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Endophytes from medicinal plants and their potential for producing indole acetic acid, improving seed germination and mitigating oxidative stress

Key words: Fungal endophytes, Diversity, Medicinal plants, Antioxidants, Indole acetic acid

Research Summary

- This study elucidates the endophytic diversity of medicinal plants (*Caralluma acutangula*, *Rhazya stricta* and *Moringa peregrina*) and the endophyte role in seed growth and oxidative stress

- Various organs of medicinal plants yielded ten endophytes, which were identified as *Phoma* sp. (6 isolates), *Alternaria* sp. (2)*, Bipolaris* sp*.* and *Cladosporium* sp*.*

- The culture filtrates (CF; 25, 50 and 100% concentration) from these endophytes were tested against the growth of normal and dwarf mutant rice lines.

- This growth-promoting effect was due to the presence of indole acetic acid in endophytic CF.

- The isolate of *Bipolaris* sp*.* exhibited significantly higher radical scavenging and anti-lipid peroxidation activity than the other isolates. *Bipolaris* sp*.* and *Phoma* sp. also exhibited significantly higher flavonoid and phenolic contents.

Innovation points

- Endophytic fungi were isolated from different organs (leaves, stem and roots) of *Caralluma acutangula* (CA), *Rhazya stricta* (RS) and *Moringa peregrina* (MP). These endophytes were found to produce indole acetic acid (IAA).

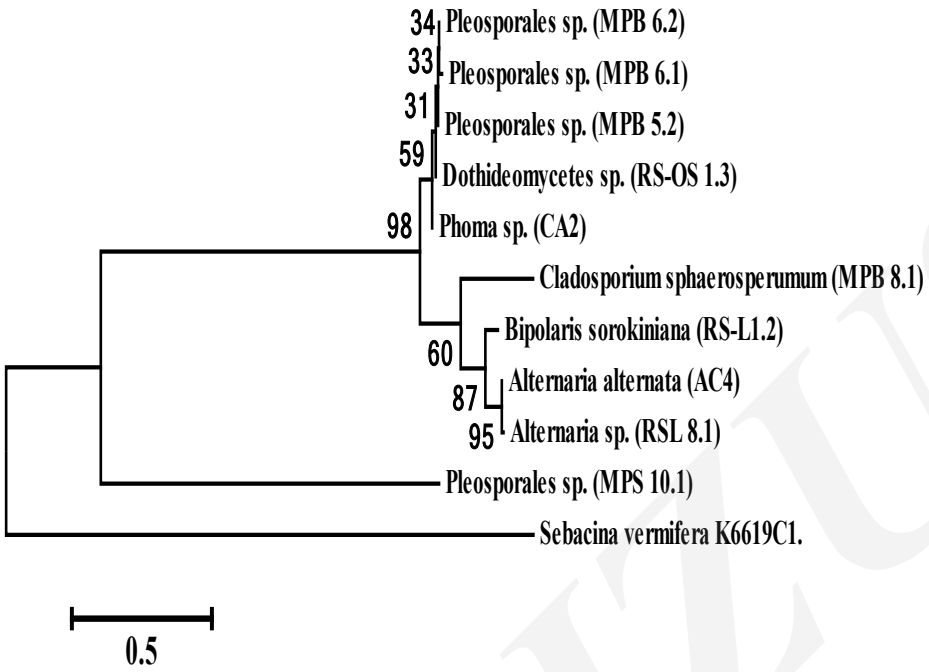

Fig. 1 Molecular Phylogenetic analysis of fungal strains, isolated from different organ of medicinal plants

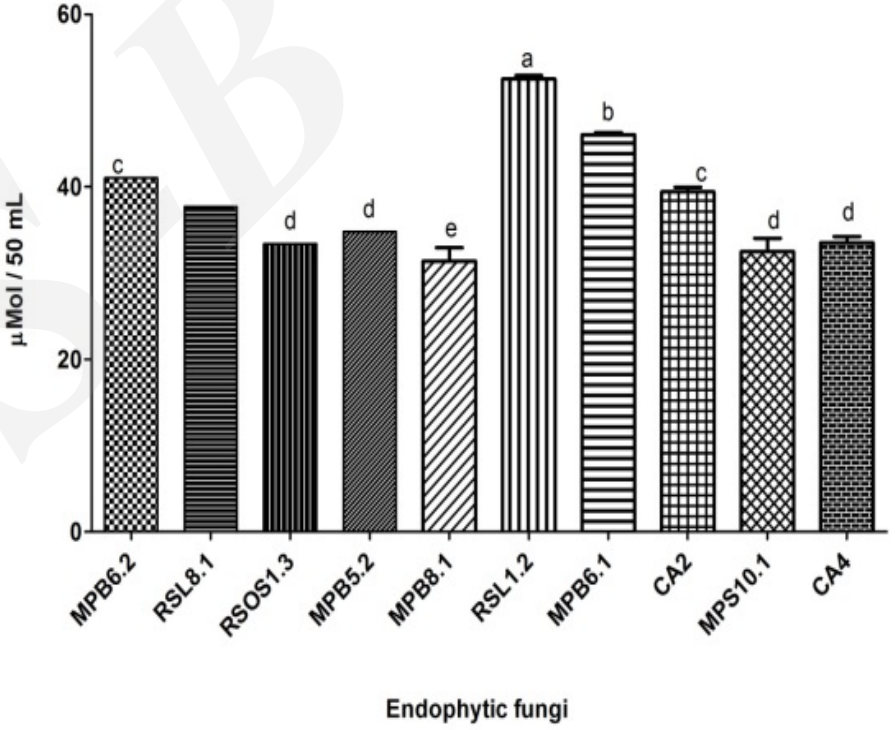

Fig. 2 IAA production by the isolated endophytes in their growing culture medium. The bars represents the mean values with standard error. The different letter(s) depict a significantly (p<0.05) different values with respect to each other as evaluated by DMRT analysis. The IAA results are based on the 50 mL growth medium of the endophytes.

Innovation points

- **Table 1.** Shows the effect of different concentrations of endophytic culture filtrates on growth of *waito-C* and Dongjin-beyo rice seed. The growth promoting effect was attributed to the IAA production.

	100%				50%				25%			
	waito-C		Dongjin-beyo		*waito-C*		Dongjin-beyo		*waito-C*		Dongjin-beyo	
Endophytes	Root (cm)	Shoot (cm)	Root (cm)	Shoot (cm)	Root (cm)	Shoot (cm)	Root (cm)	Shoot (cm)	Root (cm)	Shoot (cm)	Root (cm)	Shoot (cm)
Control	3.6±0.3b	2.6±0.47b	3.2±0.17ab	3.1±0.13c	3.6±0.37c	2.6±0.47c	4.2±0.7b	3.12±0.03d	3.65±0.3d	2.62±0.4d	4.2±0.7c	3.1±1.0d
MPB6.1	4.15±0.71a	2.7 ± 0.5b	2.1±0.14c	3.4±0.05c	5.7±0.3a	4.1±0.62a	6.1±0.83a	5.2±0.08a	4.25±0.68c	2.87±0.6d	4.2±0.7c	5.4±0.6b
MPB6.2	1.9±0.09d	2.3±0.02bc	2.72±0.19b	3.77±0.06b	2.57±0.89d	3.3±0.39b	3.87±0.8c	3.55±0.3c	6.07±0.19a	5.9±0.6a	5.5±1.9b	5.8±1.6a
MPB5.2	4.12±0.04a	3.3±0.4a	3.35±0.12a	4.0±0.13a	2.25±0.82d	2.3±0.54c	3.37±0.9c	4.3±0.7b	1.62±0.63f	1.75±0.8e	2.37±0.5e	2.8±3.0
MPB 8.1	2.3±0.2c	1.7±0.3d	2.42±0.16b	3.25±0.1c	2.15±0.49d	1.2±0.69d	6.9±0.76a	5.1±0.8a	2.02±0.01e	0.75±0.01f	2.1±0.1e	4.7±0.8c
MPS 10.1	1.7±1.5d	1.2±0d	0.67±0.03	3.2±0.33c	4.12±0.4b	3.2±0.84b	4.7±0.5b	3.2±0.9c	5.5±0.28b	2.65±0.44d	5.2±1.0b	4.2±0.9c
RS-OS 1.3	0.27±0.15e	1.6±0.7d	1.9±0.15c	1.85±0.3e	1.95±0.67e	2.2±0.36c	4.1±0.75b	3.6±0.9c	1.0±1.06f	1.4±0.04e	3.7±0.5d	3.1±0.3d
RSL 1.2	3.85±0.7ab	3.1±0.61a	3.7±0.49a	4.07±0.7a	2.0±0.84e	1.2±0.28d	3.7±0.4c	4.15±0.9b	4.52±0.11c	2.3±0.98d	6.9±1.1a	4.9±0.1b
RSL 8.1	0.75±0.8e	0.8±0.02e	0.0±0.0e	2.5±0.5d	1.25±0.29f	1.2±0.29d	0.37±0.64e	1.25±0.2f	1.75±0.04f	0.87±0.8f	5.9±0.6b	4.7±0.1c
CA2	2.0±0.1d	3.0±0.03a	1.62±0.84d	3.05±0.5c	4.75±0.08b	2.5±0.61c	4.62±0.9b	5±0.6a	6.375±0.0a	3.62±0.5c	7.0±2.1a	5.2±0.1b
CA4	0.0±0.0f	0.0±0.0f	0.0±0.0e	0.0±0.0e	2.32±0.98d	2.4±0.83c	2.5±0.2d	2.05±0.1e	1.6±0.01f	4.6±0.5b	1.125±0f	1.5±0e

Values in each cell are the mean of three replications and shown with standard deviation. The column having different letters are significantly different as evaluated by DMRT test ($p<0.05$).

Innovation points

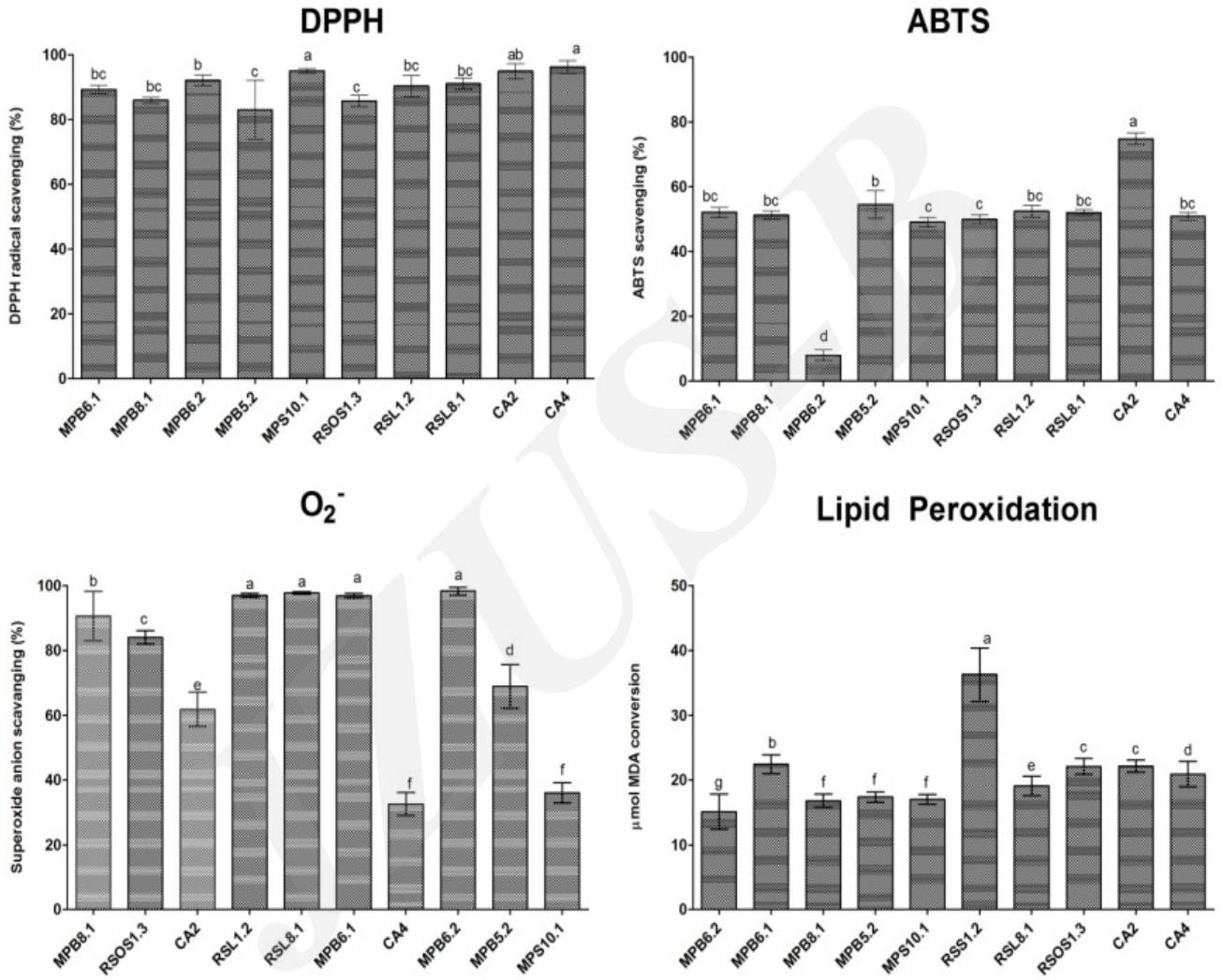

Fig. 3 Potential of fungal endophytes in scavenging radicals and avoiding oxidative stress. The different letter(s) depict a significantly ($p<0.05$) different values with respect to each other as evaluated by DMRT analysis.

Innovation points

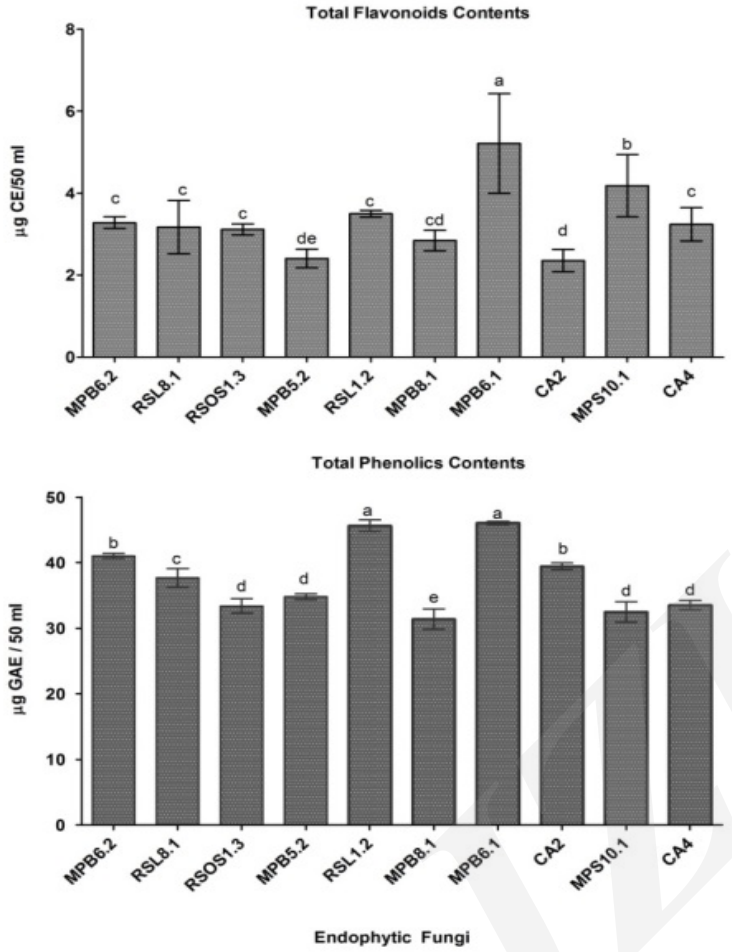

Fig. 4 Flavonoid and phenolic contents of endophytic fungal strains. The bar represents mean values with SE. The different letter(s) shows significantly ($p<0.05$) different values with respect to each other as evaluated by DMRT analysis. The results are based on the 50 mL growth medium of the endophytes and correlative to cathachol (CE) and gallic acid equivalent (GAE) for flavonoid and phenolic respectively.

Conclusion

- The medicinal plants exhibited the presence of bioprospective endophytic strains, which could be used for the improvement of crop growth and the mitigation of oxidative stresses.