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MOTILITY OF RHIZOSPHERIC BACTERIA IN THE SOIL TOWARDS WHEAT ROOTS

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The motility of rhizospheric bacteria in the soil towards roots of several wheat genotypes was investigated. The study was carried out with two bacterial strains - Azospirillum brasilense cd ATCC 29145, and Pseudomonas sp. isolated from roots of wild wheat and employed two different aceptic methods. The set-up of the first consisted of a glass dish (170 mm in diameter) filled with sterilized soil (50 mm deep) and planted at one side with a four day old, seed disinfected germinating seedling. A fine nylon net barrier restricted root growth throughout the dish. After the seedling growth, the soil was inoculated at a depth of 0.5 cm with 0.5 ml of 10^9 colony-forming-units - eight cm from the growing seedling. Soil samples were taken asceptically by a device consisting of disposable capillaries attached at regular intervals to a slide glass. The samples were plated on a selective medium by applying the capillaries on the agar. Bacterial development on the medium was visibly detected and the rate of bacterial migration was calculated by measuring the distance between colonies. The second method employed a modification of the open-channels chemotaxis cell designed by Barak et al. (J. Appl. Bacteriol. 53: 399-403, 1983). It is an autoclavable stainless steel 12 mm thick disc with four open channels each connected by two holes drilled 40 mm apart. The open channels were designed to prevent undesirable aerotactic responses of the bacteria. The disc was hermetically covered with another thin stainless steel disc, two mm above the channels, to prevent water evaporation during the course of the experiment. A PVC barrier blocked the channels. Bacteria were applied to one hole and wheat root exudates to the other. The PVC barrier was removed and after three to seven hours in laminar flow hood the fluid in the bacterial hole and the channel was pumped out. Samples were taken from the root exudates hole and bacteria were counted by the plate counting method. According to the two systems, both bacteria responded to the presence of the plant in the soil. Motility was first detected six hours after inoculation and continued later. Under appropriate soil moisture the bacteria reached the plant roots within 72 hours or less. Bacteria were not spread throughout the whole soil mass of the dish, but restricted to a narrow front in the plants' direction. In the absence of the plant, only a random and limited movement was observed in light-textured soil. In heavy soils, this movement was negligible. Soil moisture was found to be the main factor governing motility. At relatively dry soil, motility was inhibited whereas at flooded soil, the bacteria reached unpreferentially every site of the dish. Motility was related to plant attraction only to the relative soil moisture. A slight increase or decrease of soil moisture had a marked effect on the bacterial movement. The two bacterial species did not differ significantly in their motility. Also, there was no significant preference towards any of the 11 different wheat genotypes tested. However, certain genotypes were better attractants than others, particularly after short period of time. Root exudates of two different wheat species served as an attractant to the bacteria to about the same extent. It was concluded that there was an unspecific chemotactic response of the rhizospheric bacteria towards wheat roots.