Importance of interactions among endophytes for plant growth

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Plants profit extensively by harboring endophytic microbes. They promote plant growth and confer enhanced resistance to various pathogens by producing antibiotics. However, the way the interactions among endophytes influence the plant productivity has not been studied. Present study experimentally showed that endophytes isolated from rice plants produced 2 types of cultures: biofilms (bacteria attached to mycelia) and mixed cultures with no such attachments. Organic acid production as measured by pH in cultures with biofilms was higher than that of fungi alone, bacteria alone or mixed cultures. The acid production of individual microbes was marginally increased when they were in biofilms or mixed cultures. The Indoleacetic Acid Like Substances (IAAS) production of biofilms was higher than that of mixed cultures, fungi or bacteria. Bacteria and fungi produced higher quantities of IAAS than mixed cultures. In mixed cultures, the IAAS production of individual microbes was hampered considerably. There was a clear negative relationship between IAAS and pH of the biofilms, indicating that IAAS was the main contributor to the acid production. However, such a relationship was not observed in mixed cultures. Microbial acid production is important for suppressing plant pathogens. Thus the biofilm formation in endophytic environment seems to be a very important factor for healthy and improved plant growth. However, it is unlikely that an interaction among endophytes takes place naturally in the endophytic environment, due to physical barriers of plant tissues. Further, critical cell density dependant quorum sensing that leads to biofilm formation may not occur in the endophytic environment as there is a limited space. As such *in vitro* production and application of beneficial biofilmed inocula of endophytes are important for improved plant production in any agro-ecosystem.

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