SCREENING OF ACTINOBACTERIA FROM VERMICOMPOST FOR THEIR PLANT GROWTH PROMOTING PROPERTIES

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Abstract

Vermicompost, a product of organic waste decomposition mediated by earthworms and associated microorganisms, is a highly valued organic fertilizer due to its rich nutrient content and beneficial microbial communities. Among these, actinobacteria are widely distributed and recognized for their plant growth promoting (PGP) potential. Therefore, this study aimed to isolate actinobacteria from commercial vermicompost and evaluate their plant growth-promoting properties. Two commercial vermicompost products were chosen for isolation using three selective media —starch casein agar, glycerol arginine agar, and humic acid vitamin agar, supplemented with nystatin and nalidixic acid. A total of 17 isolates were obtained from Panya farm (11 isolates) and JB farm (6 isolates), which were classified into six groups based on substrate and aerial mycelium pigmentation. Subsequently, all actinobacterial isolates were screened for plant growth-promoting (PGP) traits, specifically indole-3-acetic acid (IAA) and siderophore production and phosphate solubilization. The results showed that all isolates produced phytohormone indole-3-acetic acid (IAA), with concentrations ranging from 1.47 ± 0.59 to 8.73 ± 1.71 µg mL^{-1}. Six isolates produced siderophores on Chrome Azurol S (CAS) agar. Quantitative analysis identified two siderophore types: catecholate-type (2.98 ± 2.13 to 67.44 ± 4.00 µmol L^{-1}) and hydroxamate-type (95.58 ± 21.31 to 731.33 ± 200.56 µmol L^{-1}). Moreover, sixteen isolates exhibited phosphate-solubilizing activity at varying levels (44.74 ± 6.15 to 57.62 ± 5.13 mg L^{-1}). These findings demonstrate that commercial vermicompost is a promising reservoir of plant growth-promoting actinobacteria with significant potential for sustainable agricultural applications.

Objectives

- To isolate actinobacteria from commercial vermicompost.
- To screen plant growth promoting properties of actinobacteria *in vitro*.

Material&Method

Vermicompost samples

- JB farm
- Panya farm



Isolation of actinobacteria

Selective media

- Starch casein agar
- Glycerol arginine agar
- Humic acid vitamin agar

Antibiotic : nystatin (50 ug/ml) and nalidixic acid (25 ug/ml)



Spread plate (dilution 10^{-5}-10^{-6})

Purification& Color grouping



Subculture on GPM agar

The ISCC color system

Plant growth properties



ISP2 broth
+ L-tryptophan

IAA production

Quantitative
Pikovskaya's medium

Phosphate solubilization

Quantitative
Chrome Azurol S medium

Siderophore production

Results

Representative isolates of 6 color groups



Isolation of actinobacteria



Table 1 Actinobacteria from vermicompost on selective media.

IAA production



Figure 1 IAA production of actinobacteria.

Phosphate solubilization



Figure 2 Amount of phosphorus released by phosphate solubilizing actinobacteria.



Figure 3 pH of culture broth.



Figure 4 Phosphate solubilization.

Siderophore production



Figure 5 Catecholate siderophore production by actinobacteria.



Figure 6 Hydroxamate siderophore production by actinobacteria.

Figure 7 Siderophore production.

Conclusion

- 17 isolates of actinobacteria were obtained from 2 commercial vermicompost products.
- Cultivated actinobacteria from vermicomposts exhibited plant growth promoting properties.