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OCCURRENCE OF *AZOTOBACTER* SPECIES IN THE RHIZOSPHERE OF WHEAT

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Azotobacter, a non-symbiotic nitrogen fixer, has been most commonly isolated and reported to fix nitrogen to the extent of 2-15 mg/g of carbon source utilized (Subba Rao, 1981). When maize seeds were inoculated with this bacterium, increase in yield upto 30% was observed (Mishustin, 1970). This short note reports the occurance of *Azotobacter* species in a soil cropped with wheat.

Wheat cv Punjab-81 was sown at 15 days intervals as early (4.11.1981), mid (20.11.1981) and late crop (5.12.1981) in pots containing normal loam soil. No fertilizer was applied and the plants were watered regularly. At earing stage, rhizosphere soil was collected by mechanically removing the adhering soil left after shaking the roots. For sampling rhizoplane, the roots after removing the rhizospere soil were washed three times in sterile water and suspensions were prepared by putting 1g of roots in 100 ml sterile water and mixed for 2 minutes in a blender. The soil without plants was used as non-rhizosphere soil. Dilutions of non-rhizosphere, rhizosphere and rhizoplane samples were planted on modified mannitol agar (Anonymous, 1957) and incubated at 28±2°C. After six days, 2-6 mm diameter colonies of *Azotobacter* were counted. *Azotobacter* species were identified based on diffusible pigments produced (Thompson and Skerman, 1978).

Azotobacter counts : Before sowing of wheat there were 210 cells/g of soil and after four months incubation the number rose to 255 cells/g (Table 1). The results are in agreement with the findings of Meiklejohn (1965) but differ with those of Brown *et al.* (1962) and Abd-el-Malek (1971) who reported higher numbers.

At earing stage, *Azotobacter* counts in rhizospere were nearly three times higher than the control soils. Similar results in wheat were reported by Kudrian (1957). The rhizoplane had considerably low counts as compared to rhizosphere. Brown *et al.* (1962) reported that wheat rhizoplane was free of *Azotobacter*.

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The mid sown wheat showed higher *Azotobacter* counts as comared to those of early and late sown.

Table 1. *Azotobacter coutns as influenced by wheat growth estimated at flowering stage (No. of cells/g of the material; before sowing the soil had 210 cells/g)*

Source	Early sown wheat	Mid sown wheat	Late sown wheat
Non-rhizosphere soil (control)	255	235	255
Rhizosphere soil	635	810	670
Rhizoplane	105	135	110

Table 2. *Species percentage composition of Azotobacter in non-rhizosphere, rhizosphere and rhizoplane of wheat*

Source	Species	Early sown	Mid sown	Late sown
Non-rhizosphere soil (control)	*A. chroococcum*	50	30	20
	A. vinelandii	20	40	50
	A. beijerinckii	30	10	10
	A. nigricans	—	10	10
	Unidentified	—	10	10
Rhizosphere	*A. chroococcum*	34	50	25
	A. vinelandii	25	33	33
	A. beijerinckii	25	17	17
	A. nigricans	8	—	17
	Unidentified	8	—	8
Rhizoplane	*A. chroococcum*	50	63	50
	A. vinelandii	25	25	13
	A. beijerinckii	13	—	37
	A. nigricans	12	—	—
	Unidentified	—	12	—

Species Composition : Analysis of *Azotobacter* species in non-rhizosphere soil, and rhizosphere and rhizoplane revealed that *A. chroococcum* was the commonest species, followed by *A. vinelandii*, *A. beijerinckii* and *A. nigricans* (Table 2). *A. armenicus* was absent in all the cases.

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