

Ayurvedic remedies of allergic broncho pulmonary aspergillosis

Iqraa Salim Shaikh *, Zainab Riaz Khan, Saher Ismail Dalvi and Ajaz Ahmad Kutub Ali Sayed

Department of pharmacy, AIKTC, Panvel, District- Raigad, Maharashtra, India.

World Journal of Advanced Research and Reviews, 2021, 11(03), 337–350

Publication history: Received on 20 August 2021; revised on 25 September 2021; accepted on 27 September 2021

Article DOI: <https://doi.org/10.30574/wjarr.2021.11.3.0471>

Abstract

Patients with asthma, cystic fibrosis and immunocompromised have high chance of getting sensitized to fungi, as the covid-19 pandemic has emerged there are concerns for severe complication such as invasive fungal infection (IFI) which includes ABPA. many patients with ABPA suffers from additional obstacles like allergic conditions such as atopic dermatitis (eczema), urticaria (hives), allergic rhinitis (hay fever) and sinusitis. Hence Its early detection and proper management with treatment can prevent bronchiectasis and pulmonary fibrosis which occurs in later stages during progression of disease. In this article we have emphasized on ayurvedic drugs and evaluate them on scientific basis as the Ayurveda has very crucial function to play in fungal infections from ancient times. This article highlights pathophysiology, causes of disease, methods of diagnosis and the preparation and potential of ayurvedic remedies which needs to be explore scientifically.

Keywords: Bronchiectasis; Pathophysiology; Pulmonary fibrosis; Invasive fungal infection; *Aspergillus fumigatus*

1. Introduction

Aspergillus fumigatus is a species of fungus which causes respiratory disorders, allergies and invasive infection. It caused almost 90% of aspergillus illness. When infection caused by *Aspergillus fumigatus* termed as aspergillosis and it has various types include allergic bronchopulmonary aspergillosis (ABPA), Chronic pulmonary aspergillosis and invasive aspergillosis. ABPA is a kind of lung disorder where allergic reaction occurs from a hypersensitive response of the body's immune system, when body come in contact with the fungus aspergillus (also called mold) from the environment [2]. People with cystic fibrosis, bronchiectasis and asthma are prone to acquire ABPA readily. Because they tend to have more mucus in their respiratory tract. Mucus provides favorable conditions for molds to grow rapidly. Researched shows that ABPA develop in about 2% and 2-15% of all the asthmatic and patient with cystic fibrosis respectively.

2. History

In 1897, Renon were revealed about association of asthma and aspergillosis. ABPA introduced first in 1952 by Dr. K.F Hinson and his colleagues. They described few points about ABPA i.e. (a) recurrent episode of wheezy bronchitis which is caused of inflammation and narrowing of the airways (b) serum eosinophilia (high number of eosinophils in serum) (c) sputum production (d) fever, (d) Infiltrates on chest x-ray films (while performing x-ray presence of white spots in the lungs which indicates infection). It was first reported in United States (1968). Scientists found that more than 100 species of aspergillus, but only few of them are known to cause infection in human [17].

* Corresponding author: Iqraa Salim Shaikh
Department of pharmacy, AIKTC, Panvel, District- Raigad, Maharashtra, India.

3. Causes

- ABPA can be a rare cause of poorly controlled asthma. In asthmatic patients, thick mucus is present in the airways, which make it difficult to clear up the aspergillus spores when inhaled. Patient with asthma who associated with ABPA has facing difficulty controlling their asthma despite using medications.
- ABPA affect the patients who have cystic fibrosis, they are allergic to aspergillus. Cystic fibrosis is a genetic disease that can affect the lungs. In this, lungs functioning doesn't respond to other CF therapy [18].
- Exposure of high concentration of spores is the main cause of ABPA.
- Patients with mycetoma can also develop hypersensitivity response to ABPA.
- People who having weak immune system, due to taking immunosuppressant for long time or having immune compromising disease like cancer, HIV, etc. [18].
- Covid recovered patients or suffering from covid are also susceptible to ABPA, as they are immunocompromised.
- Patients on chemotherapy for leukemia, prone to get *Aspergillus fumigatus* infection because decrease in level of white blood cells count.
- People who have recent history of influenza
- Having cavities in lungs due to existing or history of tuberculosis.

4. Pathogenesis

The pathogenesis of ABPA is complex, can involve both genetic and immune factors. Aspergillus and conidia are found all over the place. Because of their small diameter which ranging from 2 to 3 micrometers, it can easily enter the pulmonary alveoli and deposited there. Pathogenesis of ABPA yet to be known clearly. Two important aspects are considered for their development, namely persistence of fungi in the airways and asymmetric hyper-immune T-helper 2 (Th2) response (due to the HLA-DR2/DR5 bearing dendritic cells). Due to the presence of hydrophobin RodA (hydrophobic layer composed of a protein from the hydrophobin family) on the surface of conidia of aspergillus, they are immunologically inactive. Host's immune system fails to recognized the fungi. Asthmatic patients with ABPA, cause insufficient clearance of conidia of *A. fumigatus*, which allow them to germinate into hyphae [1]. Germinating conidia exposes their fungal protein by sloughing the rodlet layer. Phagocytes recognized the fungal protein and clear the fungi partially. Subsequent fungal growth causes exocytosis of proteins which in turn activate the adaptive immune response by Th cells. In contrast, Th2 CD4 + T-cell is predominant in ABPA with the release of interleukins. This Th2 response does not exterminate the fungi, but give rise to inflammation by mast cells degranulation and influx of large number of eosinophils and neutrophils. In this way, immunological and pathological finding of ABPA occurred.

4.1. Common signs and symptoms of ABPA

- Coughing
- Coughing with mucus plugs (brown in color)
- Wheezing
- Difficulty exercising
- Chest pain or tightness
- Recurrent fever

4.2. Classification of ABPA

- ABPA-S: All the diagnostic features of ABPA
- ABPA-B: ABPA with bronchiectasis, found on CT of the chest
- ABPA-HAM: ABPA with high attenuation mucus
- ABPA-CPF- With chronic pleuropulmonary fibrosis [1].

4.3. Stages of ABPA

4.3.1. Stage-1: Acute

Diagnostic criteria include presence of mucoïd impaction (mucus plugs) observed on chest imaging or bronchoscopy

4.3.2. Stage-2: Response

IgE level decreases by 25% of baseline at 8 weeks

4.3.3. Stage-3: Exacerbation

Worsening condition, Increase in IgE by $\geq 50\%$ from the baseline established during response

4.3.4. Stage-4: Remission

- Sustained clinical-radiological improvement seen.
- IgE levels remain at or below baseline for almost 6 months off treatment

4.3.5. Stage-5: Treatment-dependent ABPA

- Intensification in condition within six months of stopping therapy
- Worsening of clinical and/or radiological, with immunological worsening occur on tapering oral steroids/azoles.

4.3.6. Stage-6: Advanced ABPA

On chest imaging found that extensive bronchiectasis due to ABPA [1].

4.4. Diagnosis

4.4.1. Immunological investigation

Aspergillus fumigatus-specific immunoglobulin E (IgE)

- Increased level of *A.fumigatus* IgE (<0.35 kUA/I) will help in the diagnosis of .
- It is a preferred test for screening asthmatic patients for ABPA

Aspergillus skin test:

- Immediate cutaneous reaction occurs to *A.fumigatus* antigen which shows the presence of elevated IgE against *A.fumigatus*.
- Currently Not favoured for screening of asthmatic patients for ABPA.

Role of recombinant *Aspergillus* antigens

- Antigens which extracted from *A.fumigatus* are currently used for performing immunological assays in ABPA.
- WHO and International Union of Immunological Societies (IUIS) found that 23 specific antigens of *A. fumigatus*

4.4.2. Radiological investigation

Chest radiograph

- This method is useful for determine stages of ABPA.
- Broadly find transient or fixed ABPA.

Computed tomography of the chest:

- CT of thorax is currently the choice for ABPA and bronchiectasis are most common finding on CT test.
- ABPA can be present without radiological manifestation which prominence that diagnosis of ABPA is primarily immunological [1].

5. Pathophysiology

The pathophysiology of ABPA is composite. In an immuno compromised host (asthmatics/ Cystic fibrosis) conidia of *aspergillus* is trapped in the mucous and narrowed airways. In case of CF, there is a dysfunctional clearance along with the viscous mucous layer in the airway which causes disruption of effective spore removal process [15]. The proteolytic product of *aspergillus* may also intrude with the clearance of airway by disruption of epithelial cell barrier. Once

resident, aspergillus start germinating and proliferating which ultimately can cause in high antigen demand. Dendritic cells processes leads to the release of particular cytokines by antigen presenting cells and to antigen presentation to T lymphocytes. In the normal host, the response to antigen presentation is the activation of nonallergic (Th1) and allergic (Th2) lymphocytes. The Th1 response of cytotoxic action and antibody production may protect against aspergillus infection. The activation of Th2 pathway leads to specific cytokines and immunoglobulin elucidation that initiate allergic inflammation. The asymmetry of Th2 over Th1 is thought to drive ABPA. The magnitude of Th2 immune activation is greater in patient with ABPA as compared to the patient allergic to aspergillus. Although in both cases Th2 response predominates. Activated Th2 cells synthesize and secrete specific cytokines such as IL-4, IL-5 and IL-13. The synthesis of IgE takes place. When attached to aspergillus antigen, IgE activates mast cell. Mast cells chemokines with IL-5 recruit eosinophils. Eosinophils is the most prominent immune cells in airway mucosa of patient with ABPA and is thought to be major effective inflammatory cell. Degranulation of active mast cells and eosinophils leads to release of initiators of vasodilation and bronchoconstriction. This localized inflammation leads to mucous production, airway hyperreactivity and ultimately causes bronchiectasis and Cystic fibrosis which leads to respiratory failure [14].

6. Allopathic Classification of Drugs

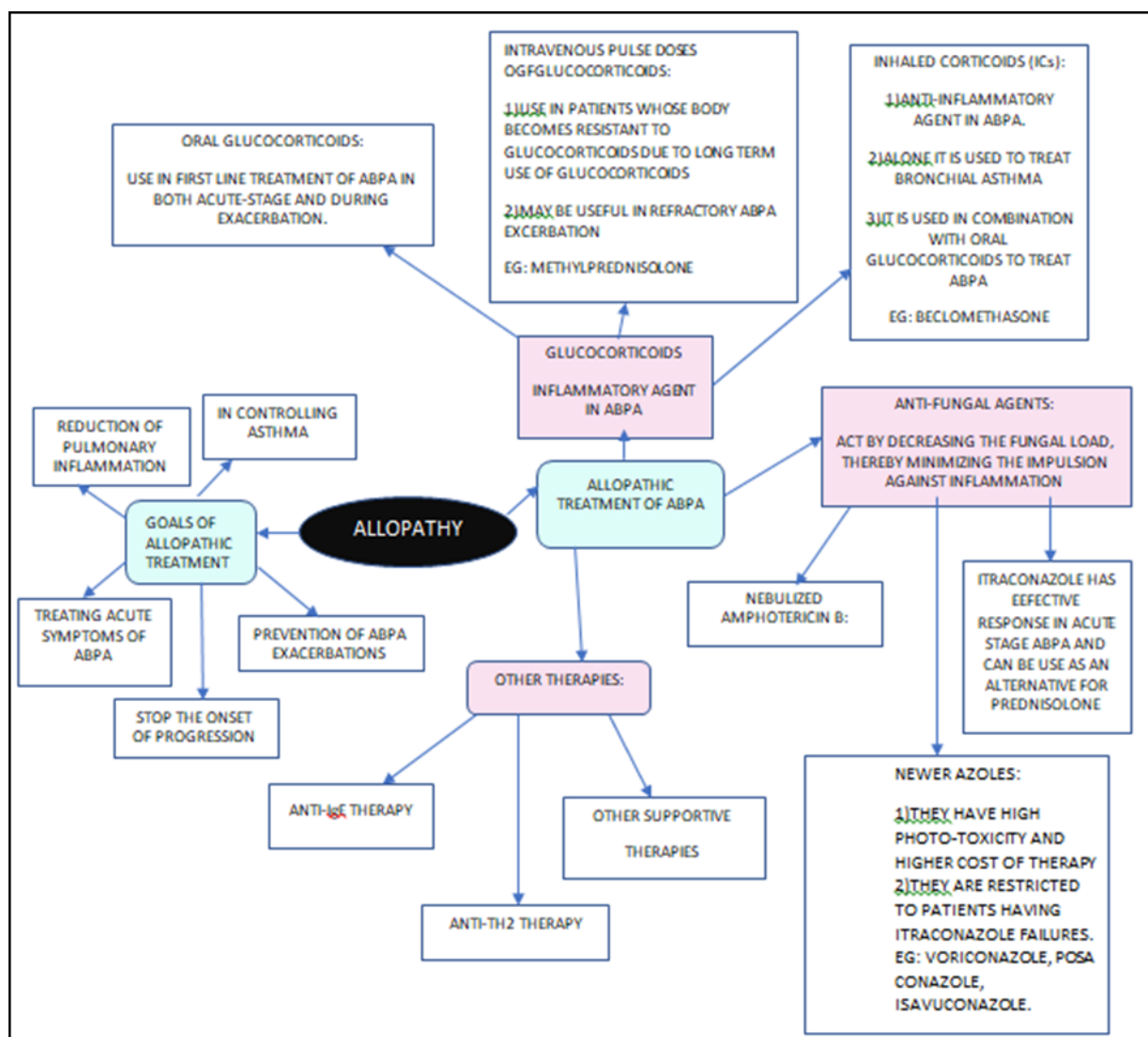


Figure 1 Allopathic classification of drugs

7. Ayurvedic Herbs and Remedies

Ayurvedic medicine system is one of the ancient medicine systems in the world native to India. Its basic principle is to prevent and treat disease rather than respond to disease [1]. It's main purpose is to balance the 3 doshas of body that

is vata(energy of movement), pitta(energy of digestion and metabolism) and kapha(energy of lubrication). ALLERGIC BRONCHO PULMONARY ASPERGILLOSIS (ABPA) is considered as Maha shwasa which is mainly triggered due to vata and kapha dosha and cause breathlessness, coughing and wheezing [2]. If remain untreated may cause bronchiectasis and also spread throughout the body affect other body organs such as brain and liver. Ayurveda provides effective herbal drugs to treat ABPA.

7.1. Ayurvedic Drugs of ABPA

7.1.1. Guduchi (*Tinospora cordifolia*)



Figure 2 Guduchi

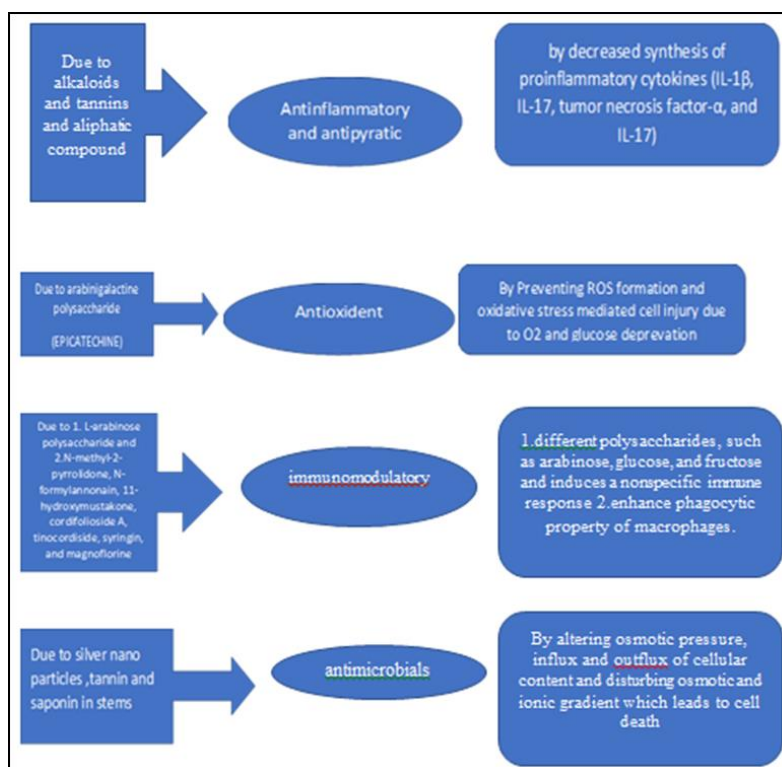


Figure 3 Properties & MOA of Guduchi

It is one of the frequently used drugs to treat the Madhumeha, Pandu, Kamala, Amlapitta, Grahani, Kustha, Jirna Jwara and Viswamjwara, Trishna, Shool, Yakritavikara, etc. it's used since vedic period and it is the best choice in terms of effectiveness, ease of availability, economy and administration. It is already mentioned in the Samhitas, Nighantus, and Granthas for its effectiveness.

Table 1 Dried stem of “*Tinospora Cardifolia*”, belonging to family menispermace

Drug name	Chemical composition [8]	Nutritional value	Pharmacological Activities [8]	Effectiveness [9]
<p><i>Tinospora cordifolia</i></p> <p>SYNONYMS Guduchi, Giloy</p> <p>FAMILY: Menispermace</p>	<p>ALKALOIDS: barberine, palmatine, tinosporine, Magnoflorine, tembetarine, choline</p> <p>2.GLYCOSIDES: cordiosides, tinocordiifolioside, cordifolioside A, B, D, E. Tinosporides, columbinsyringin.</p> <p>3.DITERPENOID LACTONE: Beta sitosterol, sitosterol.</p> <p>4.STEROIDS: ecdysterone, makisterone A, heptacosanol, octacosanol</p> <p>5.SESQUITERPENOIDS: Nonacosan-15-one</p> <p>6.ALIPHATIC COMPOUNDS :3(Alpha-4-dihydroxy-3-methoxy-benzyl)-4-(4-Compounds hydroxyl-3-methoxy-benzyl)-tetrahydrofuran. Jatrorrhizine.</p> <p>OTHER: giloinin, tinosporic acid</p>	<p>fiber content (15.9%), proteins (4.5%-11.2%), sufficient carbohydrate (61.66%) and low fat (3.1%). It has 292.54 calories per 100 g. It has high potassium (0.845%), high chromium (0.006%), sufficient iron (0.28%) and sufficient calcium (0.131%)</p>	<p>Anti-diabetic, Anti-periodic, Anti-spasmodic, anti-inflammatory, anti-neoplastic activities, anti-oxidant, immunomodulator, anti-stress, anti-leprotic, anti-malarial, hepatoprotective, anti-allergic and anti-arthritis, antifungal.</p>	<p>1. Aqueous extract: <i>Aspergillus fumigatus</i>><i>Candida albicans</i>><i>Trichophyton rubrum</i>><i>Aspergillus niger</i></p> <p>2. Ethanolic extract: <i>A.fumigatus</i>><i>T.rubrum</i>><i>C.albicans</i>><i>A.niger</i>><i>M.gypsum</i></p> <p>3. Methanolic extract: <i>A.fumigatus</i>, <i>T.rubrum</i>><i>C. albicans</i>><i>A.niger</i>> <i>M.gypsum</i></p> <p>4. acetone extract: <i>A. fumigatus</i>><i>A.niger</i>><i>T. Rubrum</i>><i>C. albicans</i></p>

Study has been done on *tinospora cardifolia* on mice which shows that the aqueous extract of stem shows high microbial inhibition zone against *aspergillus fumigatus* which causes ABPA as the most active secondary metabolites are present in stem such as alkaloids, tannin and saponin [9]. This plant is used in Ayurveda as single drug in the form of Swarasa, Kalka, Kwatha, Hima, Churna, and Ghrita. so, we will see aqueous extract of stem to treat the ABPA.

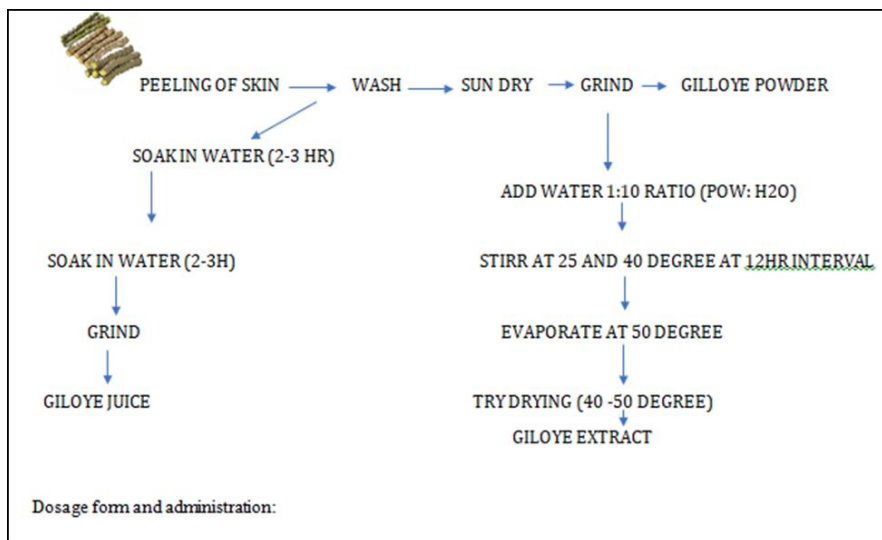


Figure 4 Extraction of Drug

Table 2 Dosage form and administration

1.giloye kawath (Kadha)	giloye powder + water + honey	2-3 tbsp a twice a day
2 giloye stem juice (Sawarsa).	giloye juice + honey	2-3 tbsp twice a day
3. Giloye medicated ghee [19]	ghee + giloye powder / decoction / herbal extract	melt the ghee with giloye so the active property will enter into ghee so the active property will enter into the ghee drink it empty stomach and wait for 30 minutes before having food.
4. Giloye kashavam(decoction)	giloye stem decoction +pappili With infused honey.	heat giloy stem powder with water stirs it until water evaporates to half then add gaja pappilli will enter into the ghee drink it empty stomach and wait for 30 minutes before having food 2 to 3 pieces add honey to remove bitterness
5. Giloye stava (extract powder) [7]	powder extract paste + water	keep aside fresh giloye extract for 4 to 5 hrs. until sedimentation and the giloye juice + honey filter Remove the filter air dry starchy sediment (extract powder) now add trikatu 1gm and add turmeric 2 pinch take it once a day with water.

7.2. Tulsi (*Oscimum sanctum*)



Figure 5 Tulsi

Consist of dried and fresh leaves of *Oscimum sanctum* Linn, which belonging to the family; Labiatea

Tulasi in Sanskrit, Holybasil in English. Erect softy hairy aromatic herbs or underherb found throughout in India. As it has several medicinal properties, grows different parts of the World. It also cultivated in gardens and homes in India beacuse of having mythological importance. About Tulsi and its therapeutic values has been well written in Ayurveda and described as Dashemani shwasaharni (antiasthmatic) and Kaphaghna (anti-cough). Medicinal uses of plants were mentioned in “Rigveda” which has been written between 4500-1600 BC, supposed to be the oldest repository of human knowledge [3]. Because of restorative advantages tulsi is used for relieving different types of illness, irritation, intestinal sickness, coronary illness, migraine, stomach issue, kidney stones, heart related problems and many more.

Table 3 Chemical compositions and their Action of Drug Tulsi

Chemical composition	Pharmacological activities
Essential oils: Eugenol and linalool	Antifungal; activity against candida albicans and candida tropicalis [3]
Carracrol and Tetpene Sesquiterpene B-caryophyllene	Antibacteria; used to treat oral infection
Eugenol and methyl Eugenol	Analgesic: toothache
	Respiratory disorders: bronchitis, bronchial asthma, influenza, cough and cold
Eugenol	Cardiac disorders as Vasodilator
	Along with Triphala used to treat ocular disorders
	Gastrointestinal disorders; gastritis, hepatic disorder, increase peristaltic movement of GI tract.
Polyphenol rosmanic acid	Antioxidant; so, this property helps in treating oral lesion

Tulsi promotes the removal of catarrhal matter and mucus from the bronchial tube which is favorable environment for growth of *Aspergillus fumigatus*. Chewing Tulsi leaves relieves from the symptoms like cold and cough and other respiratory problems. The drug has vital role in body as a immunomodulator which help to stabilize, recovers, and maintains the proper balanced functioning of immune system. Prepare the body against foreign matters like bacteria, viruses, microbes, allergens by enhancing the immune system [4]. Through double blind randomized controlled trials scientists predict that ethanolic (70%) extract of Tulsi leaves has immunomodulatory property. In India, people believed that by taking Tulsi leaves on empty stomach, improves immunity. It also helps in decontamination of environment.

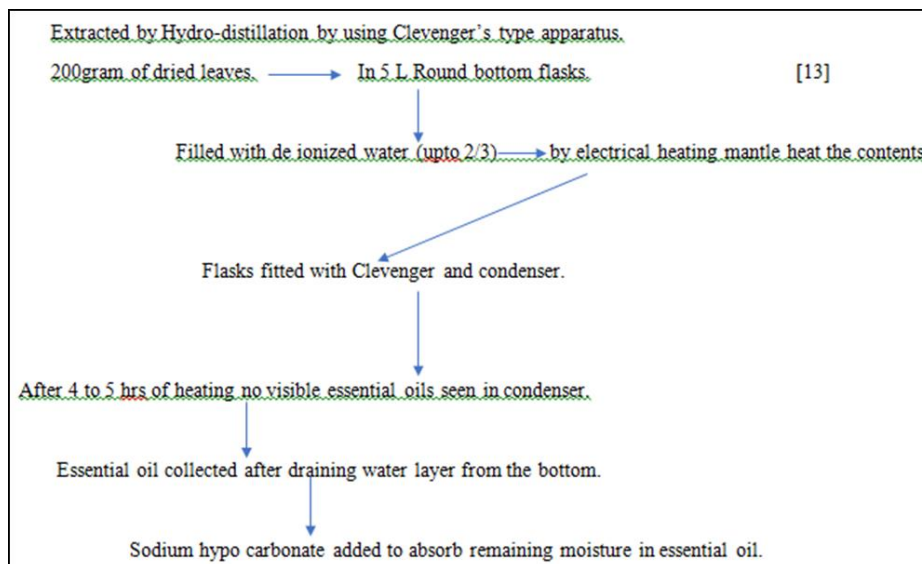


Figure 6 Extraction of essential oil from dried leaves of tulsi

Table 4 Herbal Remedies by using Tulsi

Tulsi kashawam(decoction)	Tulsi leaves decoction +honey + ginger	Use for bronchitis, asthma, influenza, cough and cold like symptoms. Take twice a day.
Tulsi leaves extract	Tulsi leaves +water(boiled)	Use to treat symptoms like sore throat. Gargle 2 times a day after meal
Tulsi seeds powder	Powder + water/cow's milk	Use as an antioxidant to treat ABPA. Take twice a day

7.3. Turmeric (*Curcuma longa*)



Figure 7 Turmeric

BIOLOGICAL SOURCE: It is dried as well as fresh rhizome of *curcuma longa*, *C.domestica*, belongs to family-zingiberaceae [5].

Curcuma longa (haridra) often known as turmeric is a tall or long herb. it is cultured all over the tropical and other regions in India. The name 'Haridra' itself indicates the yellow colour of plant. The word 'curcuma' has its origin from arabic name kurkum and 'longa' shows that it is tall. Haridra is the most commonly used drug in Ayurvedic and allopathic medical field. In ayurveda the shloka (verse) gives information of the characteristics and activity of herb haridra. It is tikta(bitter) and katu(pungent) in taste. It is easily digestible (laghu) and penetrating (ruksha). It is hot in potency and alleviate kapha and pitta dosha.Haridra can be used to pacify kapha and pitta doshas ,and can be used against allergic reactions induced by imbalance of these doshas [15] . The plant contains phyto constituents like volatile oil, resins, Starch grain, cuscumin, curcuminoids and Mono sesquiterpenes such as camphorcamphene, zingiberene, cucumenes,etc. These phytoconstituents contributes to its anti-allergic and anti-microbial actions [6].

Table 5 Chemical compositions and their Action of Drug Turmeric

Chemical compositions	Pharmacological actions
Curcumin	Anti-inflammatory, anti-oxidant, immunomodulating in ABPA, anti-tumour and anti-cancer, anti-HIV, antimutagenic, anti-fungal, anti-diabetic, antifibrinogenic, wound healing, lipid lowering, radio protective.
Demethoxy curcumin, bisdemethoxycurcumin, methanol Extract, water extract (curcumin)	Anti-oxidant
Diacetyl curcumin, triethyl curcumin	Anti-inflammatory
Tetrahydro curcumin	Anti-inflammatory, antidiabetic

7.3.1. Turmeric in bronchial asthma

Turmeric (haldi) due to its natural anti-inflammatory and expectorant activity helps relieve the symptoms of asthma. Turmeric is the best ayurvedic medicine for bronchial asthma reduces congestion of the bronchial tubes and help in removing phlegm thus provides relaxation from symptoms and prevents inflammation of Airways which in turn helps to continue normal airflow to lungs. Turmeric decreases kapha so is used to remove mucous in the throat, is useful in asthma. Curcumin is active component of turmeric for its therapeutic effects including anti-inflammatory, anti-oxidant, anti-allergic and immunomodulatory property. It has direct effect to reduce congestion, allergic reactions, improves breathing with better immunity against allergens [15]. Curcumin's anti-microbial properties are same efficacious as steroids and antibiotics in decreasing bacterial infections which could lead to an asthma attack.

7.3.2. Anti-oxidant property of turmeric in ABPA

Since haridra rectifies the Agni (metabolic fire) by the virtue of its ushna veerya, katu-tikta rasa, laghu -ruksha gunas and katu vipaka, Haridra cleanses and detoxifies Rasa (digestive juices and nutrition) and thus enables free circulation of Nutrients to every cell of the body thus restoring the normal body functions. Haridra by removing the blocks in the cells created by contaminated kapha and pitta enabling free movement of vata also enables the anatomical and physiological recovery of kapha varga dhatus. The control of all three doshas by turmeric can be considered as an anti-oxidant effect of haridra. In some Research it is proven that taking turmeric in spice or supplement form could possibly help in reducing inflammation and decrease airway obstruction due to its anti-oxidant property, so this is one of therapy to treat bronchial asthma [6].

7.3.3. EXTRACTION

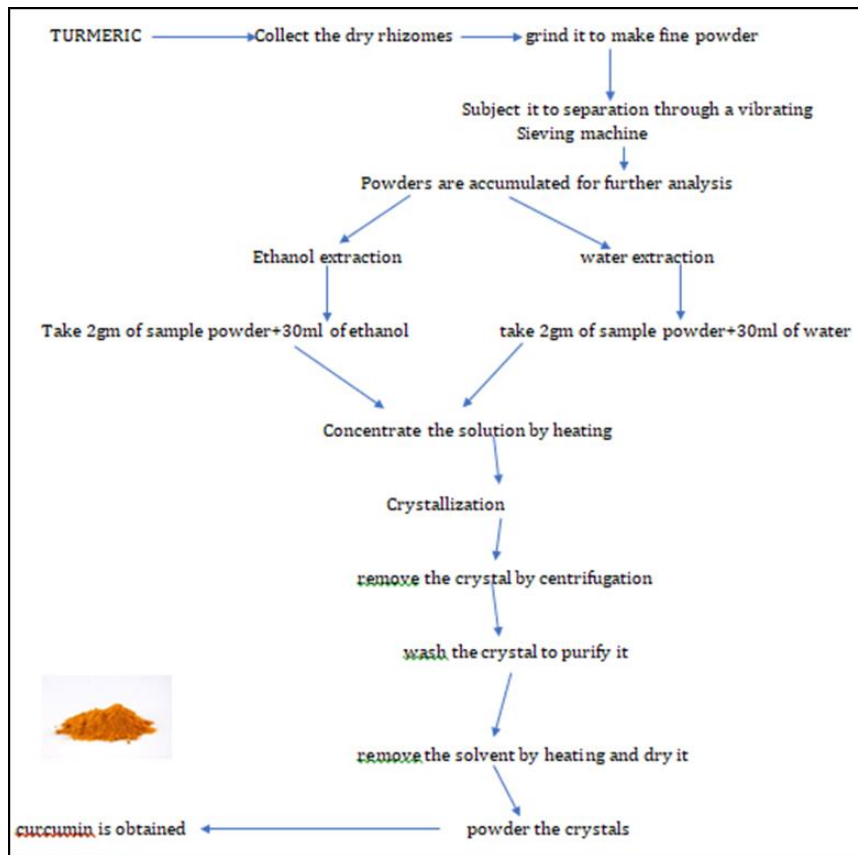


Figure 8 Extraction of Curcumin

7.3.4. Ayurvedic medicines with turmeric as an ingredient

- Khadiradi Vati: use in treatment of bad breath (1-2 tablets ,2-3 times a day, or as directed by ayurvedic doctor.

NOTE: It is advised to keep the tablet in mouth and swallow its pieces slowly.

- Vatasranut: it's fumes are inhaled to relief hiccups, asthma and poisonous conditions.
- Curcumin capsules: it provides relief from. The symptoms such as shortness of breath, coughing, and wheezing. It also possesses immuno boosting property, thus useful in allergic broncho pulmonary aspergillosis. (1-2 capsules ,2 times a day with water, just after meals).
- Acetone extract, methanol extract, water extract: use as an anti-oxidant in ABPA
- Ethanol extract: Anti-fungal
- Curcumin longa is also used as a single drug:
 - Decoction(kwatham):50-100ml
 - Juice (swarasa): 10-20 ml
 - Powder(churna): 2-4gm

7.3.5. Home remedies of haridra

- Add a pinch of salt and turmeric powder in a pint of water and rinse your mouth with this solution to cure bad breath naturally.
- Having a cup of warm milk, with the pinch of turmeric powder is used to treat allergy such as cold and cough.

7.4. Adulsa (*Adhatoda vasica*)



Figure 9 Adulsa

Biological source: dried and fresh leaves of *Adhatoda vasica* or malabar nut. Family; *Acanthaceae*.

commonly known as Adosa (Vasaka), It is found in India in lower Himalayan range and different parts of the world. It is used in Indian medicine system for more than 2000 years. In Ayurveda it is commonly known as vasa. It is traditionally use in treatment of cold and cough hence it is used in combination with allopathic medications and therefore there is increase in the interest in research programs due to its pharmacological action and chemical composition. It considers as household remedies for many diseases. It has some toxicological effect such as it is contraindicated in pregnancy.

Table 6 Chemical compositions and their Action of Drug Adulsa

Chemical composition	Pharmacological action [11]
Alkaloids: Vasicinone, vascinol , 20% vasicine	Anti-allergic activity
Leaves: vasicine, Vasicinone, vitamin C, carotene, essential oil Roots: vasicinolone, vasicol, peganine, sitosterol Glucoside (beta-glucoside galactose, deoxyvasicine, 2-hydroxyl-4-glucosyl-oxychalcone) Flowers: b-sitosterol-D-glucoside, kaemppferol. Quercetin, Alkaloids (adhatinine, vasinol).	Expectorant Bronchodilator Cold Antihistaminic Treat bronchial, asthmatic and pulmonary infection Antimicrobial Antioxidant anti-inflammatory Leprosy Leucoderma, tumors, sore-eye, gonorrhoea Antidiabetic Anti-ulcer Hypotensive activity Haepatoprotective Rheumatism Jaundice Anti-tuberculosis
Vasicine	Bronchodilator, respiratory stimulant uterine stimulant effects
Vasicinone	bronchodilatory, weak cardiac stimulant, antianaphylactic action

Vasaka leaf juice (Vasa swarasa) is comprise in more than 20 formulations including Vasarishta, Mahatiktaka ghrita, Triphala ghrita, Vasavaleha, Vasakasava, Mahatriphalaghrita, Panchatiktaghritaguggulu and Panchatikta ghrita [16].

7.4.1. Remedies

Table 7 Herbal Remedies by using Adulsa

VASAKA JUICE(SWARSA)	Juice +infused with honey + ginger	Use to treat cough, cold and chronic bronchitis related to ABPA. Take thrice a day
VASAKA FLOWER POWDER(KSHAYA)	Flower powder + honey	Use in chronic respiratory infections and excess mucous conditions hence used in ABPA
VASAKA CHURNA(POWDER)	Powder +water/milk	Antitussive and anti-inflammatory Take twice a day after meal
VASAKA LEAVES AND ROOTS DECOCTION(KASHAWAM)	Decoction honey	Use as antioxidant in ABPA Take twice a day after meal

8. Conclusion

In this reviewed article we put spotlight on the disease called Allergic Bronchopulmonary aspergillosis (ABPA). ABPA is a hypersensitivity condition which associated with lungs resulting from immune response (IgE mediated) to antigens of the *Aspergillus* species particularly *A.fumigatus*. Pathogenesis of ABPA is complex and involve both genetic and immune factors. Ayurvedic drugs are used to prevent and manage ABPA with 100% purity and safety. For treating early condition of disease, it is necessary to adopt appropriate treatment. Ayurveda provides treatment from different parts of the plants which includes herbs and herbal remedies. We emphasize on some drugs which are useful to give effective results to strengthen body to fight allergic condition, also boost immunity and cure the symptoms of disease. Before consuming the home remedies, it is advisable to patients who are suffering from ABPA should consult the ayurvedic medicine practitioner.

Compliance with ethical standards*Acknowledgments*

We would like to thank Prof. Ajaz Sayed for his continuous guidance and support in publishing this article.

Disclosure of conflict of interest

The authors declare that there was no conflict of interest regarding the publication of this manuscript.

References

- [1] Ritesh Agarwal inderpal s.sehgal .21 july 2020.Allergic bronchopulmonary aspergillosis.10 july 2019.
- [2] Takeshi Terashima,Taro Shinozaki.27 march 2018.A case of Allergic Bronchopulmonary Aspergillosis Successfully Treated With Mepolizumab.
- [3] Bhateja Sumit, Arora Geetika. December 2012. Therapeutic benefits of Holi Basil (Tulsi) in General and Oral medicine: A reviewed. 7 October 2012.
- [4] Lopamudra Sethi, Preetha Bhadra, June 2020, A REVIEW PAPER OF TULSI PLANT (OCIMUM SANCTUM L.). 21 April 2020.
- [5] Textbook of Pharmacognosy and Phytochemistry by Biren N. shah,A.K.Seth. 339-341.
- [6] Pharmacognosy and Pharmacobiotechnology (revised expanded edition) by Ashutosh kar ,Pgno. 331-332
- [7] Soumita basu. Giloy Satva Powder: Benefits,Uses,Ingredients,Method,Dosage and Side effects. 06 May 2021.
- [8] Bhuwan Chandra Joshi.Pharmacognostical Review of *Tinospora cardifolia*. Nov 2016.
- [9] BK Ashok, B Ravishankar, PK Prajapati, Savitha D. Bhat.Antipyretic activity of Guduchi Ghrita formulations in albino rats. Ayu. 2010 Jul-Sep; 31(3): 367–370.

- [10] David W. Denning, corresponding author, Catherine Pashley, Domink Hartl, Andrew Wardlaw, Cendrine Godet, Stefano Del Giacco, Laurence Delhaesand Svetlana Sergejeva. Fungal allergy in asthma–state of the art and research needs. *Clin Transl Allergy*. 15 Apr 2014.
- [11] Ritika Bhatt. 9 January 2020. *Vasaca: Biological source, Medical Uses, Chemical Constituents, Adulterants*.
- [12] Victor E. Ortega, Frank Genesee. *Allergic Bronchopulmonary aspergillosis (ABPA)*. July 2019.
- [13] DR. SC Mahapatra. immuno modulatory effects of Tulsi (*osimum sanctum linn*). on healtrhy human subjects. January 2011.
- [14] Jitendra Sisodia, Tushar Bajaj. 2 March 2021. *Allergic Broncho pulmonary Aspergillosis*. January 2021.
- [15] Susan J Hewlings, Douglas S Kalman. *Curcumin: A Review of Its Effects on Human Health*. 2 September 2017.
- [16] S Soni, Sheetal Anandjiwala, G Patel, M Rajani. 13 January 2013. *Validation of Different Methods of Preparation of Adhatoda vasica Leaf Juice by Quantification of Total Alkaloids and Vasicine*. 12 November 2007.
- [17] DR. Tinku Joseph. *Allergic Broncho Pulmonary Aspergillosis*. 10 July 2016.
- [18] Amanda Delgado. 20 August 2018. *Allergic Bronchopulmonary Aspergillosis*.
- [19] Biswajyoti Patgiri, Bharti L Umretia, Pradip U Vaishnav, Pradeep Kumar Prajapati, Vinay J Shukla, B Ravishankar. *Anti-inflammatory activity of Guduchi Ghana (aqueous extract of Tinospora Cordifolia Miers.)*. *Ayu*.2014; 1: 108-110.