CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187

Available online at: http://www.iajps.com *Review Article*

REVIEW ON HERBAL DRUGS USED IN TREATMENT OF 'MUCORMYCOSIS'

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Article Received: January 2023 **Accepted:** January 2023 **Published:** February 2023

Abstract:
Across the globe and mainly in India, several cases of Mucormycosis in people with COVID19 have been increasingly reported. The rise in the number of cases, the emergence of new risk factors and causative agents, mortality associated with mucormycosis in India is considerably high and the challenges in managing the disease.
Mucormycosis is a rare but often fatal disease caused by certain fungi. It is sometimes called zygomycosis or phycomycosis. It is an opportunistic infection that typically develops in patients with weakened immune systems, diabetes, kidney failure, organ transplants or chemotherapy for cancer.
Mucormycosis is a rare angio invasive infection mainly recognized in immuno-compromised patients which occurs due to the fungi mucorales. This rare fungal infection can be classified into rhino-orbitocerebral, cutaneous, disseminated, gastrointestinal and pulmonary types.
In this we discuss about the herbal drugs used in the treatment of Mucormycosis. For mucormycosis,it is very important to get treatment as if left untreated this can prove fatal.In this article we will discuss mucormycosis,its causative agents and symptoms of mucormycosis infection and how it can be managed using Ayurvedic formulations.

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Please cite this article in press ***Ashutosh G. Puri*** *et al.* ***Review on*** *herbal* ***drugs used in treatment of*** *'mucormycosis'., Indo Am. J. P. Sci, 2023; 10 (02).*

1. INTRODUCTION:

Mucormycosis previously called zygomycosis is a serious but rare fungal Infection caused by a group of molds called mucormycetes.A group of molds Called 'Mucoromycotina' cause Mucormycosis.The genera of mold most commonly seen in human infections include rhizopus and mucor.

The symptoms of mucormycosis depend on where in the body the infection occurs. The most commonly affected sites are nose, sinuses, eye, and even brain. This usually results in runny nose, unilateral facial swelling and pain, headache, fever and even blurring of vision. It can also affect other parts like lungs and stomach including intestine and skin.

This is a type of anaerobic infection which can also happen when deep tissues get injured or get exposed. The most common conditions which diminish the body's ability to fight diseases are HIV, AIDS, Diabetes mellitus (in case of uncontrolled glucose levels in the body), cancerous conditions, patients on chemotherapy and many others.

In COVID 19 a three pronged assault make the patients susceptible:

1) **COVID-19** : immune dysregulation, ciliary dysfunction thrombo-inflammation
2) **Hyperglycemia** : polymorphonuclear neutrophils (PMN) dysfunction,impaired chemotaxis and intracellular killing.
3) **Corticosteroid :** impairment in the neutrophil migration, ingestion and phagolysosome fusion.Also exacerbates hyperglycemia.

2.HISTORY

In 1885, the German pathologist Paltauf, reported the first case of Mucormycosis and described it as Mycosis Mucorina. During 1980s and 1990s Mucormycosis was increasingly seen among immuno compromised individuals.Based on the prevalence rate, a study carried out in France reported amplification by 7.4% per year. Worldwide occurrence along with the possibility of seasonal variation of mucorales infection has been reported.

The first reported case of Mucomycosis dates back to 1885 when the German pathologist Paltauf described the first case as Mycosis Mucorina. Rate of mucormycosis increased rapidly mostly in immunocompromised individuals consequently in 1980s and 1990s.Thus a study was carried out depending upon the prevalence rate in France which showed amplification by 7.4% per year.The supposed possibility of seasonal variation of mucorales and its occurrence all over the world was also reported.

The first case of mucormycosis was possibly one described by Friedrich Kuchenmeister in 1855. Furbringer first described the disease in the lungs in 1876.In 1884, Lichtheim established the development of the disease in rabbits and described two species;Mucor corymbifera and Mucor rhizopodiformis, later known as Lichtheimia and Rhizopus, respectively. In 1943, its association with poorly controlled diabetes was reported in three cases with severe sinus,brain and eye involvement.

In 1953, Saksenaea vasiformis, found to cause several cases, was isolated from Indian forest soil, and in 1979, P. C. Misra examined soil from an Indian mango orchard, from where they isolated Apophysomyces, later found to be a major cause of mucormycosis. Several species of mucorales have since been described.

3.COVID-19 ASSOCIATED MUCORMYCOSIS:

COVID-19 associated mucormycosis cases were reported during first and second(delta) wave, with

maximum number of cases in delta wave.There were no cases reported during the Omicron wave.

A number of cases of mucormycosis, aspergillosis, and candidiasis, linked to immunosuppressive treatment for COVID-19 were reported during the COVID-19 pandemic in India in 2020 and 2021.

One review in early 2021 relating to the association of mucormycosis and COVID-19 reported eight cases of mucormycosis; three from the U.S., two from India, and one case each from Brazil,Italy, and the UK.

The most common underlying medical condition was diabetes. Most had been in hospital with severe breathing problems due to COVID-19, had recovered, and developed mucormycosis 10–14 days following treatment for COVID-19.

Five had abnormal kidney function tests, three involved the sinus, eye and brain, three the lungs, one the gastrointestinal tract, and in one the disease was widespread. In two of the seven deaths, the diagnosis of mucormycosis was made at postmortem.

That three had no traditional risk factors led the authors to question the use of steroids and immunosuppressive drugs.Although,there were cases without diabetes or use of immunosuppressive drugs.

There were cases reported even in children. In May 2021, the BBC reported increased cases in India. In a review of COVID-19-related eye problems, mucormycosis affecting the eyes was reported to occur up to several weeks following recovery from COVID-19.

It was observed that people with COVID-19 were recovering from mucormycosis a bit easily when compared to non-COVID-19 Patients.

4.RISK FACTORS

a) Hyperglycemia in undiagnosed or uncontrolled diabetic.
b) Ketoacidosis
c) Corticosteroid and anti-IL-6-directed strategies in COVID patients
d) Cancer or post-transplant patient
e) Neutropenia, on chemotherapy
f) Patients on Immunomodulators
g) Voriconazole therapy

Most of the patients prone to mucormycosis have weakened Immune system and other underlying medical condition.The Risk factors mainly include:-

1. Diabetes mellitus, especially with diabetic ketoacidosis
2. Cancer
3. Long-term corticosteroid use
4. Organ or stem cell transplants
5. HIV/AIDS
6. Skin trauma (burns, surgery or injuries)
7. Excess iron in the body
8. Injection drug use
9. Treatment with deferoxamine (Desferal)
10. Malnutrition
11. Low white blood cell count (neutropenia)
12. Prematurity birth/low birth weight

5.SOCIETY AND CULTURE

The disease has been reported in natural disasters and catastrophes; 2004 Indian Ocean tsunami and the 2011 Missouri tornado.The first international congress on mucormycosis was held in Chicago in 2010, set up by the Hank Schueuler 41 & 9 Foundation, which was established in 2008 for the research of children with leukaemia and fungal infections.

A cluster of infections occurred in the wake of the 2011 Joplin tornado. By July 19, 2011, a total of 18 suspected cases of mucormycosis of the skin had been identified, of which 13 were confirmed.
A confirmed case was defined as,
1)Necrotizing soft-tissue infection requiring antifungal treatment surgical debridement in a person injured in the tornado.
2)with illness onset on or after May 22
3)positive fungal culture or histopathology and genetic sequencing consistent with a mucormycete. No additional cases related to that outbreak were reported after June 17. Ten people requireadmission to an intensive-care unit, and five died.

In 2014, details of a lethal mucormycosis outbreak that occurred in 2008 emerged after television and newspaper reports responded to an article in a pediatric medical journal. Contaminated hospital linen was

found to be spreading the infection. A 2018 study found many freshly laundered hospital linens delivered to U.S. transplant hospitals were contaminated with Mucorales.

Another study attributed an outbreak of hospital-acquired mucormycosis to a laundry facility supplying linens contaminated with Mucorales. The outbreak stopped when major changes were made at the laundry facility. The authors raised concerns on the regulation of healthcare linens.

6.CLASSIFICATION OF MUCORMYCOSIS

Generally, mucormycosis is classified into five main types according to the part of the body affected.A sixth type has been described as mucormycosis of the kidney or miscellaneous, i.e., mucormycosis at other sites, although less commonly affected**.**

1)Sinuses and brain (rhinocerebral):- Most common in people with poorly controlled diabetes and in people who have had a kidney transplant.

2)Lungs (pulmonary):- The most common type of mucormycosis in people with cancer and in people who have had an organ transplant or a stem cell transplant.

3)Stomach and intestine (gastrointestinal):- More common among young, premature, and low birth weight infants, who have had antibiotics, surgery, or medications that lower the body's ability to fight infection.

4)Skin (cutaneous):- After a burn, or other skin injury, in people with leukaemia, poorly controlled diabetes, graft-versus-host disease, HIV and intravenous drug use.

5)Widespread (disseminated):- When the infection spreads to other organs via the blood.

7.SIGNS AND SYMPTOMS

Signs and symptoms of mucormycosis depend on the location in the body of the infection.Infection usually begins in the mouth or nose and enters the central nervous system via the eyes.

If the fungal infection begins in the nose or sinus and extends to brain, symptoms and signs may Include one-sided eye pain or headache, and may be accompanied by pain in the face,numbness, fever, loss of smell, a blocked nose or runny nose.

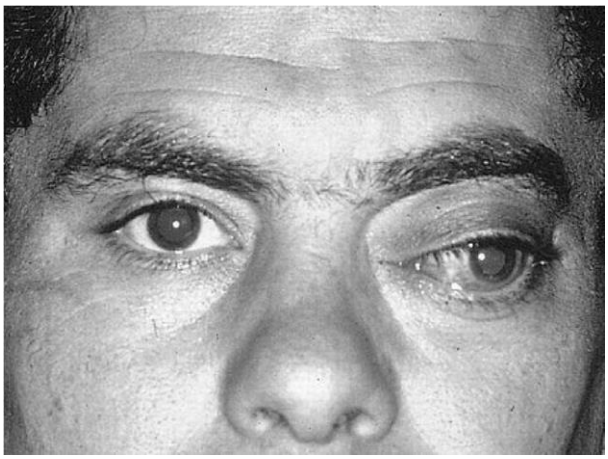
The person may appear to have sinusitis. The face may look swollen on one side, with rapidly progressing "black lesions" across the nose or upper inside of mouth. One eye may look swollen and bulging, and vision may be blurred.

A)Picture showing Periorbital Fungal Infection (Mucormycosis)

B)Chemosis (swelling of congectiva)

Fever, cough, chest pain, and difficulty breathing, or coughing up blood, can occur when the lungs are involved. A stomach ache, nausea, vomiting and bleeding can occur when the gastrointestinal tract is involved.
Affected skin may appear as a dusky reddish tender patch with a darkening centre due to tissue death. There may be an ulcer, and it can be very painful.

C) Sinusitis



D)Exophthalmos

(Bulging of the eye anteriorly out of the orbit)

Invasion of the blood vessels can result in thrombosis and subsequent death of surrounding tissue due to a loss of blood supply.

Widespread (disseminated) mucormycosis typically occurs in people who are already sick from other medical conditions, so it can be difficult to know which symptoms are related to mucormycosis. People with disseminated infection in the brain can develop changes in mental status or lapse into a coma.

8.CAUSE OF MUCORMYCOSIS

Mucormycosis is a fungal infection caused by fungi in the order Mucorales. In most cases it is due to an invasion of the genera Rhizopus and Mucor, common bread molds.

Most fatal infections are caused by Rhizopus oryzae.It is less likely due to Lichtheimia, and rarely due to Apophysomyces.Others include Cunninghamella,Mortierella and Saksenaea. \

The fungal spores are present in the environment, can be found on items such as moldy bread and fruit, and are breathed in frequently, but cause disease only in some people.

In addition to being breathed in and deposited in the nose, sinuses, and lungs, the spores can also enter the skin via blood or directly through a cut or open wound, and can also grow in the intestine if eaten.

Once deposited, the fungus grows branch-like filaments which invade blood vessels,causing clots to form and surrounding tissues to die.

Other reported causes include contaminated wound dressings.Mucormycosis has been reported following the use of elastoplast and the use of tongue depressors for holding in place intravenous catheters.

Outbreaks have also been linked to hospital bed sheets,negative-pressure rooms, water leaks, poor ventilation, contaminated medical Equipment and building works**.**

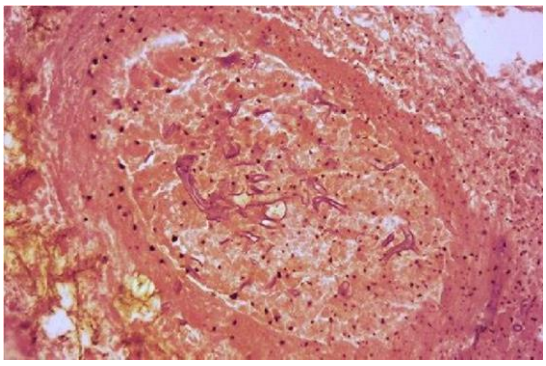
9.CULTURE AND BIOPSY

To confirm the diagnosis, biopsy samples can be cultured. Culture from biopsy samples does not always give a result as the organism is very fragile.

To precisely identify the species requires an expert.The appearance of the fungus under the microscope will determine the genus and species.

The appearances can vary but generally show wide,ribbon-like filaments that generally do not have septa and that unlike in aspergillosis—branch at right angles, resembling antlers of a moose, which may be seen to be invading blood vessels.

Ribbon-like hyphae which branch at 90°



Hyphae in blood vessel

Mature sporangium of a Mucor

10.Definition,Set of doubts and their Answers as per WHO

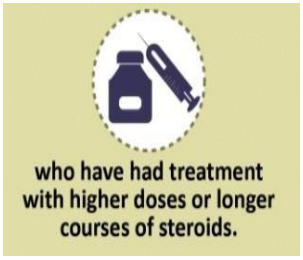
Mucormycosis:-

- A rare but serious fungal disease.
- caused by the 'mucormycetes' group of fungi.
- are of a variety of colours.
- has been incorrectly called 'Black fungus'.

Recently many people with COVID-19 have been diagnosed with mucormycosis.It is not currently known if this is due to COVID-19 or some other reason.

1)Who is at risk?

Ans:-In most people,the fungi do not cause harm,There is a greater risk of infection in people.



2)How does the infection spread ?

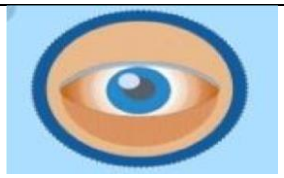
Ans:-

The fungi are found throughout the environment and most people breath them in without any effect.	
People with weak immune system can develop infection in the sinuses and lungs when the fungi enter their airways.	

They do not spread from person to person.	
In rare cases,skin infection occurs usually only after a skin injury.	
Very rarely,it has been known to affect the gastro-intestinal system.	

3)How can I recognise it ?

Ans:-Anyone can recognise it with some common symptoms of mucormycosis are mentioned in below table:-

Swelling of the face and around the eye,usually on one side.	
Facial pain or headache,usually on one side.	
Red eye,usually on one side	
Black patches on the nose or the roof of the mouth and Fever: if you have these,please speak to a health care provider urgently.	 

4)How is it detected ?
Ans:- Many of these symptoms,such as fever and headache are also common symptoms of other diseases,including COVID-19.

Mucormycosis needs to be confirmed through a laboratory test.if you are at greater risk and have these symptoms consult your health care provider.

The usual way for a health care provider to confirm Mucormycosis is as follows:-

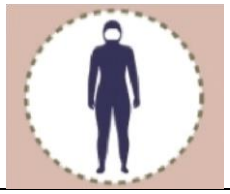
To take a sample from the inside of the nose or a sinus for laboratory testing.	
To see the fungus under a microscope or grow the fungus (Fungi culture)	
Also conduct scans or camera-based (Endoscopy) tests of the sinuses,head and lungs if necessary.	

5)What is the treatment ?

Ans:- Strictly follow your health care provider advice.Mucormycosis is treated with antifungal medicines. These must only be used as advised by a health care provider.Surgery may also be needed around the nose and eyes sometimes.Do not self medicate,because these drugs can have harmful effects if they are not used properly

6)How can we protect ourselves ?

Ans:- Most healthy people are at very low risk of this disease.There is no vaccine for Mucormycosis and those who are at greater risk could reduce their risk by protecting themselves from the fungi in the environment.

Avoid damp buildings or those damaged by water,for example due to floods and cyclones.	
Avoid areas with a lost of dust,like construction sites.	
Avoid close contact with soil.	
Wear clothes that cover arms and legs while working outdoors.	
If you cut your skin,clean the injury area with soap and water.	

11.TREATMENT

11.1) Multiple pharmacological actions of the suggested herbs and spices

Glycyrrhiza glabra:-

Glycyrrhiza glabra has been traditionally used to treat various health problems including fever, respiratory problems, skin diseases, paralysis, etc. The aqueous extract of Glycyrrhiza glabra contains proteins, different types of amino acids, carbohydrates, fibre, and minerals (zinc, copper, sodium, potassium, calcium, and phosphorus). It also shows multiple pharmacological actions such as antiviral, anti-fungal, antibacterial, antioxidant, anti-inflammatory, antidiabetic, spasmolytic, and anticoagulant activities.

The root extracts of Glycyrrhiza glabra and glabridin, an active constituent of Glycyrrhiza glabra were active against filamentous fungi and yeast. The antifungal activity of Glycyrrhiza glabra (phenolic extract and individual polyphenolic compounds) has been studied against opportunistic fungal infections including, different Candida strains.

Azadirachta indica

The anti-diabetic potential of the leaves of Azadirachta indicia has been validated through a randomized,double-blind,placebo-controlled clinical study and sucrase enzyme inhibitory study.

Apart from this, the liposomal gel containing neem extract with an antifungal drug (ketoconazole) has been prepared and studied against seborrheic dermatitis, which showed synergistic antifungal action against Aspergillus niger and Candida albicans. The recent review also elaborated the antifungal activity of most effective medicinal plants, including Azadirachta indica against dermatophytes.

Ocimum sanctum

Ocimum sanctum (Tulsi) is considered to be the queen of green/herbal medicine because it has a wide range of nutritional and medicinal properties. It improves the defence mechanism against viral infection in humans. Its active constituents (caryophyllene, eugenol and βcarotene) showed a strong interaction score with the spike protein of SARS-CoV-2.

Apart from this, the leaves extract and essential oil of Ocimum sanctum also depicted antifungal activity against clinically isolated dermatophytes and most of the Aspergillus spp., respectively. Moreover, the extract of Ocimum basilicum inhibited the aerial mycelium growth of Fusarium spp. The antifungal efficiency of essential oils also proved to be 10-100 fold higher than the ketoconazole and bifonazole.

More interestingly, essential oil prepared from the basil aerial parts had displayed anti-fungal activity against different pathogenic fungi including Mucor mucedo, Aspergillus niger (A. niger), etc. These detailed studies suggest that the antifungal efficiency of basil extract and its essential oils against the deleterious fungal growth.

Curcuma longa

The consumption of turmeric can exert anti-diabetic action through its multiple actions. For example, it can improve the function of pancreatic β-cells and improve insulin resistance, which eventually normalizes the disturbed carbohydrate metabolism. Moreover, the antioxidant property Curcuma longa can down-regulate the expressions of inflammatory cytokines through its control over nuclear factor kappa B(NF-κB) signalling. Turmeric along with ginger also cures inflammation through its anti-inflammatory actions.

The plants enriched with terpenoids, saponins, and alkaloids are considered as the source of potent antifungal drugs. For example, the chemical analyses of ginger revealed plentiful compounds which include alkaloids, steroids, saponins, phytosterols, flavonoids, proteins, vitamins (A, B, C), minerals, etc. It is reported that steroidal saponin of ginger inhibited the rice blast fungus, Pyricularia oryzae. In addition, the aqueous extract, essential oil, and oleoresin of ginger also exhibited antifungal activity against A. niger and F. oxysporum.

Cuminum cyminum and Cinnamomum zeylanicum

Cuminum cyminum (Cumin) is an aromatic plant. It shows anti-diabetic activity through its protective action over the pancreatic β-cells. It also increases insulin secretion and enhances glycogen storage. Cumin can positively regulate carbohydrate metabolism through its insulin potentiating action.

Apart from this, the essential oil of cumin has been enriched with terpenoids, cymene, cumin aldehyde.Cumin (essential oil) and cinnamon have exhibited remarkable antimicrobial activities against harmful fungi like A. niger and Aspergillus flavus (A. flavus). Cinnamomum zeylanicum (Cinnamon) is considered as a health-promoting agent.

It has been revealed that the inclusion of cinnamon in daily food can protect the body from the complications of impaired insulin action. Apart from this, cinnamon essential oil and extract were depicted the strongest effect on the fungi, Rhizomucor sp. and A. niger, respectively.

Citrus limon

The crude extract of Citrus limon has shown antifungal effects against the fungal isolates of infected patients. The major bioactive constituent of Citrus limon is d-limonene, a chief antioxidant, which protects skin because of its cleansing and purifying properties.

It is well known that Citrus limon is a chief source of vitamin C and various minerals. Therefore, it performs various functions such as antioxidant, co-factor, immunity promotor, and inducer of hormone and collagen biosynthesis.

Moringa oleifera

Moringa oleifera is the most important functional food. It has been consumed as spinach and soup. All parts of Moringa oleifera have been used as traditional ailments for the treating of various conditions such as anaemia, sore throat, respiratory disorders, chest congestion, diabetes, etc. Its leaves are the best source for various vitamins (vitamin C, A, E, and B complex vitamins such as riboflavin, thiamine, nicotinic acid, pyridoxine, folic acid, and niacin) and minerals (zinc, selenium, calcium, potassium, copper, and iron).

Most of the vitamins are essential for anti-viral and anti-inflammatory activities and also improve overall immune function. Its aqueous extract contained numerous bioactive compounds and showed various pharmacological activities. Various solvents extracts and essential oil of Moringa oleifera leaves have depicted antifungal activity against the various dermatophytes.

It has been believed that the anti-fungal effect of leaf extracts of Moringa oleifera against phytopathogenic fungi might be exerted through its small peptides, which can either bind with chitin, or increase fungal membrane or cell wall permeability.

Papaver somniferum

Papaver somniferum L. is commonly known as poppy seeds. It is rich in unsaturated fatty acids, vitamin E, and minerals (zinc, iron, copper, manganese, phosphorus, selenium, and magnesium). These minerals are essential for various pharmacological actions including antidiabetic, antiviral, anti-inflammatory, and immunomodulatory properties. It holds various health benefits including analgesic, antioxidant, anti-inflammatory, anti-diabetic activities, etc.

Its fiber and minerals contents improve immunity and exert antidiabetic activity.

The paste form of poppy seeds or a combination of poppy seeds with other herbs reduced scalp infections, skin inflammation, and is also effective in the treatment of eczema, burns, and itching. For example, chamomile flowers alone or with crushed poppy-heads are used as a poultice and also used in facial swelling associated with infection or abscess. Furthermore, plants enriched with bioactive compounds like alkaloids and triterpenoids are believed to be a source of potent antifungal drugs.

The alkaloid extracts of Papaver species, including Papaver somniferum were more effective against human fungal pathogen than the studied bacterial pathogens. The available backgrounds of Papaver somniferum L. (poppy seeds) suggest that poppy seeds are the reservoir of pharmaceutically important bioactive compounds. Further exploration of compounds of poppy seeds could fulfil recent therapeutic needs for various life-threatening human diseases/infections.

The elaborated herbs and spices hold numerous bioactive compounds and micronutrients. Therefore, the intake suggested herbs-spices mixture could exert multiple effects such as antiviral, anti-fungal, antihyperglycemic, antioxidant, anti-inflammatory, and immunomodulatory effects for the correcting of altered immunity and metabolism in post-COVID diabetic patients and could offer effective protection against the impaired immune-metabolism associated Mucorales infections.

Treatment of mucormycosis involves antifungal medications. Early intervation with antifungal medications improves the outcome of infection with mucormycosis.

11.2) Plants showing Antifungal Activity:-

Sr. No.	Botanical Name	Family	Plant Image	Parts used	Chemical Classes
1	Eugenia uniflora	Myrtaceae		leaves	Sesquiterpenes, Monoterpenes, Hydrocarbons
2	Psidiunguajava	Myrtaceae		Leaves	Methanolicextract

3	Curcuma longa	zingiberaceae		Rhizome	Turmeric oil
4	Schinusterebithifolius	Anacardiaceae		Stem bark	Extract
5	Perseaamaricana	Lauraceae		Leaves	Chromene
6	Parapiptadeniari gita	Fabaceae		Stem bark	Pyrolidine amide
7	Ajaniafruticulosa	Asteraceae		Fruits	Guinolides

8	Alibertiamacrophylla	Rubiaceae		Leaves	Extract
9	Aquilegia vulgaris	Ranunculaceae		Leaves and stems	Bis (Benzyl)
10	Mimosa tenuiflora	Mimosaceae		Stem bark	Sesquiterpenes, Lactones
11	Piper regnelli	Piperaceae		Leaves	Extract

12	Rubicatinctorum	Rubiaceae		Root	Triterpenes

13	Vernonanthurat weediea	Asteraceae		Root	Extract
14	Zingiberofficina le	Zingiberaceae		Rhizome	Steroidal saponins
15	Daturametel	Solanaceae		Whole plant	Diterpenoid alkaloid

16	Ecballium elaterium	Cucurbitaceae		Fruits	Extract
17	Cassia tora	Leguminocea e		Seeds	Anthraquinone
18	Chamaecyparis pisifera	Cupressaceae		Leaves and Twigs	Isaflavone

19	Prunusyedoensis	Rosaceae		Leaves	Diterpenes

20	Tithoniadiversif olia	Asteraceae		Whole plant	Contained saponins,polyphenols

11.3)Herbal Formulations for Mucormycosis Infection by Planet Ayurveda

Planet Ayurveda is a leading Ayurvedic firm which deals with the manufacturing of herbal formulations. These formulations are prepared using potent herbs who are really effective in managing many conditions. The formulations prepared by Planet Ayurveda do not contain any kind of adulterants, dyes, additives, fillers etc. These medications are too potent to manage many conditions and are very fruitful hence giving positive noticeable results. The medication or formulations offered by Planet Ayurveda for the management of mucormycosis infection is as follows**:-**

1. Gandhak Rasayan
2. Kaishore guggul
3. MahaManjisthaghan vati
4. Neem capsules
5. Phyllanthus niruri capsules

Products Description:-

1. Gandhak Rasayan

Gandhak rasayan is a natural preparation for skin rejuvenation which has gandhak (purified sulphur) as its content. It improves the immune system and also is very helpful in elimination of harmful toxins. Rasayan is basically a formulation which has cell regenerative effect and also gives luster to skin and enhances its aura. It is an excellent formulation for many skin related disorders.

Dosage: Two tablets twice a day after meals.

2. Kaishore Guggul

Kaishore guggul is an Ayurvedic classical medication which has ingredients like amalaki

(Emblica officinalis), bibhitaki (Terminalia bellerica),Haritaki (Terminalia chebula), Guggul (Commiphora mukul), Guduchi (Tinospora cordifolia) and many more. It is very effective in removing toxins from blood and therefore is a very useful herbal formulation for pacifying levels of pitta and is a very effective herbal formulation for various metabolic disorders.

Dosage: Two tablets twice a day after meals

3. MahaManjisthaghan Vati

As the formulation has manjistha manjishtha (Rubia cordifolia) in its ingredient, the formulation is very potent in treating various skin orders and also has a blood purification effect. Most importantly it behaves as an immunomodulator and is very effective in managing swelling over the affected area along with settling down the disturbances in the metabolism.

Dosage: Two tablets twice a day after meals.

4. Neem Capsules

Neem (Azadirachta indica) is a very effective herb which can be used for blood purification and also has a detoxification effect on the digestive system. The capsules are prepared using potent and standardised extract of neem which is very effective in treating and relieving swelling and tissue damage by mucormycosis infection. Moreover, it is used in treatment of intestinal worms, loss of appetite, skin ulcers, heart and blood vessel related disorders.

Dosage: One capsule twice a day after meals.

5. Phyllanthus Niruri Capsules

Bhumi amla (Phyllanthus niruri) has many properties which are really less known. This herb is potent in treating many viral infections like hepatitis and has ulcer healing effects. The phyllanthus niruri capsules are prepared from the standardised extract of bhumi amla. They are potent in managing swelling and can also be used in treatment of uncontrolled glucose levels too.

Dosage: One capsule twice a day after meals.

12.CONCLUSION:

To conclude that mucormycosis otherwise called as Black fungus which is a fungal infection.Currently used drugs in the treatment of fungal infections are having many side effects and resistance development is very common against these drugs.

Plants have been considered as traditional source of antifungal medicines for past may years.

The plants having antifungal activity are used for the treatment of mucormycosis.

Mucormycosis is an aggressive fungal infection. It is an essential task for clinicians to pick these infections at early stage. Histopathological studies are of great help in determining the diagnosis.

Mucormycosis infection is deepening its roots in the society due to degrading immunity of population as a result of any associated conditions like cancer, diabetes and many other immunocompromising disorders. In a healthy population, even after getting in contact with the fungal spores no symptoms are observed but when these spores come in contact with someone who has low immunity can produce a life-threatening situation.

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