



## Antimicrobial activity of *Ailanthus altissima* on selected keratinophilic fungi

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### Abstract

*Ailanthus altissima* is a medium-sized tree that reaches heights between 17 and 27 m with a diameter at breast height of about 1 m. Keratinophilic fungi are of wide spread occurrence in nature and in soil they colonize various keratinic substances present as animal remains and thus add to the nitrogen content of the soil. They are mainly saprophytic and potentially pathogenic to humans and other animals.

In this study the plant *Ailanthus altissima* was tested for its antimicrobial activities against some keratinophilic fungi *in-vitro*. These fungi were isolated from solid waste pollutant areas. Leaf extract of *Ailanthus altissima* was tested against *Trichophyton*, *Mentagrophytes Geotrichum candidum*, *Chrysosporium indicum*, *Malbranchea aurantiaca*, *Chrysosporium keratinophilum* and *Chrysosporium tropicum* using weight loss method and Food Poisoning technique.

Maximum percent inhibition in dry mycelial weight was observed in *T. mentagrophytes* followed by *G.candidum* (64.17) > *C.indicum* (61.82) > *M.aurantiaca* (60.98) > *C.keratinophilum* (54.92) > *C.tropicum* (53.57).

In Radial growth *Trichophyton* showed maximum inhibition of 71.16% followed by *Geotricum candidum* (61.19%) > *C.keratinophilum* (60.71%) > *C.tropicum* (59.73%) > *Chrysosporium indicum* (59.49%) > *Malbranchea aurantiaca* (51.63%).

The results show that *Ailanthus altissima* can be used as antimicrobial agent and its activity can be exploited in medical formulations as a safe and potential antifungal agent.

**Keywords:** *Ailanthus altissima*, antimicrobial activity, keratinophilic fungi

### Introduction

*Ailanthus altissima* is a medium-sized tree that reaches heights between 17 and 27 m with a diameter at breast height of about 1 m. The bark is smooth and light grey, often becoming somewhat rougher with light tan fissures as the tree ages. The twigs are stout, smooth to lightly pubescent, and reddish or chestnut in colour. The leaves are large, odd- or even-pinnately compound on the stem. They range in size from 30 to 90 centimetres in length and contain 10–41 leaflets organised in pairs, the flowers are small and appear in large panicles up to 50 cm in length at the end of new shoots. The individual flowers are yellowish green to reddish in colour, each with five petals and sepals.

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### Materials and methods

#### Preparation of basal media

Sabouraud's Dextrose Agar (SDA) and Sabouraud's Dextrose Broth (SDB) Media were prepared separately. Their compositions are given below:

**SDA:** Dextrose – 40gm., Peptone -10gm., Agar – 20gm., Distilled Water – 1000ml

**SDB:** Dextrose – 40gm., Peptone -10gm., Distilled Water – 1000ml.

#### Preparation of plant extract

Fresh leaves of *Ailanthus altissima* were collected, washed and dried over blotting paper and cut into small pieces.

100gm of leaf was grounded in a wearing blender with 300ml distilled water. The contents were filtered through muslin cloth to remove pulp and and the filtrate was used for experiment purpose.

#### A. For dry mycelial weight (weight loss method, fergus, 1969a) [4]

An aliquot of 30ml SDB medium was dispensed into 150ml Erlenmeyer Flasks, 3ml plant extract was added in each flask. Separate set of flasks were run as control without adding plant extract. These flasks were sterilized at 15lbs pressure for 15-20 min through autoclaving. They were then inoculated with 6mm diameter inoculum discs of keratinophilic fungi (Experimental organisms). Flasks were incubated at +28 OC as static culture. After 8 days the content of each flask were filtered through preweighed Whatmann No.1 filter paper discs. Papers were folded and dried at 80 oC for 24hours in an oven. The Dry Mycelial weight (DMW) was obtained in each case. With the help of control the percent inhibition in thr DMW was calculated and values were recorded in Table-1.

#### B. For radial growth (food poisoning technique, nene, 1971) [7]

Under aseptic conditions presterilized SDA medium was poured into sets of presterilized Petriplates, 3 ml plant extract was added in each Petriplate. Sets of Petriplates without treatment were run as control. All the sets were inoculated by 6mm diameter inoculum discs obtained from 8 days old colonies of experimental organisms. They were incubated at +28 OC for 8 days. After the said period, radial growth was measured with the help of scale and percent inhibition affected in the radial growth was and readings were recorded in Table-2.

$$\text{Percent Inhibition} = \frac{\text{Control-Treated}}{\text{Control}} \times 100$$

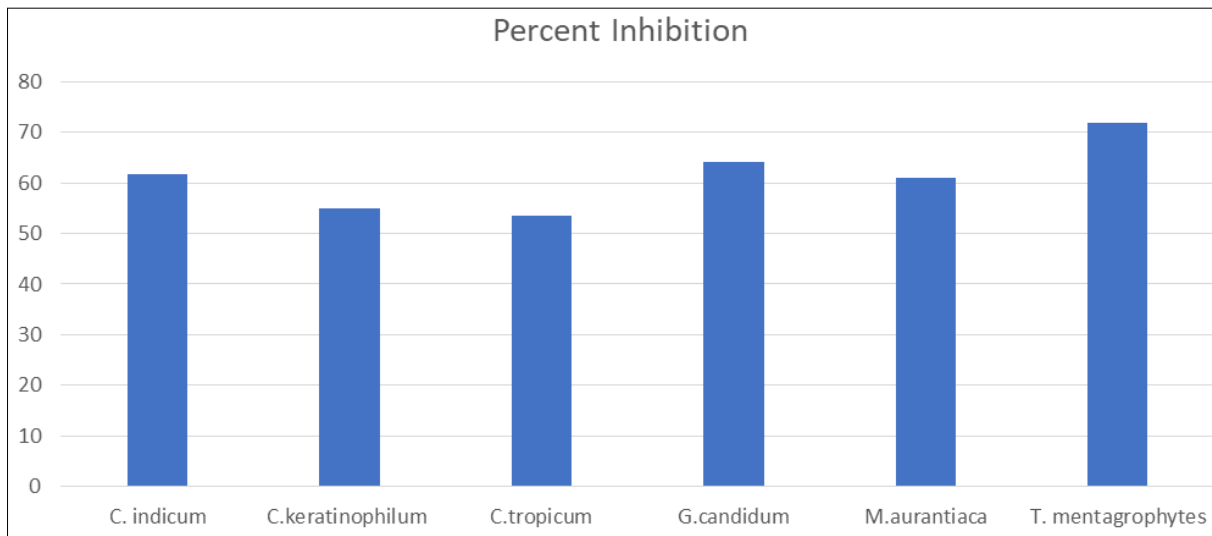
**Result and discussion**

Antimicrobial effect of *Ailanthus altissima* on selected keratinophilic fungi is represented in Table 1 and 2.

Overall maximum of 71.91 % inhibition in Dry Mycelial Weight was observed in *T. mentagrophytes* followed by *G.candidum* (64.17) > *C.indicum* (61.82) > *M.aurantiaca* (60.98) > *C.keratinophilum* (54.92) > *C.tropicum* (53.57).

**Table 1:** Showing percent inhibition in dry mycelial weight

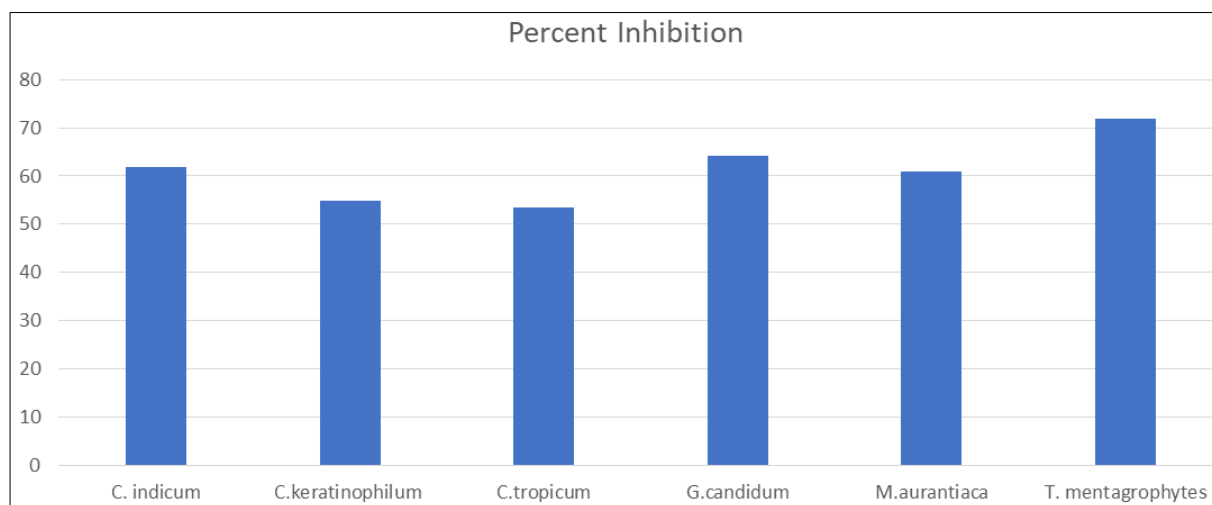
S.No.	Experimental Organism (Keratinophilic Fungi)	Control	Dry Mycelial Weight	Percent Inhibition
1	<i>Chrysosporium indicum</i>	296	113	61.82
2	<i>C.keratinophilum</i>	315	142	54.92
3	<i>C.tropicum</i>	336	156	53.57
4	<i>Geotricum candidum</i>	268	96	64.17
5	<i>Malbranchea aurantiaca</i>	405	158	60.98
6	<i>Trichophyton mentagrophytes</i>	381	107	71.91



**Fig 1**

**Table 2:** Showing percent inhibition in radial growth

S.No.	Experimental Organism (Keratinophilic Fungi)	Control	Radial Growth	Percent Inhibition
1	<i>Chrysosporium indicum</i>	39.5	16.0	59.49
2	<i>C.keratinophilum</i>	36.4	14.3	60.71
3	<i>C.tropicum</i>	38.0	15.3	59.73
4	<i>Geotricum candidum</i>	42.0	16.3	61.19
5	<i>Malbranchea aurantiaca</i>	33.7	16.3	51.63
6	<i>Trichophyton mentagrophytes</i>	54.8	15.8	71.16



**Fig 2**

In Radial growth *Trichophyton mentagrophytes* showed maximum inhibition of 71.16% followed by *Geotricum candidum* (61.19%) > *C.keratinophilum* (60.71%) > *C.tropicum* (59.73%) > *Chrysosporium indicum* (59.49%) > *Malbranchea aurantiaca* (51.63%).

Plants exhibit allelopathy by releasing phytotoxins from leaves, roots, rhizomes, flowers, fruits, seeds and glandular trichomes (Atiqur et.al, 2009) <sup>[1]</sup>. Allelochemicals can damage cell membranes through interaction with a constituent of the membrane or as a result of an impairment of membrane function (Dilfuza et.al, 2017) <sup>[3]</sup>. Basic plant processes such as hormonal balance, chlorophyll production, respiration, photosynthesis, plant water relations and permeability may be affected by allelochemicals (Morsy, 2014) <sup>[6]</sup>. Allelochemicals reduce the germination of spores and mycelial growth of pathogenic fungi (Caramelo et.al.2021; Shahid et.al, 2023) <sup>[2, 9]</sup>.

*A. altissima* bark, extracted with methanol yielded a strong phytotoxic extract that contained Ailanthone as one of the major antimicrobial compounds (Halima, 2023) <sup>[5]</sup>. In addition to ailanthone, it also contains other quassinoids including Amarolide, Acetyl Amarolide, 2-Dihydro Ailanthone, Ailanthone, Chaparrin, Quassin, Neoquassin, Shinjulactone and Shinjudilactone (Rizzo et.al, 2023) <sup>[8]</sup>.

Previous investigations have shown that Ailanthone is certainly a major antimicrobial compound in methanolic extract of *A. altissima* bark (Caramelo et.al.2021) <sup>[2]</sup>. The medicinal properties of *A. altissima* has been established in general although it is considered as an undesirable weed tree. The antimicrobial effects under field conditions due to the presence of ailanthone in the bark extract has been enumerated.

## Conclusion

In the present study we see that leaf extract of *A.altissima* is effective against keratinophilic fungi. Along with quassinoids including Amarolide, Acetyl Amarolide, 2-Dihydro Ailanthone, Ailanthone, Chaparrin, Quassin, Neoquassin, Shinjulactone and Shinjudilactone it also contains gallic acid, isoquercetin and hyperoside and thus this plant can be used medicinally for its antimicrobial properties.

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