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A Review of Herbal Remedies for Candidiasis

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ABSTRACT

The origins of Herbal remedies may be traced back to the Vedic era, and the Atharva Veda contains literature on health and sickness, which has been followed for the treatment. A review on the primary chronic fungal ailment Candidiasis, which is caused by the fungus *Candida albicans*, and its Herbal therapies. Allopathic treatment is likewise effective, but because of its expensive cost and numerous negative effects, herbal is chosen due to its diversity. Antifungal herbal drugs such as *Echinacea Angustifolia*, *Terminalia chebula*, *Morinda citrifolia*, *Cassia fistula*, *Embelia ribe*, *Azadirachta indica*, and others have been experimentally proven to have antifungal activity.



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INTRODUCTION:

Candidiasis is a fungal infection caused by a yeast (a type of fungus) called *Candida*. *Candida* is a type of fungus that can infect your skin and other parts of your body. The most common species for causes infection is *Candida albicans*. It is an artful parasitic pathogen that's capable of candidiasis in the human host. *C. Albicans* develop in a few diverse morphological shapes extending from unicellular budding yeast to true hyphae with the parallel sidewall of the skin. Thrush is a type of candidiasis that affects the mouth's mucous membranes while Vaginitis is a type of candidiasis that affects the vaginal mucous membrane. The fungus can rarely infect the respiratory system, causing a bronchopulmonary infection. The infection seldom spreads throughout the body, but if it does, it might harm the heart's lining or the meninges. *C. Albicans* lives as safe commensals within the gastrointestinal and genitourinary tract and accounts for more than 70% of all oral yeast infections.

Types of candida fungus skin infections include:

- Athletes foot
- Oral thrush (fig. 1)
- Nail fungus
- Diaper rash
- Jock itch
- vaginitis



According to the latest reports, *C. Auris* is a pathogenic fungus that poses a severe worldwide health risk. It is multi-drug resistant and can be transmitted to others by being carried on the skin of patients without causing infection. Standard laboratory procedures have a hard time detecting it therefore, misidentification can result in ineffective treatment.

Causes of Candidiasis:

- The fungus grows in warm, moist, & sweaty conditions therefore, armpits, groin, & skin folds between fingers & toes are the most prone areas.
- Hot, humid weather
- Poor hygiene

- Tight clothes

Symptoms of Candidiasis:

- Red or purple patches
- Soreness
- Cracks in skin
- Scaling of the skin
- Maceration
- Erythema which is characterized by redness
- Rashes

Diagnosis of Candidiasis:

Invasive candidiasis is diagnosed based on your medical history, symptoms, physical examinations, and laboratory investigations. Taking a blood sample or a sample from the infected body site (skin sampling, nail clipping, or plucking hair from the affected area) and sending it to a laboratory to see if it will grow *Candida* in a culture is the most typical way that healthcare providers test for invasive candidiasis. [1]



Fig.1: Oral thrush

PATHOPHYSIOLOGY OF CANDIDIASIS:

Candida albicans are passed down through the generations by reproduction and are found in the normal microflora of humans. Candidiasis is a yeast infection caused by '*Candida Albicans*' as abnormal development. Candida is caused by an imbalance in the environment,

which is the most prevalent cause of candidiasis. This imbalance is more common in women's vaginal tissue, hence infection is less common in men than in women. *Candida albicans* can spread during sexual activity on rare occasions. *Candida albicans* infection can be divided into two types:

1. Local Infection: This is the most prevalent type of infection. It is caused by an imbalance in the *Candida albicans* local flora, which is triggered by antibiotic use, which reduces the amount of Lactobacillus bacteria, lowering the number of acidic products and the vaginal pH. Pregnancy, uncontrolled diabetes, a weakened immune system, and vaginal irritation are among the other causes of local infection. This results in a local overgrowth of *Candida albicans*, which is followed by local mucocutaneous infection. They appear as white patches on the mucosa of the labial and buccal mucosa, the hard and soft palate, the tongue, periodontal tissues, the oropharynx, and the vagina. Vaginitis, for example.

2. Systemic Infection: Because there is a local mucocutaneous infection, the skin/mucosal barrier is breached. This aids them in direct invasion into the bloodstream. It is called Candidemia. It infects visceral tissues, resulting in widespread organ infection. This spectrum of yeast infection is extremely dangerous and can affect the blood, heart, brain, eyes, bones, or any other organ in the body. [2]



Fig. 2 Allopathic drugs for Candidiasis

ALLOPATHIC TREATMENT FOR CANDIDIASIS:

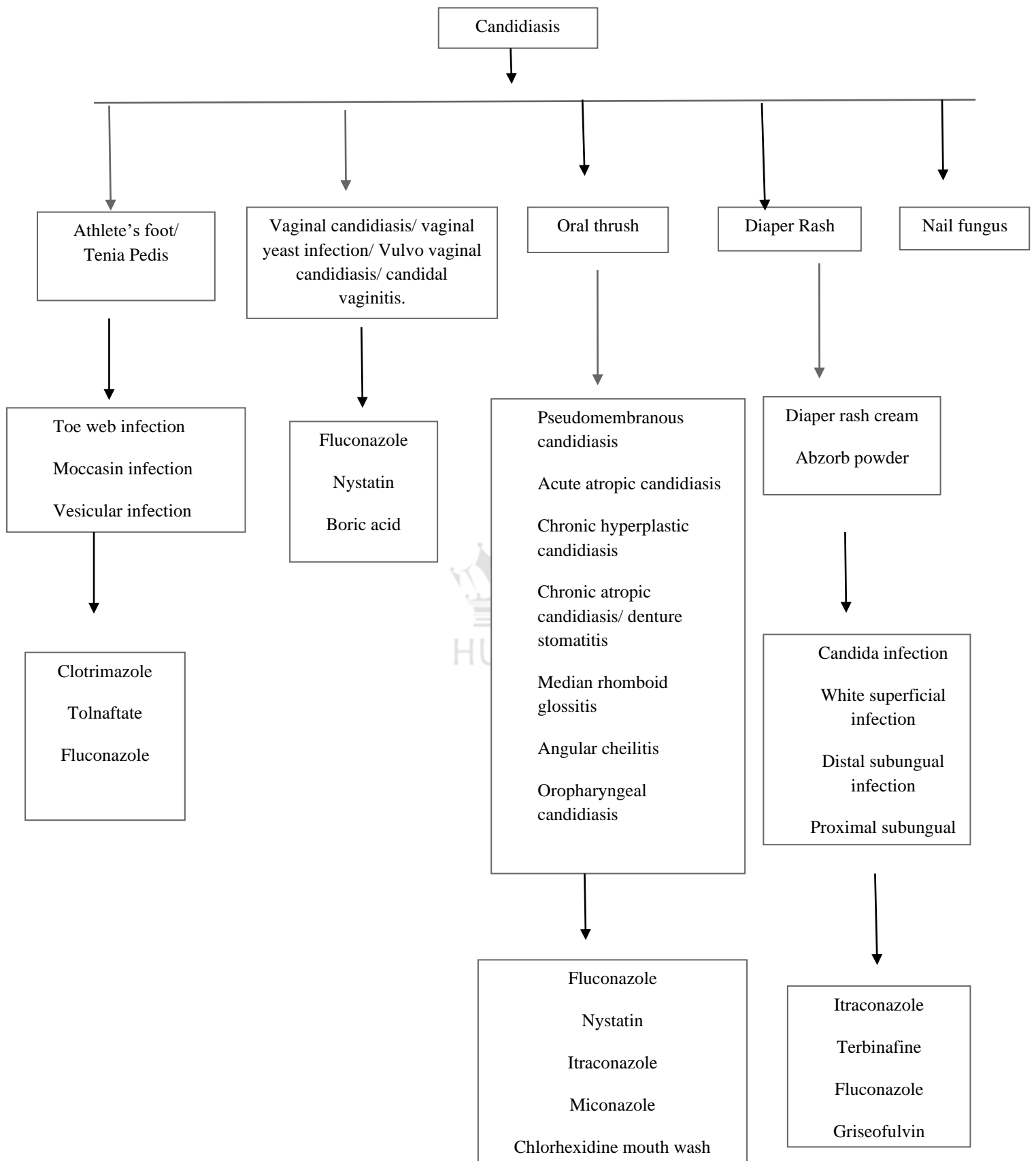


Fig. 3 Classification of allopathic remedies for Candidiasis

Herbal treatment for Candidiasis:

1. Terminate candida growth through natural herbs and supplementation: Various natural antifungal medications can be utilized to inhibit candida growth. It's crucial to remember that many strains of candida gain resistance to antibiotics and natural therapies quickly due to genetic mutation, so using antifungal medications is the best option.

Oleuropein-rich olive leaf extract is helpful against Candida. Caprylic acid is an excellent antifungal agent for enteric (intestinal) candida. In addition to these two, bee propolis is frequently effective. Clove oil and oregano oil, on the other hand, have been demonstrated to be effective against a variety of bacteria, including Candida. Olive oil and grapefruit seed extract are also effective.

2. Detoxification: When *Candida albicans* organisms are eliminated, a huge number of poisonous chemical compounds are released, which can produce a variety of unpleasant symptoms.

As a result, detoxification is required to eliminate those toxic compounds.

Restoration: Herbs like Bala, ashwagandha, Brahmi, and Guduchi might help you gain strength and immunity. Herbs like vidanga, neem, pomegranate, and tulsi are effective at killing yeast once the underlying imbalance is resolved.

Pipalli Rasayana permits the digestive fire to be regulated.

Triphala Rasayana is an anti-oxidant that is quite effective. The use of Triphala Rasayana cleanses the subtle pathways and energizes all of the body's tissue components. [4]

Herbs and medicines for Candidiasis:

Herbs

1. *Echinacea Angustifolia* (purple flower):

- a) *Echinacea Angustifolia* is a powerful antiviral & antifungal agent.
- b) Echinacea shows immunomodulatory effects, which are used to prevent & treat colds & flu.
- c) Cichoric acid, caprylic acid, and caffeic acid are the chemical constituent that shows the antifungal effects.

d) It comes in teas, capsules, pills, and Liq. Extractor as dried herbs. [5]

2. *Curcuma longa* (turmeric):

a) *Curcuma longa* exhibits antioxidant, antifungal, antibacterial, anti-inflammatory, and anticarcinogenic activities.

b) Curdione, curcumenol, curcumol are the chemical entities showing antifungal activities.

c) Besides herbal formulation one can combine fresh ground turmeric with a small amount of water and apply this paste to the skin, also one can have turmeric tea to get daily benefits. [6]

3. *Azadirachta indica* (neem):

a) Anti-inflammatory, antibacterial, antifungal, anticarcinogenic, antioxidant, antimalarial, antiulcer, anti-hyperglycemic, and antimutagenic activities are shown by *Azadirachta indica*.

b) Nimonol, Quercetin, and beta-sitosterol are the chemical constituents that are responsible to show antifungal properties.

c) It is available in the form of powder, cream, tincture, or leaf extract, general leaf extract is taken orally as per the recommendation of the physician.

d) Organic oil of *A. indica* is applied to the infected area. [7]

4. *Embelia ribe* (Vidanga):

a) *Embelia ribe* exhibits antifungal, antihelmintic, anti-estrogenic, anti-inflammatory, antibacterial, and antivenom characteristics.

b) It is also effective in the treatment of fevers and respiratory problems.

c) Embelin is a key chemical compound found in *Embelia ribe* seeds that have antifungal properties.

d) Vidanga is available in a variety of forms, including powder, churna, and decoction. [8]

5. *Cassia fistula* (Aragvadha):

a) Golden Shower is another name for *Cassia fistula*.

b) Antifungal, anticancer, anti-colic, antifertility, antiarthritic, antitussive, antiviral, anti-inflammatory, and antibacterial characteristics are found in *Cassia fistula*.

- c) The pulp of ripe fruits has an antifungal effect, and traditional people have utilized fruits to treat skin ailments, fever, and leprosy.
- d) β -Sitosterol and hexacosanol are present in bark and stem showing antifungal activity.
- e) It is also available in a liquid form. [9]

6. *Morinda citrifolia* (Noni):

- a) *Morinda citrifolia* has antifungal, antimicrobial, antioxidant, anti-inflammatory, anticancer, antidiabetic, and antihelminthic properties.
- b) It also has analgesic, sedative, and memory-enhancing effects.
- c) Chemical compounds of *Morinda citrifolia* fruit, such as octanoic acid, hexanoic acid, and caproic acid, work as antifungal agents. [10]

7. *Terminalia chebula* (Haritaki):

- a) One of the key ingredients of Triphala Churna is *Terminalia chebula*, popularly known as Haritaki or Harda.
- b) Haritaki is also known in Tibet as the "King of Medicine."
- c) Haritaki affects the digestive, excretory, neurological, respiratory, and reproductive systems of women.
- d) Antibacterial, antifungal, antiviral, antimutagenic, anticarcinogenic, antiplasmodial, antioxidant, and anti-diabetic properties
- e) It's available in powder, paste, decoction, and gargle form. [11]
- f) Bibhitaki is the chemical constituent showing antifungal activity.



Fig 4. (a)-*Echinacea angustifolia*, (b)-*Curcuma longa*, (c)- *Azadirachta indica*
(d)- *Embelia ribe*, (e)- *Cassia fistula*, (f)- *Morinda citrifolia*,
(g)- *Terminalia chebula*

Herbal medicines for Candidiasis:

1. Echinacea Supreme:

- (a) Echinacea Supreme contains echinacea purpurea roots and seeds, as well as *echinacea angustifolia* roots and aerial parts, and also vegetable glycerin.
- (b) It comes in the shape of capsules and is a solid dosage form.
- (c) Echinacea Supreme is a potent antiviral, antifungal, and immunostimulant.
- (d) To treat candidiasis, chemical elements such as caprylic acid and cichoric acid are released into the lower GI tract.
- (e) The recommended daily dose is 750-1500mg.

2. Vidanga Churna:

- (a) Vidanga is also known as false pepper because it resembles pepper.
- (b) It is made up of embelin. Homoembelin, vilangine, and quercitol are all examples of christembine.
- (c) In addition to antifungal properties, it aids in the treatment of indigestion, depression, throat infections, obesity, skin problems, and intestinal worms.
- (d) Marketed formulations come as Churna, powder, paste, and capsules in a variety of dosages.
- (e) It's best to avoid it if you're pregnant, breastfeeding, have acid reflux, or have a low sperm count.

3. Keva Silver Plus:

- (a) Keva silver plus is a non-toxic, natural antibiotic that kills over 650 pathogens such as viruses, bacteria, fungi, and yeast.
- (b) It has no adverse effects, is resistant to bacteria, and is effective against the majority of pathogens, including HIV, Epstein Barr, parasites, candida, and Lyme disease.
- (c) It possesses broad-spectrum antimicrobial immune support, including antibacterial, antiviral, and antifungal properties.
- (d) Keva silver plus is made up of the purest silver and 30ppm of Oligodynamic silver. [14]

4. Triphala Churna:

(a) As the name implies, it is made out of three plants: Amalaki, Bibhitaki, and Haritaki, in almost equal amounts.

(b) The tannins, gallic acid, ellagic acid, and chebulinic acid are the main components of the formula.

(c) Triphala possesses most of the pharmacological effects such as antifungal, antioxidant, anti-inflammatory, immunomodulating, appetite stimulation, gastric hyperacidity reduction, dental caries prevention, antipyretic, analgesic, antibacterial, antimutagenic, wound healing, anti-cariogenic, antistress, adaptogenic, hypoglycemic, anticancer, hepatoprotective, chemoprotective, radioprotective, and chemopreventive effects.

(d) Triphala may also improve digestion and absorption of food, lower cholesterol levels in the blood, improve circulation, relax bile ducts, prevent immunosenescence, maintain endocrine system balance, and increase red blood cell and hemoglobin formation. [13]

Dietary and Lifestyle changes for Candidiasis as per Herbal remedies:

Do's

- Using herbs like ginger, white pepper, black pepper, pippali, asafoetida, coriander leaf, mustard seeds, ajwain, cinnamon, clove, and cumin.[3]
- A gluten-free diet should be consumed.[3]
- Vegetables except for starchy ones such as potato and with a lot of sugar(carrots, beets)
- Almond milk & rice milk can be included.
- Sufficient sleep
- Frequent exercise to improve the immunity
- Reduce stress with yoga, meditation, and Herbal massage

Don'ts

- Sugars must be avoided since *C. Albicans* is an anaerobe that obtains energy from sugars via the alcoholic fermentation pathway. As a result, all sugars must be avoided.[3]
- Avoid foods that contain yeast, such as cheese and mushrooms.

How effective are Herbs and treatments for Candidiasis:

1. *Terminalia chebula* (Haritaki): Haritaki is a powerful Herbal medicine that has a wide range of uses. Chebulinic acid, found in *T.chebula*, is a tannin that has anticandidal action when tested with a paper disc. [11]
2. *Curcuma longa* (Turmeric): *Curcuma longa* was found to have antifungal action against *Candida albicans* in an experiment. As the concentration of alcoholic extract of turmeric increased, the size and number of fungal colonies shrank. [6]
3. *Morinda citrifolia* (Noni): On Muller Hinton Agar (MHA) medium, the disc fusion method was used for Noni. *M.citrifolia* showed the greatest inhibition at 1000 µg/ml after investigating the zone of inhibition. As the concentration of *M.citrifolia* extract was raised, the inhibition increased. [14]
4. Olive Oil: Oleuropein's antifungal effects were investigated utilizing Germ Tube formation inhibition, Antimicrobial susceptibility testing, membrane modulation, and ergosterol content, and it was discovered that at 3.12 mg/ml, oleuropein inhibited SAP activity by roughly 13%. [15]
5. *Cassia fistula* (Aragvadha): The antifungal activity of *C.albicans* and other fungi was investigated. The zone of inhibition was measured to be between 12 and 21 nm wide. Among the other fungi, *C.albicans* was highly inhibited.

In vitro studies of various Herbal drugs on *Candida albicans*

1. *Embelia ribe* (Vidanga):

The goal of this study was to discover if *Embelia Ribes* seed extract has antifungal action against a variety of plant pathogenic fungi.

E. Ribes seeds were collected from a private firm near Hyderabad, where they were originally brought from Kerala and authenticated at Osmania University's Department of Botany. Fresh, healthy seeds were rinsed multiple times with tap water and dried in the shade. In a Soxhlet apparatus, air-dried, ultimately powdered seeds (500 g) were extracted with petroleum ether (60-80°). The plant extract was concentrated further in rota vapor and the leftovers were weighed. By dissolving the plant extract in dimethyl sulphoxide, several quantities of stock solutions (0.5 mg to 2.0 mg) were generated (DMSO).

Eight test organisms, *Aspergillus niger* (MTCC 281), *Rhizopus oryzae* (MTCC 262), *Aspergillus terreus* (MTCC 1281), *Cladosporium* species (MTCC 1003), *Colletotrichum crassipes* (MTCC 2223), *Colletotrichum capsici* (MTCC 2071), *Armillaria mellea* (MTCC 409) and *Candida albicans* (MTCC 183) were obtained from the Institute of Microbial Technology, Chandigarh and maintained on potato dextrose agar (PDA).

The antifungal activity of plant extract was tested using an agar cup bioassay [6]. PDA medium (Himedia, 39 g) was suspended in distilled water and autoclaved for 20 minutes at a pressure of 15 lb/sq. The medium was injected with seven-day-old cultures of test organisms (0.5 ml). Cups were scooped out of Petri plates with an 8 mm sterile cork borer after inoculation. Different concentrations of test solutions (0.5 to 2.0 mg) were added to each cup. DMSO was used as a control, while Bavistin (5 g) was utilized as a standard. Inhibition zones were assessed after the treatment and controls were incubated in an incubator at 26° for 24 to 78 hours. For each treatment, three to four replicates were kept.

Table 1 shows the effects of different concentrations (0.5-2.0 mg) of E. Ribes seed extract against eight different fungi. The antifungal activity was seen at all concentrations tested, although it was less effective below 0.5 mg of seed extract, hence the data were excluded. It's possible that the test solution's crude character is to blame for the extract's low activity at lower concentrations. The diameter of inhibitory zones varied between doses, ranging from 9 to 18 mm for distinct fungal species, and increased as the concentration of test solution increased. The maximum antifungal activity was obtained at a seed extract concentration of 2.0 mg. A comparable investigation of natural plant extracts against other fungal and bacterial diseases has been published [7–10]. Because plants and diseases co-evolved, it's realistic to expect a variety of antifungal chemicals having both specific and broad antifungal activity [11].

ZONE OF INHIBITION OF EMELIA RIBES SEED EXTRACT FOR ANTIFUNGAL ACTIVITY

All of the fungal species were inhibited to variable degrees by different concentrations of the test solution. *Colletotrichum crassipes* had the highest inhibition zones of all (18 mm). *Cladosporium* (17.5 mm), *Armillaria mellea* (17 mm), *Colletotrichum capsici* (17 mm), *Aspergillus niger* (16.5 mm), and *Rhizopus oryzae* (16.5 mm) were the next species on the list, in that order. In comparison to the other organisms, *Aspergillus terreus* and *Candida albicans* had smaller inhibition zones (15.5 mm and 16.0 mm, respectively).

The current study demonstrated that *E. Ribes* seed extract had antifungal activity against a variety of fungal strains, including plant pathogens. As a result, *Embelia Ribes* has the potential to become a valuable biopesticide and antifungal agent. However, more research into the extraction and purification of bioactive components is required.[TAB. 1]

Test fungi	The concentration of seed extract (mg)							
	0.5	0.7	0.9	1.1	1.3	1.5	1.6	1.7
<i>Aspergillus niger</i>	9	10	10	11	12	12	13	13
<i>Aspergillus terreus</i>	9	10	11	12	13	14	14	14.5
<i>Rhizopus oryzae</i>	10	11	12	13	14	15	15.5	15.5
<i>Cladosporium species</i>	11	12	12	13	14	15	16	16.5
<i>Armillaria mellea</i>	10	11	12.5	13	13.5	14	15.5	16
<i>Colletotricum capsici</i>	10	11	12	12.5	13	14	15	15.5
<i>Colletotrichum crassipes</i>	10	11.5	12.5	13	14	14.5	15	16
<i>Candida albicans</i>	9	10	11	12	13	14.5	15	15.5

2. *Cassia fistula* (Aragvadha):

Fresh and healthy pods of *C. fistula* plants were collected in various areas of Jamnagar district, Gujarat, India, between June and August 2009. According to Ayurvedic classical sources, the plant's fruit pulp was harvested. The plant specimens were identified at I.P.G.T and R.A.'s Pharmacognosy Laboratory in Jamnagar. Plant parts were obtained using information from India's ethnobotanical survey. Each specimen/plant material was tagged, numbered, and annotated with the collecting date, location, and medicinal uses.[TAB. 2]

Between June and August 2009, fresh and healthy pods of *C. fistula* plants were collected in various areas of the Jamnagar district, Gujarat, India. The plant's fruit pulp was extracted, according to Ayurvedic traditional traditions. I.P.G.T and R.A.'s Pharmacognosy Laboratory in Jamnagar recognized the plant specimens. Plant components were acquired using data from an ethnobotanical study conducted in India. The date, location, and medical applications of each specimen/plant material were tagged, numbered, and documented on each specimen/plant material.

Chloroform and hydroalcoholic extracts were also chilled and filtered. Antimicrobial experiments were conducted on the concentrated hydro alcoholic and chloroform extracts. The residue was dissolved in various concentrations of dimethyl sulfoxide (DMSO) and tested for antibacterial activity.

The following microorganisms: *S. aureus* (MTCC 96), *S. pyogenes* (MTCC 442), *E. coli* (MTCC 443), *P. aeruginosa* (MTCC 424), and fungal strains *A. niger* (MTCC 282), *A. clavatus* (MTCC 1323), *C. Albicans* (MTCC 227) were chosen based on their clinical and pharmacological importance. Antimicrobial activity was assessed using bacterial strains taken from Chandigarh's Institute of Microbial Technology. Following refrigerated storage at 4°C, the bacterial and fungal stock cultures were cultured for 24 hours at 37°C on Nutrient Agar and Potato Dextrose Agar media (Microcare lab, Surat, India). The bacteria were cultivated in Mueller–Hinton agar (MHA) plates at 37°C (the bacteria were cultured in nutrient broth at 37°C and kept on nutrient agar slants at 4°C), while the yeasts and molds were grown in sabouraud dextrose agar (SDA) and potato dextrose agar (PDA) media at 28°C, respectively. The stock cultures were kept at a temperature of 4°C.

Method for determining the zone of inhibition Hydroalcoholic and chloroform extracts were tested for antibacterial and antifungal activities in vitro. The agar disc diffusion method was used to test the antibacterial and antifungal properties of plant extracts against four pathogenic bacteria (two gram-positive and two-gram negative) and three pathogenic fungi. [45–47] The Agar cup method was used to determine antimicrobial activity. Purified extracts were dissolved in DMSO, filtered through a sintered glass filter, and kept at 4°C. Two gram-positive, two gram-negative, and three fungal strains were used as a standard antibiotic for comparison of the results for determining the zone of inhibition (ZOI). The antibacterial and antifungal activities of all the extracts were tested against *E. coli*, *P. aeruginosa*, *S. aureus*, *S. pyogenes*, and the fungi *Candida albicans*, *Aspergillus niger*, and *Aspergillus clavatus*. Using

nutrient agar tubes, sets of five dilutions (5, 25, 50, 100, and 250 g/mL) of *C. fistula* extract and standard drugs were prepared in double-distilled water. The indicator bacterial strains (108 CFU) were planted on Muller Hinton sterile agar plates and incubated at 37°C for 3 hours. After 18 to 24 hours of incubation at 37°C for bacteria and 48 to 96 hours at 28°C for fungi, the zones of growth inhibition around the discs were assessed. The sensitivity of the microorganism species to the plant extracts was assessed by measuring the diameters of inhibitory zones on the agar surface around the discs (including the diameter of the disc), with values, less than 8 mm considered inactive against bacteria.

TABLE NO. 2: Antifungal activity of hydroalcoholic and chloroform extracts of *Cassia fistula*.

Microorganism	Zone of inhibition (mm)									
	Concentration (mcg/ml)									
	Hydroalcoholic extracts (mcg/ml)					Chloroform extracts (mcg/ml)				
	5	25	50	100	250	5	25	50	100	250
<i>A.niger</i>	-	13	15	17	18	-	16	17	18	21
<i>A.clavatus</i>	-	13	16	17	19	-	14	16	19	21
<i>C.albicans</i>	-	16	17	18	20	-	12	16	17	20

The extracts' antibacterial and antifungal activity rose linearly as the concentration of extracts (g/ml) increased. In comparison to standard drugs, the results revealed that *S. pyogenes* was more sensitive to both extracts for bacterial activity than *S. aureus*, *E. coli*, and *P. aeruginosa*, and *C. Albicans* showed good results for fungal activity than *A. niger* and *A. clavatus*. All of the sensitive bacteria had a growth inhibition zone of 10–20 mm, while fungal strains had a zone of 12–21 mm.

3. *Terminalia chebula* (Haritaki):

Fresh fruits of *Terminalia chebula*, *Terminalia bellirica*, and *Phyllanthus Emblica* were collected from hilly areas, identified and authenticated by Dr. John Britto, Rapinet Herbarium, St. Joseph's College Trichy, Tamilnadu, India, and given the voucher specimen numbers VEA/001/2013, VEA/002/2013, and VEA/003/2013, respectively.

Using a stainless steel blender, Triphala fruits were shade dried, deseeded, and ground into fine powder in a 1:1:1 ratio. Extracts were made using a Soxhlet extractor, 95 percent ethanol filtrates were pooled and each solvent was removed using a rotary evaporator at 40°C under decreased pressure. Preliminary screening of several plant ingredients was done on the methanol, acetone, and aqueous extracts.

Microorganism Preparation:

Gram-positive bacteria *Staphylococcus aureus* (MTCC 3160), gram-negative bacteria *Pseudomonas aeruginosa* (MTCC 1934), and *Klebsiella pneumoniae* were employed in this investigation (MTCC 4030). MTCC, Chandigarh, India, provided fungal strains *Aspergillus flavus* (MTCC 277), *Aspergillus niger* (MTCC 282), and *Candida albicans* (MTCC 183). Hi Medium, Mumbai, India provided all of the chemicals, media components, and antibiotic-impregnated discs used in this investigation.

Medium Preparation:

For *Staphylococcus aureus* and *Pseudomonas aeruginosa*, nutritional agar media was employed, LB medium for *Klebsiella pneumoniae*, and Czapek Yeast Extract Agar for *Aspergillus flavus*, *Aspergillus niger*, and *Candida albicans*. Antimicrobial and antifungal properties were determined by sub-culturing these microorganisms.

Antifungal Properties:

Food Poisoning was used to test extracts for antifungal activity against *A. flavus*, *A. niger*, and *Candida albicans*. In separate flasks, extract concentrations (1000µm) were combined with sterilized media and then transferred to Petri plates and allowed to harden. In an aseptic environment, a 6mm diameter fungal culture disc was collected and inoculated to the center of Petri plates containing extract, and the colony's radical development was measured after the incubation period.[TAB. 3]

TABLE NO. 3: Antifungal activity of Triphala from various solvents:

Test sample and extracts	Zone of Inhibition (mm)					
	Fungal strain					
	C.albicans %		A.flavus %		A.niger %	
Acetone	7	28	7.	28	15.	31.9
Methanol	7.	28	7.	28	14.	29.78
Aqueous	11.	44	11.	44	18.	38.29
Antibiotics	10.	29	49.	26.4	15.	44.1

4. *Morinda citrifolia* (Noni):

Extract source, collection, and preparation:

Madurai, a city in the southern part of Tamil Nadu, India, provided ripe fruits of *M. citrifolia*. The fruits were washed in distilled water and the juice extracted. To make a powder extract, the juice was centrifuged and then lyophilized to dryness. For additional testing, serial dilutions of the extract (solvent water) were made and concentrations of 1000, 500, 250, and 100 g/ml were achieved.

Inoculum preparation:

The Institute of Microbial Technology in Chandigarh provided the microbial strain used in this investigation (*C. Albicans*, MTCC 3958). On the slant of nutritional agar, stock cultures were kept at 4°C. Transferring a loopful of cells from stock cultures to test tubes of nutrient broth for fungi and incubating for 24 hours at 37°C yielded active cultures for studies. The assay was carried out using the disk diffusion method.

Disk Diffusion method:

Disk diffusion on Muller Hinton agar (MHA) medium was used to assess the antifungal activity of the supplied sample. In the petri dish, the MHA medium is poured. The inoculums were placed on the solid plates using a sterile swab moistened and the bacterial suspension after the medium had solidified. Using sterile forceps, the discs were placed on the MHA plate, and different concentrations (1000 µg, 500 µg, 250 µg, and 100 µg) of each sample were loaded on the discs. The negative control was a blank disc sprayed with solvent

dimethyl sulfoxide and dried off, whereas a positive control was amphotericin B (10 µg/disc). By measuring the diameter of the zone of inhibition the microbial growth was determined.[TAB. 4]

An independent t-test was used to assess the data. The significance threshold was set at 0.05.

TABLE NO. 4: Antifungal activity <i>Morinda citrifolia</i> fruit extract						
Microorganism	Zone of inhibition (mm)					
	1000mcg	500mcg	250mcg	100mcg	DMSO	Amphotericin B 100mcg
C.albicans	16.6 + 0.3 16.6 - 0.3	13.6 + 0.3 13.6 - 0.3	8.6 + 0.3 8.6 - 0.3	8.3 + 0.3 8.3 - 0.3	-	20.6 + 0.6 20.6 - 0.6

Side effects and risks of Herbal medicine and treatment for Candidiasis:

Herbal medicine is an old tradition that has aided millions of people in living healthier lives. Herbal remedies, like any other medical method, have contraindications and the possibility of negative consequences or side effects. This is especially concerning when therapies are given by unqualified practitioners, or when they are used wrongly, abused, or administered poorly.

1. Vidanga has its contraceptive effect, its long-term usage should be done with care. Might cause skin rashes, if your skin is hypersensitive to heat due to its hot potency.[20]
2. In the case of Aragvadha, it may cause heavy purgation. It should not be used in diarrhea. Nausea, dizziness. It is also not recommended for small kids, pregnant women & lactating mothers.[19]
3. While liver damage, acute hepatitis, liver toxicity, and high blood potassium (hyperkalemia) are side effects of Noni.[21]
4. Higher doses of Haritaki can cause stomatitis, acute fever, stiffness of the jaw, and fatigue.[17]
5. Olive leaf extract may lower blood pressure and blood sugar levels and cause allergic reactions.

6. Nausea, dizziness, and stomach pains Allergic responses, such as redness, swelling, and difficulty breathing, are serious adverse effects are the Echinacea side effects.

CONCLUSION:

In conclusion, we can retain that the fungal infection Candidiasis is one of the most common health problems which can be resolved not only by allopathy but in a better way by Herbal remedies. Due to diverse activity, low side effects, and low cost, medicinal plants have emerged as viable alternative sources for Candidiasis. Herbal medicines had marked their position in curing Candidiasis. Herbs like Echinacea, *Curcuma longa*, Olive leaf extract, Vidanga, Haritaki, Noni, Neem, and others have been reported to have substantial antifungal action against *C. Albicans* species in various formulations.

REFERENCES:

1. Centers for disease control and prevention (CDC) 30th October 2020. Invasive Candidiasis. Viewed on 29 June 2021. <https://www.cdc.gov/fungal/diseases/candidiasis/invasive/index.html>
2. *Candida albicans* (Pathogenesis) viewed on 29 June 2021 [https://microbewiki.kenyon.edu/index.php/Candida_albicans_\(Pathogenesis\)](https://microbewiki.kenyon.edu/index.php/Candida_albicans_(Pathogenesis))
3. Scott Gerson. The Herbal Approach to Candidiasis by Scott Gerson. Viewed on 29 June 2021. <https://www.gersonayurveda.com/giam-blog/2019/4/2/the-ayurvedic-approach-to-candidiasis-by-scott-gerson-md-m-phil-ayu-phd-ayu>
4. Sajimon George. Candida Treatment Viewed on 29 June 2021. <https://www.ayurclinic.com.au/candida-treatment-ayurveda-melbourne/>
5. Nadereh Mir-Rashed, Isabel Cruz, Matthew Jessulat, Michel Dumontier, Claire Chesnais, NG Juliana, Virginie Treyvaud Amiguet 01 November 2010. Disruption of the fungal cell wall by antifungal *Echinacea* extracts. viewed on 28 June 2021 <https://academic.oup.com/mmy/article/48/7/949/1055388>
6. Jeevitha Muruges, Rajeshwari G Annigeri,² G K Mangala,³ P Hema Mythily,⁴ and J Chandrakala⁵ Aug; 23 2019 Evaluation of the antifungal efficacy of different concentrations of *Curcuma longa* on *Candida albicans*: An *in vitro* study. viewed on 29 June 2021 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6714268/>
7. Girish K October 2020 Antifungal Potential of Neem (*Azadirachta indica* A. Juss.). viewed on 27 June 2021 https://www.researchgate.net/publication/344457108_Antifungal_Potential_of_Neem_Azadirachta_indica_A_Juss
8. A Sabitha Rani,* K Saritha, V Nagamani, and G Sulakshana In vitro Evaluation of Antifungal Activity of the Seed Extract of Embelia Ribes (vidanga) 2011 Mar. viewed on 27 June 2021 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3267316/>
9. N. R. Bhalodia, P. B. Nariya, R. N. Acharya, and V. J. Shukla 2012 Jan In vitro antibacterial and antifungal activities of Cassia fistula Linn. fruit pulp extracts. viewed on 27 June 2021 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3456850/>
10. K Barani, Sunayana Manipal, D Prabu, Adil Ahmed, Preethi Adusumilli, C Jeevika Anti-fungal activity of *Morinda citrifolia* (noni) extracts against *Candida albicans*: An in vitro study. viewed on 27 June 2021 <https://www.ijdr.in/article.asp?issn=0970-9290;year=2014;volume=25;issue=2;spage=188;epage=190;aulast=Barani>
11. Prakash Chandra Gupta January 2012 Biological and pharmacological properties of *Terminalia chebula* Retz. (Haritaki) viewed on 29 June 2021

https://www.researchgate.net/publication/279651727_Biological_and_pharmacological_properties_of_Terminalia_chebula_Retz_Haritaki_-_An_overview

12. Christine Tara Peterson. Therapeutic Uses of Triphala in HerbalMedicine 2017 Aug 1. viewed on 28 June 2021 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5567597/>

13. Ajay K. Gautam, Shubhi Avasthi, Anu Sharma, Rekha Bhadauria Antifungal Potential of Triphala Churna Ingredients against Aspergillus Species Associated with Them During Storage viewed on 27 June 2021 <https://scialert.net/fulltext/?doi=pjbs.2012.244.249>

14. Keva Silver Plus Keva Industries In Technical . viewed on 28 June 2021 <https://slidetodoc.com/keva-silver-plus-keva-industries-introduces-in-technical/>

15. Nataša Zorić,^{1,*} Nevenka Kopjar,² Ivan Bobnjarić,³ Igor Horvat,³ Siniša Tomić,¹ and Ivan Kosalec ¹ Dec 2016; Antifungal Activity of Oleuropein against *Candida albicans*—The In Vitro Study. viewed on 27 June 2021 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6273721/>

16. Echinacea: What Should I Know About It. viewed on 27 June 2021 <https://familydoctor.org/echinacea-what-should-i-know-about-it/>

17. Int J pharm sci, volume 6, issue 8, 123-126, original article .viewed on 28 June 2021 <https://innovareacademics.in/>

18. KEVA SILVER PLUS KEVA INDUSTRIES INTRODUCES In Technical . viewed on 28 June 2021 <https://slidetodoc.com/keva-silver-plus-keva-industries-introduces-in-technical/>

19. N.R. Bhalodia, P.B. Nariya, and V.J Shukla . viewed at 29 June 2021 <https://www.ncbi.nlm.nih.gov/>

20. A Sabitha Rani, k saritha and G Sulakahana . viewed at 29 June 2021 <https://www.ncbi.nlm.nih.gov/>

21. K Barani, Sunayana manipal, D. Prabu, Adil Ahmed, preethi adusumilli. Indian journal of dental research official publication of the Indian Society for dental research .viewed on 29 June 2021 <https://pubmed.ncbi.nlm.nih.gov/>

22. U.S. National Library of medicine. viewed on 29 June 2021 <https://medlineplus.gov/>

23. Medically reviewed by Carissa Stephens, R.N., CCRN, CPN written by Zawn Villiers. viewed on 30 June 2021 <https://www.medicalnewstoday.com/>

24. Medically reviewed by Alana Biggers, M.D. MPH - Written by Jenna Fletcher on June 26, 2017. viewed on 30 June 2021 <https://www.medicalnewstoday.com/>

25. Medically reviewed by Elaine K.Luo, M.D - written by April Kahn - updated on Nov 1, 2019. viewed on 30 June 2021 <https://www.healthline.com/>

26. The postgraduate medical journal, Volume 78, issue 922. viewed on 30 June 2021 <https://pmj.bmj.com/>

27. Medically reviewed by - the University of Illinois - written by Yvette Brazier on October 29, 2018. viewed on 30 June 2021 <https://www.msmanuals.com/>.

List of Abbreviations:

1. C.albicans – Candida albicans
2. C.auris – Candida auris
3. HIV- Human Immunodeficiency Virus
4. MHA- Muller Hinton Agar
5. M.citrifolia – Morinda citrifolia
6. DMSO – Dimethyl Sulphoxide
7. MTCC – Microbial Types Culture Collection and gene bank
8. E.ribes – Embelia ribes
9. PDA – Potato Dextrose Agar
10. C.fistula – Cassia fistula
11. SDA – Sabouraud Dextrose Agar
12. ZOI – Zone Of Inhibition
13. E.coli – Escherichia coli
14. S.aureus – Staphylococcus aureus
15. S.pyogenes – Streptococcus pyogenes
16. A.niger – Aspergillus niger
17. A.clavatus – Aspergillus clavatus
18. A.flavus – Aspergillus flavus
19. IPGT and RA – Institute for Postgraduate Teaching and Research in Ayurveda

