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Influence of Carbonyl Position in C9 Ketones Against the Phytoparasitic Pinewood Nematode

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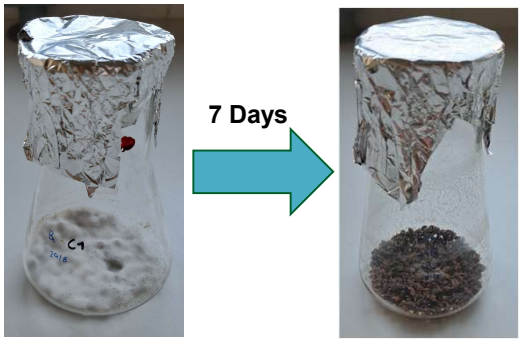
INTRODUCTION & AIM

The pinewood nematode (PWN, *Bursaphelenchus xylophilus*), is the causal agent of pine wilt disease (PWD) and poses a major threat to coniferous forests worldwide, leading to severe ecological and economic losses. Traditional chemical nematicides, though effective, raise environmental concerns due to their persistence, non-selective toxicity, and the emergence of resistant populations. As sustainable alternatives, medium carbon chain aliphatic compounds containing oxygenated functional groups such as ketones, alcohols, and carboxylic acids have shown promising nematicidal activity.

Structural features, particularly the position of the carbonyl group, play a crucial role in determining their bioactivity. This study aimed to evaluate the nematicidal potency of three positional isomers of C9 ketones 2-nonanone, 3-nonanone, and 5-nonanone against the PWN, to explore structure activity relationships (SAR) and identify structural features that enhance nematicidal efficacy.

METHODS

- **2-**, **3-**, and **5-nonanone** stock solutions were prepared in methanol to a final concentration of **20 mg/mL**

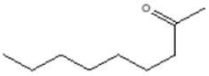
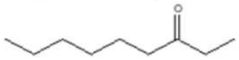
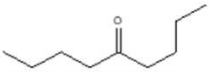


Nematode culture: PWN maintained *in vitro* on ***Botrytis cinerea*** grown on sterilized **barley grains.**

- Direct-contact bioassays in 96-well plates: **±60** nematodes per well.
- Treatments: **1 mg/mL** final concentration of each ketone.
- Incubation: **24 h** at **25 °C** in darkness**.**

Mortality assessment: Nematode count under stereomicroscope; corrected mortality calculated relative to methanol control.

RESULTS & DISCUSSION

Ketones	Chemical structure	PWN mortality[1]	Nematicidal strength
2-Nonanone		92.3±1.2	Strong
3-Nonanone		80.1±0.8	Strong
5-Nonanone		17.1±0.5	Low/inactive

- Bioactivity decreased with increasing carbonyl distance from the terminal end **(2 > 3 > 5)**.

Methanol Control

2-nonanone 1 mg/mL

- Indicates that **terminal** or **near-terminal carbonyl positioning** enhances membrane interaction or metabolic disruption.
- Confirms that **minor structural shifts** in **homologous aliphatic compounds** markedly affect nematicidal potency.
- Results align with prior SAR studies on aliphatic and oxygenated volatiles.

CONCLUSION

- **Carbonyl group position** critically determines nematicidal activity among **C9 ketones**.
- Findings support **medium-chain oxygenated aliphatic** compounds as eco-friendly leads for **next-generation nematicides**.

FUTURE WORK / REFERENCES

- Further research should explore **dose-response effects**, **synergistic interactions**, and **field-scale validation** for sustainable PWD management.

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