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## **Agro-industrial waste materials and wastewater sludge for rhizobial inoculant production**

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This review has considered the use of waste in the production of liquid and solid rhizobial inoculants. Many agroindustrial wastes showed good potential to replace the standard medium and the commonly used peat in inoculant production. Although availability, transport, cost and treatment of these wastes may limit inoculant production, their use still offers a valuable alternative for recycling wastes that supports sustainable agriculture. The use of industrial and option for sludge disposal and recycling, and may reduce the production cost of inoculants. The rhizobium-legume symbiosis plays an important role in agriculture, because it offers the ability to convert atmospheric molecular nitrogen into forms useable by the plant, a process called biological nitrogen fixation. Most of the research to optimize symbiotic nitrogen fixation and to increase the use of legumes in crops systems has been in part stimulated by increasing fertilizer prices and by environmental concerns. Compared to other wastes, sludge is an abundant raw material for inoculum preparation. Sludge can be used without any treatment process because of its organic composition (C, N, P, solids) and its nutrient value. In some cases, sludge pre-treatment may be necessary to maximize cell numbers and to reduce fermentation time. Improvements in sludge technology (formulation of the product, test in the field) are still necessary before large-scale application of this new strategy can be realized.

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