

研究简报

溶磷菌和固氮菌溶解磷矿粉时的互作效应

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摘要 采用4株溶磷菌 (Lx81、Dm84、Jm92、Lx191)、和3株固氮菌 (ChW5、ChW6、ChO6) 单独和混合接种后测定培养液有效磷含量、pH值及总有机酸含量的方法, 研究溶磷菌和固氮菌溶解磷矿粉时的互作效应。结果表明, 相对于单独接种溶磷菌: Lx81与3株固氮菌分别混合培养能提高磷矿粉的溶解能力, 4株溶磷菌与 ChW6、Lx81、Dm84、Lx191与ChO6分别混合培养及Jm92+ChW5组合溶磷量极显著增加 ($p<0.01$); Dm84+ChW5、Lx191+ChW5、Jm92+ChO6组合的溶磷量下降 ($p<0.01$)。除Lx81+ChW6、Lx81+ChO6培养液pH值降低外, 混合培养的其它组合培养液pH值均较单独接种溶磷菌时升高。有机酸测定结果表明, Lx81、Jm92与ChW5、ChO6分别混合培养、ChW6+Lx81组合有机酸含量升高 ($p<0.01$), 其它7种组合的有机酸含量均较单独接种溶磷菌的值下降 ($p<0.01$)。溶磷菌和固氮菌单菌培养时溶磷量与pH值、溶磷量与总有机酸含量及pH值与总有机酸含量之间呈现线性相关; Dm84、Lx191与3株固氮菌分别混合培养溶磷量与pH值之间、Lx81与3株固氮菌分别混合培养溶磷量与总有机酸含量之间呈现线性相关, 其它组合的溶磷量与pH值、总有机酸含量间没有相关性。溶磷菌和固氮菌混合培养对溶解磷矿粉既有协同作用也有拮抗作用。

关键词 [溶磷菌](#); [固氮菌](#); [互作效应](#); [溶磷能力](#)

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Studies on the interactions between phosphate-solubilizing bacteria and nitrogen-fixing bacteria in rock phosphate solubilization

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Abstract Several microorganisms species are known to have the function of dissolving insoluble phosphate through organic acids excretion. Therefore, the higher crop yields would be gained when the seed or the soil were inoculated with phosphate-solubilizing bacteria (PSB) which would be able to improve the solubilization from fixed soil phosphorus and applied phosphatic manure. Furthermore, the interactions between phosphate-solubilizing bacteria (PSB) and nitrogen-fixing bacteria (NFB) in rock phosphate solubilization have been paid much attention in the practice recently. In this research four strains of PSB (Lx81、Dm84、Jm92、Lx191) and 3 strains of NFB (ChW5、ChW6、ChO6) were selected to investigate the effects of interaction between PSB and NFB, P-solubility, pH value and total organic acids production through incubation of those strains in Pikovaskaia's (PKO) medium individually or in pairs of different combinations. The results showed that different PSB responded differently to NFB on P solubilization, pH value

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e and total organic production when they were incubated in pairs. Compared with the samples of only PSB inoculating groups, the capacity of P solubilization was increased significantly ($p < 0.01$) when Lx81 inoculated with 3 NFB strains in pairs respectively; similar trends were also found in the groups of inoculating of Lx81, Dm84 and Lx191 with ChO6 in pairs respectively, the groups of 4 PSB strains that inoculated with ChW6 in pairs respectively as well as the groups of Jm92 that inoculated with ChW5 together. In contrast, the P solubilizations capacity of incubation of Dm84+ChW5, Lx191+ChW5, Jm92+ChO6 were decreased. The pH values of mixed inoculation groups were all increased compared with the groups of only PSB inoculation groups except for the groups of Lx81+ChW6 and Lx81+ChO6 whose pH values decreased. By measuring the total organic acids content levels, it was found that compared with the groups of only inoculated PSB, the levels of the total organic acids were increased significantly when Lx81 or Jm92 inoculated with ChW5, Lx81, Jm92 inoculated with ChO6 and Lx81 inoculated with ChW6 together respectively ($p < 0.01$), but the values of other 7 treatments in pairs were decreased significantly ($p < 0.01$). The linear relationships between two variables of the content levels of P solubilizations and the pH values, the content levels of P solubilizations and the total organic acids content levels, the pH values and the total organic acids content levels were found among the samples of groups that inoculated with PSB or NFB separately, The content levels of P solubilizations and the pH values of the groups of Dm84, Lx191 inoculated with 3 NFB strains mixed or separately had linear relationships. The content levels of P solubilizations and the total organic acids content levels of the groups of Lx81 inoculated with 3 NFB strains mixed separately had linear relationships. No correlations between the variables of the content levels of P solubilizations, the total organic acids content levels as well as pH values of other groups were found. So it was concluded that the interactions between PSB and NFB would be either cooperative or anticompetitive in dissolving rock phosphate when they were inoculated in a mixed way.

Key words [phosphate-solubilizing bacteria](#) _ [nitrogen-fixing bacteria](#) _ [interactions](#) _ [P-solubility](#)

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