Allelochemical mediated protection and growth stimulation of *Vigna radiata* plants during *Podosphaera xanthii* attack

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ABSTRACT

Allelochemicals are the secondary metabolites produced by living organisms that are not necessary for their primary metabolic functions. *Asafoetida* (hing), an aromatic gum-resin is a kind of allelochemical widely used as flavors in the household cooking. Majority research work mentions the medical applications of *Asafoetida* on human beings like anti-spasmodic, anti-inflammatory, anti-viral and antibiotic effects, but limited plant applications have been explored. *Vigna radiata* (Mung bean) is the most susceptible plant for infection with the fungus, *Podosphaera xanthii* that cause powdery mildew disease in these plants reducing yields by more than 40% in conducive seasons. Thus, the study focused on evaluating the possibilities of hing application in controlling *P. xanthii* attack and eventually stimulating the growth of Mungbean plants in a better way. The plants were challenged with a range of hing solutions alongwith standard reference of Neem oil and Plant growth was recorded in terms of height, weight and chlorophyll content. 1500-3000ppm was found to be the optimum concentration range of Hing which reduced the *P. xanthii* infestation and increased mungbean growth.

Introduction

*Asafoetid*a (Hing) is an allelochemical used as dried aromatic gum-resin exuded from the living rhizome, root stock (or) taproot of varied plant species of genus *Ferula*.

Composition: resin (40 to 65%), gum (20 to 25%) and volatile oil (4 to 20%)

Asafoetida application may offer a single robust solution to farmers to enhance the overall crop product various reasons such as crop protection, pest repellent, eco-friendly, cost- effective, biodegra high absorption rate and user friendly.

With this background the role of hing in protect and growth stimulation of Mungbean plants du *P. xanthii* infection was tested.

Materials and Method

- **Isolation** of *Podosphaera xanthii* from infected Mungbean plants
- **Subculturing** and maintenance on mungbean seeds at room temperature.
- **Detached leaf infection experiment:** Sterilized Mungbean leaves were infected with *P. xanthii conidia* and the extent of infestation were observed after 1d, 2d, 3d, 4d, and 5 days of spore inoculation. Experiment was set up in petriplates containing MS media.
- **Microscopy:** Compound light microscopy and SEM
- ***In planta* study** to check the antifungal effect of Hing on mungbean plants.

Results

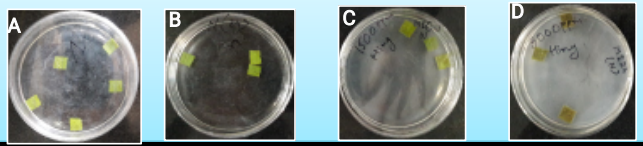

Fig. 1. Observation of mungbean leaf segments at day 1. A: Control leaf segments; B: Control leaf segments inoculated with *P. xanthii*; C: leaf segments inoculated with *P. xanthii* in presence of 1500ppm Hing D: leaf segments inoculated with *P. xanthii* in presence of 3000ppm Hing ppm Hing.

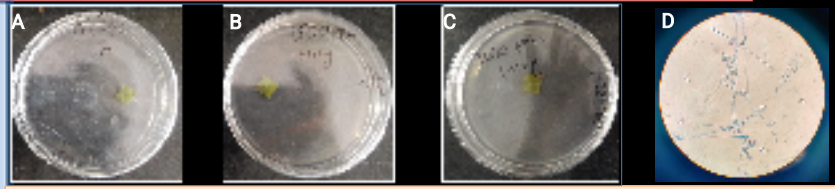

Fig. 2. Observation of mungbean leaf segments at day 5. A: Control leaf segments inoculated with *P. xanthii*; B: leaf segments inoculated with *P. xanthii* in presence of 1500ppm Hing C: leaf segments inoculated with *P. xanthii* in presence of 3000ppm Hing D: *P. xanthii* as observed in a compound microscope at 100X magnification

Microscopy results: Light microscopy revealed high damaging effects in the palisade and spongy tissues in pathogen infected sections after 2 days and complete tissue death after 6 days, but no damage in presence of hing treatment till 5 days. SEM confirmed the attachment of conidia and entry of haustoria through epidermal layers in *P. xanthii* challenged leaves, but it was controlled in hing treated leaves.

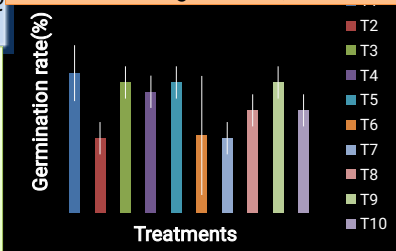

Fig. 3. Germination rate of Mungbean seeds set after day 5 in water agar experiment.

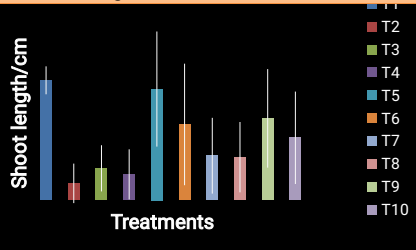

Fig. 4. Shoot length of mungbean plant s after 7 days of growth in water agar

Set No.	Treatments	Set No.	Treatments
T1	Seed (control)	T6	Seed + 3000ppm Hing
T2	Seed + *Podosphaera xanthii*	T7	Seed + 1% neem oil + *P. xanthii*
T3	Seed + 1% neem oil	T8	Seed + 2% neem oil + *P. xanthii*
T4	Seed + 2% neem oil	T9	Seed + 1500ppm Hing + *P. xanthii*
T5	Seed + 1500ppm Hing	T10	Seed + 3000ppm Hing + *P. xanthii*

Conclusions

- Asafoetida is widely known for its medical applications, but very less has applications have been explored against phytopathogenic fungi and plant growth stimulation. The present study envisaged the application of hing in controlling powdery mildew disease of *Vigna radiata* and also stimulated its overall growth. 1500ppm hing concentration was found to be the optimum concentration that controlled *Podosphaera xanthii* infestation upto a greater extent.
- Neem oil was used in the experiment as a standard reference of organic amendment with a vision of future plant application in combination with *asafoetida*.
- This study could also partially reveal that the volatile component of Hing was responsible for slowing down and inhibiting the growth of fungal pathogens. Detail mechanism yet needs to be explored.

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