

Response of sorghum to foliar sprays and seed inoculation with *Azotobacter*

Occurrence of non-symbiotic dinitrogen fixers in phyllosphere has been reported by Ruinen, 1956, Bond 1959, Meiklejohn, 1962, Vasantrajan and Bhat, 1968, Bhat *et al.* 1971 and Sen 1975. Wani, *et al* have reported the presence of *Azotobacter* spp. in the phyllosphere of sorghum and other crops. They also studied efficacy fixing nitrogen *in vitro*. This report deals with the effect of spraying of *A. chroococcum* and *A. vinelandii* isolated from sorghum phyllosphere on the dry matter of sorghum plants.

A. chroococcum and *A. vinelandii* were grown in 250 ml Erlenmeyer flasks containing 100 ml of modified Burk's broth (11) at $25 \pm 2^\circ\text{C}$ for 8 days on a rotary shaker. The cells were collected by centrifuging the culture at 15,000 rpm for 30 min in a refrigerated centrifuge. The pellet was suspended in sterile saline (0.8%) to get a concentration of 10^{12} cells per ml. The effect of Sorghum seeds (CSH—2) was assessed by soaking the surface sterilized seeds for 1h in the bacterial suspension. Twenty-five seeds were kept in sterile plates containing moist tissue papers. Seeds soaked in sterile saline served as control. Five replicates were kept for each treatment. Germination percentage, radicle and plumule lengths were noted after 3 days.

A pot experiment of 4 treatments and 5 replications was conducted under green house condition. Healthy sorghum seeds of CSH—2 were used. Seeds were inoculated with a lignite culture (11) of *A. chroococcum* and *A. vinelandii*. The pots were filled with nonsterile soil supplemented with a basal dose of superphosphate @ 20 kg P/ha. Eight seeds were sown and four plants were finally maintained per pot. First spray of bacterial suspension containing 5×10^6 cells was given 2 weeks after seedling emergence. The plants were sprayed with an atomizer until the whole

surface became wet. Second spray was given two weeks after the first. The plants were harvested after 7 weeks and dry weights were recorded. Total nitrogen content of the plants was determined by microkjeldhal method control plants were sprayed with sterile saline.

The results indicated that sorghum seeds treated with *A. chroococcum* and *A. vinelandii* isolated from the phyllosphere of sorghum increased germination, radicle and plumule length of Sorghum. Seed germination improved (60 per cent) with a mixture of *A. chroococcum* and *A. vinelandii*. In the control it was only 45%.

Sorghum seeds treated with *Azotobacter* increased the radicle and plumule length to 4.06 cm and 0.81 cm, respectively. But in the control they were 1.34 cm and 0.61 cm, respectively. Dry weight of jowar plants was significantly increased when inoculated with *Azotobacter* spp. as a seed inoculant or a foliar spray (Table 1). A good dry matter yield of 11.24 g/plant was observed when *Azotobacter* was used in combination as a seed and foliar inoculant. The increase was 50 per cent. The differences amongst the treatments receiving *Azotobacter* spp. culture either by seed or foliar inoculation were not significant. A 10 per cent increase in dry matter yield with foliar spray might be due to the improved adaptibility of *Azotobacter* spp. to phyllosphere niche. Yields of wheat and paddy plants was observed in pots and field when plants were sprayed with *A. chroococcum* isolated from water hyacinth phyllosphere, increased (Sen, 1975, Iswaran, *et al*, 1978). Production of growth promoting substances by *Azotobacter* has been reported earlier (Mishustin and Shinnikora, 1971, Sen, 1975). Better seed germination and production of a healthy root system due to seed inoculation with *Azotobacter* has been reported earlier. (Lazarev, 1964, Lovett and Sagar, 1978).

Table 1—Effect of Phyllosphere *Azotobacter* spraying on dry matter weight and nitrogen content of jawar plants

Treatment	Dry matter weight (g/plant)*	Per cent increase over control	Nitrogen content (mg/plant)*	Percentage increase over control
1. Seed inoculation	10.21	44.41	0.544	67.11
2. Foliar spray	10.92	54.45	0.586	81.23
3. Seed inoculation and foliar spray** ..	11.24	58.98	0.645	100.88
4. Control	7.07	—	0.343	—
C.D. at 1%	2.47	—	NS	—

* Average of five replications (four plants in each pot).

** foliar spray of bacterial suspension was given two weeks after seedling emergence.

Clearly phyllosphere isolates of *Azotobacter* favour grains of sorghum plants

presumably by increasing the nitrogen status.

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