

Effect of *Azotobacter* Seed Inoculation on Wheat (*Triticum vulgare*)

By

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ABSTRACT

Response of Wheat crop to three different *Azotobacter* inoculants was studied. Inoculated crops produced 3655 to 4907 kg of grain and 2486 to 2633 kg of dry matter per hectare and uninoculated control gave 3347 kg of grain and 1951 kg of dry matter per hectare. *Azotobacter* inoculation also gave increased nitrogen content in the grain and the dry matter.

INTRODUCTION

Wheat accounts for 11 per cent of the world food consumption. It is second only to rice as a source of nourishment. India is the third major wheat growing country in the world. In per hectare yield India is however way behind several countries. Several factors contribute for low yield and the shortage of nitrogenous fertilizers is one of the most important factors.

Therefore, in such a situation to meet the shortage of nitrogenous fertilizers, it is imperative to use naturally available resources. The soil harbours certain free living bacteria which are capable of fixing atmospheric nitrogen asymbiotically. The most important non-symbiotically nitrogen fixing organisms are the members of the genus *Azotobacter*.

The present investigation was undertaken to study the response of

wheat crop to seed inoculation with different cultures of *Azotobacter*.

MATERIALS AND METHODS

The effectiveness of *Azotobacter* strains was tested in winter season on wheat variety S-308 under field conditions. The trial was laid out on black cotton soil at Agricultural College Farm, Parbhani. The total nitrogen of soil was estimated by Kjeldahl method and it was found to be 0.04 per cent. The pH of the soil was 8.3. The seed was inoculated two hours before sowing with different cultures of *Azotobacter*. Irrigations were given as and when required. Randomized block design was adopted with four treatments replicated five times. The treatments were as follows:— A) ... Control, B) Parbhani culture C) Culture from Bafe Lab., Poona, and D) Culture from Biological Nitrogen Fixation Scheme, Poona.

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For the treatment 'A' the seeds were dibbled as such. In case of treatment 'B' fourteen days old culture, isolated from Parbhani soil was used. Ten ml liquid culture was added in few grams of sterilized soil and slurry was prepared, and used for inoculating one kg of seed. In the third and fourth treatments Bafe Lab, and Poona cultures were used, respectively for seed inoculation with 50 g of inoculant culture per kg of seed. The plants were uprooted after sixty days for nitrogen determination. Observations were recorded on five randomly selected plants from each plot for height, number of tillers, number of leaves at the interval of one month. Final observations were recorded at the time of harvest. Finally grain and dry matter yield and nitrogen contents were also recorded.

RESULTS AND DISCUSSION

It is observed that the differences between the mean plant height as influenced by various treatments were non-significant. In all the inoculated treatments plants were taller than control. In case of mean number of tillers and mean number of leaves it was observed that though the results were non-significant inoculated treatments were superior over uninoculated control. BNFS culture was found to be superior over other cultures (Table I).

The statistical analysis of the data given in Table II showed that the differences between the dry matter yields were significant. Treatments 'D' 'C' were significantly superior over

TABLE I. Effect of various treatments on mean plant height, number of tillers and number of leaves per plant

Treatment	Height in cm	Number of Tillers	Number of leaves
Control	61.04	10.52	44.74
B	61.68	11.56	49.14
C	61.88	11.72	51.04
D	66.12	11.96	52.16
S. E. \pm	2.84	0.96	3.79
C. D. at 5%	N. S.	N. S.	N. S.

N. S. - Not significant

control. Results were non-significant in respect of grain yield. However all the inoculated treatments were numerically superior over uninoculated control. Likewise, differences in percentage nitrogen of whole plants from treatment 'D' and 'C' were significantly superior over control. However treatment 'B' was numerically superior over control.

TABLE II. Effect of seed inoculation with different cultures of *Azotobacter* on dry matter, grain yield and percentage of total nitrogen of wheat.

Treatment	Dry matter (kg/ha)	Grain yield (kg/ha)	Percentage of nitrogen
Control	3347	1951	1.377
B	3655	2486	1.625
C	4748	2536	1.879
D	4907	2637	1.892
S. E. \pm	303	200	0.120
C. D. at 5%	923	N. S.	0.369

N. S. - Not Significant

It was observed that the differences in the mean plant height, number of tillers and number of leaves in various treatments were non-signifi-

cant. Treatment 'D' with BNFS culture was superior to the rest of the treatments. The maximum plant height was noted in treatment 'D' (66.12 cm) while the lowest was observed in control (61.04 cm). Maximum number of tillers (12.18) were found in inoculated treatment while in control they were 10.52. The above results are in conformity with those of Patel (1969) who reported that the inoculated seedlings were twice as long as uninoculated ones. Brown *et al.*, (1964) also observed significant growth responses to *Azotobacter* inoculation.

The results were significant for dry matter production and percentage nitrogen and non-significant in case of grain yield. However, the inoculated treatments were numerically superior to the control. BNFS and Bafe Lab cultures were significantly superior to the control in fixing nitrogen. The findings are in agreement with those Aivarzhi (1941) who reported increased yield of winter wheat and spring barley due to *Azotobacter* inoculation. Zinoveva (1956) observed high-

est nitrogen fixation by *Azotobacter* sp. isolated from rhizosphere of wheat and oat. The findings of Gadgil (1960) and De and Bhattacharya (1960) also support the present findings.

REFERENCES

- AIVARZHI, F. 1941. Effectiveness of *Azotobacter*. *Sotsial. Zern. Khoz.*, 1: 126—132.
- BROWN, M. E., S. K. BURLINGHAM and R. M. JACKSON, 1964. Studies on *Azotobacter* spp in soil. III Effect of artificial inoculation on crop yield. *Pl. Soil* 20: 194-214.
- DE, P. K. and BHATTACHARYA, 1960. *Azotobacter* inoculation. In: *Radio isotopes of fertilizers and cow dung gas plant*. I.C.A.R. Publication, New-Delhi, pp. 314-316.
- GADGIL, P. D. 1960. *Studies on nitrogen fixation by Azotobacter in association with some soil micro-organisms*. M. Sc.(Agri.) thesis, Univ. of Poona.
- PATEL, J. J. 1969. Micro-organisms in the rhizosphere of plants inoculated with *Azotobacter chroococum*, *Pl. soil* 31: 209-223.
- ZINOVEVA, Kh. G. 1956. The relationship between the specific strains of *Azotobacter* and various sources of carbon nutrition. *Microbiol. Zh.* 18: 13—19.