

Biocontrol efficacies of endophytes

Similar and discrete traits of endophytes harbored in plants with similar secondary metabolite production

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*It is immensely important to understand the reaction and stability of endophytes in any microbe-microbe interactions due to biotic selection pressures, outside the host environment. It is compelling that similar biosynthetic principles apply phylogenetically unrelated plants (like *Radula marginata* and *Cannabis sativa* L.) with regard to production of structurally similar compounds. The basic objective was to evaluate the probable contributions and capabilities of endophytes harboured in liverwort *Radula marginata* in aiding host fitness against the pathogens.*

Liverworts are small, simple and non-vascular plants existing in almost all ecosystems, though they are abundant in the tropical niches. However, these small plants are highly rich in terpenoids and aromatic compounds. Recent investigations on *Radula marginata* led to the identification of bibenzyl cannabinoids (namely perrottetinene and perrottetinenic acid), with structural similarity to tetrahydrocannabinol, the major psychoactive secondary metabolite of *Cannabis sativa* L. plants. Taking cues from our previous work on the endophytic community of *C. sativa*, this study compares and evaluates the ecological significance and antagonistic potential of bacterial endophytic community of *R. marginata* as compared to that of *C. sativa*.

The endophytes were challenged against *B. cinerea* and *T. roseum*, under five different media conditions to justify and compare the potent benefits and challenges encountered by endophytic isolates against the pathogens. Some isolates demonstrated physical defense strategies by causing malformation of pathogen mycelia on contact. Others were able to perceive unfavorable conditions long before physical proximity, and displayed chemical defense by either releasing visible exudates, forming inhibition zone (halo) or even producing secondary metabolites in form of dark brown to black bands. Although *Bacillus* sp. is quite commonly found in various ecological niches, exhibiting an endophytic lifestyle in two different host plants with similar biosynthetic principles is noteworthy. To gain a deeper insight into the significance of presence of similar bacterial species, the bacterial endophytic isolates were further exploited for their efficacies in retaining certain 'defensive' functional traits like biofilm formation.

Thus far, our work underlines the similar and discrete traits of endophytic community of plants from different geographical niches with similar secondary metabolite (cannabinoid) production.

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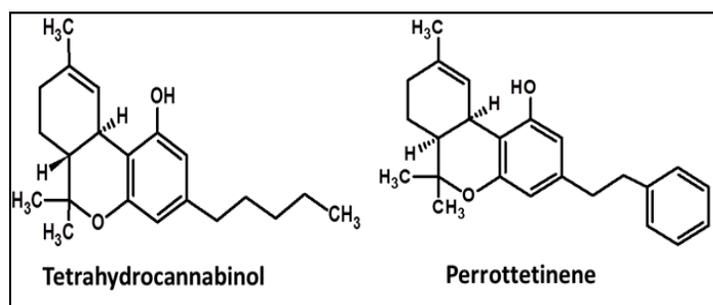


Figure 1: Structurally similar secondary metabolite in *Cannabis sativa* L. and *Radula marginata*

Endophyte Strain number	Antagonistic inhibition (% inhibition) against <i>Botrytis cinerea</i> in five different media					Different endophyte-pathogen interactions under five different media				
	WA	SA	PDA	MEA	NA	WA	SA	PDA	MEA	NA
R1	0	15	22	-10	55	4	2	2	1	3
R2	20	-29	33	10	NG	4	1	3	1	12
R3	20	0	11	20	82	4	3	1	1	4

Code	Endophyte-pathogen interaction descriptions		
A	Both endophyte and pathogen grow towards each other, but growth stopped and mycelia of pathogen malformed as their mycelia came in physical contact; no sporulation; no color alteration of mycelia; no release of visible exudates; no inhibition zone (no halo)		
B	Both endophyte and pathogen grow towards each other, but growth stopped and mycelia of endophyte malformed as their mycelia came in physical contact; no sporulation; no color alteration of mycelia; no release of visible exudates; no inhibition zone (no halo)		

Figure 2: Antagonistic potential (inhibition calculations) of endophytic isolates harbored in *Radula* against phytopathogens

Publications:

[1] Kusari P., Kusari S., Spiteller M., Kayser O. (2014) Biocontrol potential of endophytes harbored in *Radula marginata* (liverwort) from the New Zealand ecosystem. *Antonie van Leeuwenhoek* 106: 771-788