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The effect of nitrogen-fixing microorganisms on plant promotion in cabbage

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Abstract

Chemical fertilizers have been used to increase crop production and contributed to escaping food shortages. However, excessive use of chemical fertilizers over a long period caused many problems such as environmental pollution and the hampered production potential of the land. Thus, it is necessary to develop eco-friendly bio-fertilizers that can replace the use of chemical fertilizers. Here, we tested the effect of some nitrogen-fixing microorganisms on the plant growth promotion. Seventy free-living nitrogen fixing microorganisms were isolated from rhizosphere of crop cultivation fields, streamside soils and sludge in Anseong, Korea. Of them, three strains (NF2-4-1, Yeast; EMM409, Mesorhizobium; Gsoil662, Burkholderia) were selected to be most efficient in the capacity of N-fixing nitrogen based on colony forming cell assay in N-free media. To investigate the ability to promote plant growth, these strains were inoculated into the soil and cabbage were grown for 4 weeks in the growth chamber. Fresh weight, dry weight, and leaf area were measured from 4-week-old plants. Phenotypic analysis revealed that the growth of the plants inoculated with NF2-4-1 and EMM409 strains were significantly promoted compared to the mock-treated control plants, while Gsoil662-inoculated plants did not show statically significant promotion. These results indicate that these nitrogen-fixing microorganisms can be used to develop plant growth promoting bio-fertilizers. Further analysis on nitrogen fixing level in soil by these strains will be tested.

Keywords: Nitrogen-fixing microorganism, Plant growth effect, Bio-fertilizer, Cabbage

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