Farmacia 57(2): 141-156.

83. Kregiel D, Berlowska J, Witonska I, Antolak H, Proestos C, et al. (2017) Saponin-based, biological-active surfactants from plants. Application and characterization of surfactants, pp: 183-205.

84. Bhattacharya S (2006) Anticancer botanicals. New Delhi: Daya Pub-lishing House, pp: 8.

85. Kaushik D, Kaushik P (2012) Scindaspus officinalis:Acomparhensive review. IntJ Pharm 2(2): 18-27.

86. Jain SK, Srivastava S (2005) Traditional uses of some Indian plants among islanders of the Indian Ocean.

Traditional uses of some Indian plants among islanders of the Indian Ocean 4(4): 345-357.

87. Atia Sharif HN, Rehman R, Mushtaq A, Rashid U (2016) A review on bioactive potential of Benzoin Resin. International Journal of Chemical and Biochemical Sciences 10: 106-110.

88. Pharmacopoeia B (2009) The British Pharmacopoeia Secretariat of the Medicines and Healthcare products Regulatory Agency. United Kingdom.

89. Fachini-Queiroz FC, Kummer R, Estevão-Silva CF, Carvalho MD, Cunha JM, et al. (2012) Effects of Thymol and Carvacrol, Constituents of Thymus vulgaris L. Essential Oil, on the Inflammatory Response. Evid Based Complement Alternat Med.

90. Pina-Vaz C, Rodrigues GA, Pinto E, Costa-de-Oliveira S, Tavares C, et al. (2004) Antifungal activity of Thymus oils and their major compounds. J Eur Acad Dermatol Venereol 18(1): 73-78.

91. Bellia G, Pieroni A (2015) Isolated, but transnational: the glocal nature of Waldensian ethnobotany, Western Alps, NW Italy. J ethnobiol ethnomed 11(1): 37.

92. Tasic S (2012) Ethnobotany in SEE-WB countries; traditional uses of indigenous plants. Lekovite sirovine 32: 71-81.

93. Mahboubi M, Kashani LMT (2018) A Narrative study about the role of Viola odorata as traditional medicinal plant in management of respiratory problems. Advances in Integrative Medicine 5(3): 112-118.

94. Shende JJ, Rajurkar BM, Mhaiskar MN, Dalal LP (2014) Ethnobotanical studies of Samudrapur Tahsil of Wardha district. IOSR J Pharm Biol Sci 9(6): 16-23.

95. Salam S, Jamir NS, Roma M (2016) Ethnobotanical remedies to cough and cold as practiced by the Tangkhul tribe in the Ukhrul District of Manipur, India.