

Overview

Phytophthora parasitica is a phytopathogenic fungus and a widespread oomycete that infects a wide range of crop plants. The fungus can attack and damage the root tissues [1]. The fungus has been successfully controlled by chemical fungicides. Synthetic agrochemicals have direct effects on non-target organisms and the surrounding environment [2].

Zingiberaceae family consists of about 47 genera and 500 plant species distributed throughout the tropical and subtropical regions. Many members of the family have been studied for antifungal activity against dermatophytes, filamentous fungi, and yeast-like fungi [3].

This work aims to investigate the *in vitro* antifungal activity of essential oils derived from the Zingiberaceae family, including *Zingiber officinale*, *Alpinia officinarum*, and *Curcuma longa*, against *P. parasitica* mycelia growth.



Zingiberaceae family



P. parasitica

Methodology



Fresh rhizomes



Hydrodistillation

Hydro-distillates

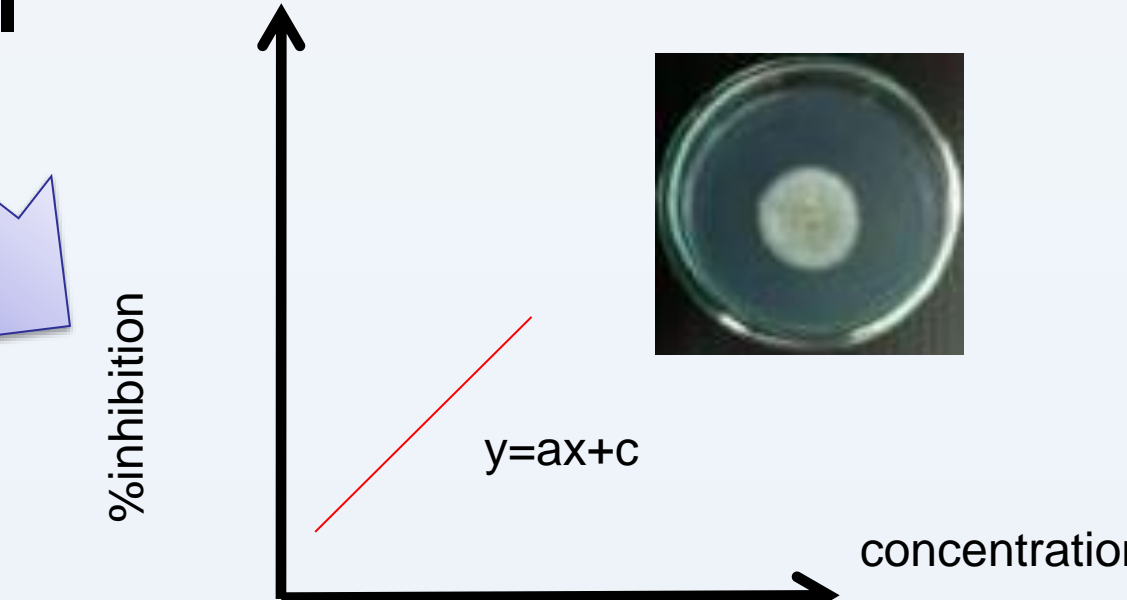
Ether extraction

Filtrate and Evaporate

Essential oil



GC/MS analysis



Antifungal activity, IC₅₀

Results

Table 1. Percentage yields of the oils

Plant	%Yield (v/w)	Color characteristics
<i>Z. officinale</i>	1.04	Pale-yellow clear liquid
<i>A. officinarum</i>	1.30	Pale-yellow clear liquid
<i>C. longa</i>	1.60	Pale-yellow clear liquid

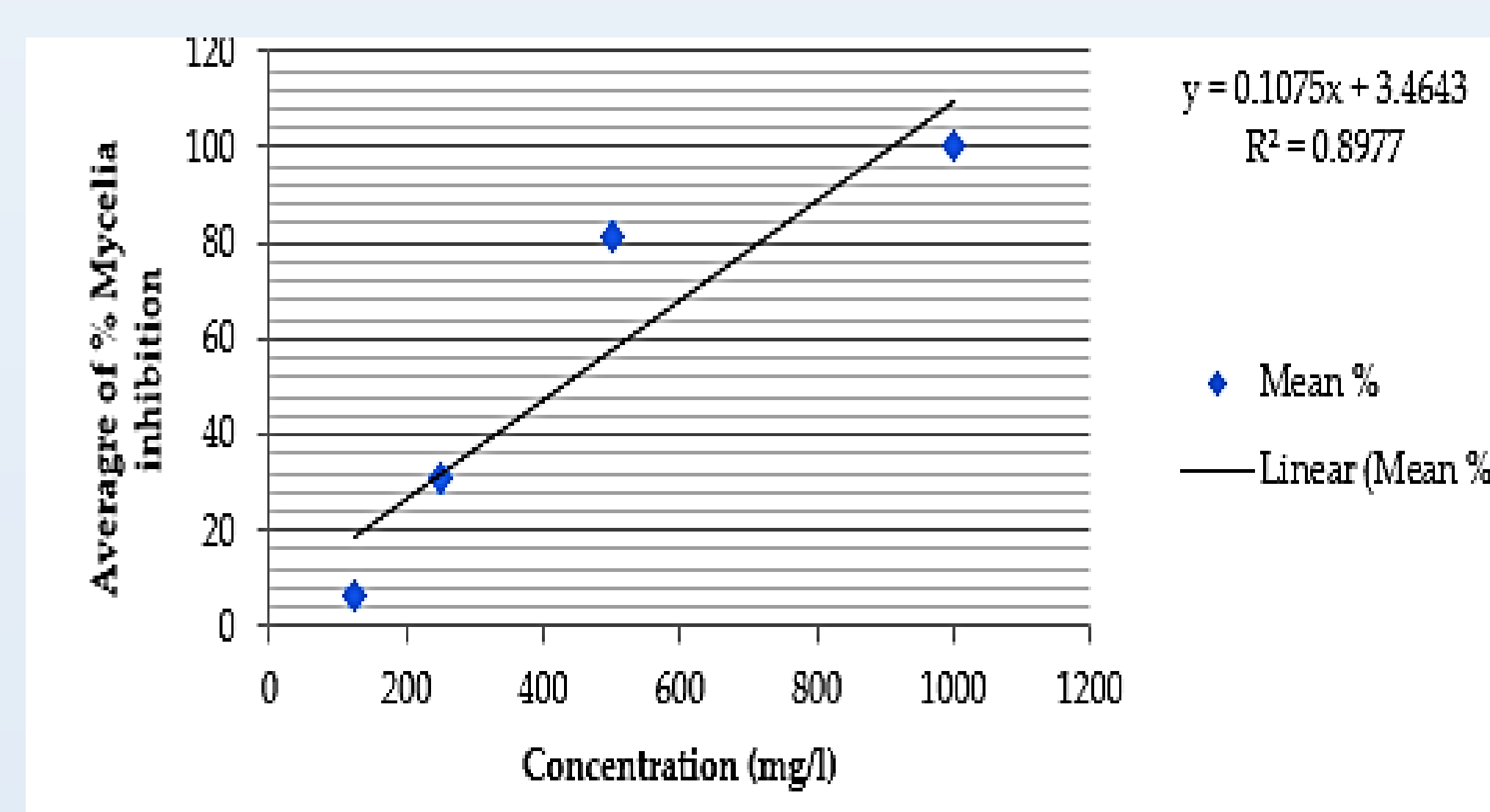
Table 2. Antifungal activity of essential oils against *P. parasitica* at 1,000 mg/l

Essential oil	% Mycelia growth inhibition* (% Mean±SD), n=3
<i>Z. officinale</i>	20.55±1.47 ^b
<i>A. officinarum</i>	100.00±0.00 ^a
<i>C. longa</i>	21.67±1.46 ^b

Chemical compositions

- 21 principal compositions, accounting for 99.1%.
- Major compounds,
 - eucalyptol (52%)
 - α-fenchyl acetate (9%),
 - β-pinene (6%),
 - α-terpineol (6%),
 - β-caryophyllene (4%)

Figure 1. IC₅₀ value of the *A. officinarum* oil against *P. parasitica*



The IC₅₀ values of 432.89 mg/l had higher antifungal activity than eucalyptol (> 1,000 mg/l).

Conclusion

The essential oils of rhizomes of *Z. officinale*, *A. officinarum*, and *C. longa* showed antifungal activity against *P. parasitica*. The *A. officinarum* oil displayed the most antifungal activity. The major composition of the effective oil was eucalyptol. The synergistic agent as the oil presented more mycelia growth inhibition than the eucalyptol. The *A. officinarum* oil could be feasible to use as a natural agrochemical for prevention of the growth of *P. parasitica*.

References

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