

EFFECT OF ALGAL INOCULATION ON THE YIELD AND VITAMIN C CONTENT OF TWO VARIETIES OF TOMATO

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Summary

Two varieties of tomato (Pusa Rubi and Selection 120) positively responded to algal inoculation in terms of the yield of fruits and shoots, but there was no significant effect on the vitamin C content of the fruits. A combined application of urea and algae was more effective than the application of urea alone.

Although the effect of nitrogen fixing blue-green algae in increasing the yield of rice has been well documented^{14,15}, the response of other crops to algal inoculation is comparatively little known. Umarova and Umanov¹³ and Kogan and Osmanova⁸ observed that both in presence and absence of nitrogen, algae increased the yield of cotton. Such positive responses have also been observed with barley⁵, oat¹², tomato¹, maize⁹, wheat⁷, pea⁶ and some vegetables⁴. It has also been reported that association of Rhizobium with blue green algae results in increased yields of pea¹¹. Periminova¹⁰ observed a pronounced reduction in the incidence of smut in barley in the experimental plots inoculated with algae. The present communication deals with the effect of algal inoculation on the yield and Vitamin C content of two varieties of tomato – Pusa Rubi (August–December) and Selection 120 (March–June).

Four week old tomato seedlings were transplanted in 14 inches earthen pots containing 10 kg soil fortified with a uniform basal dressing of superphosphate and muriate of potash at the rate of 80 kg P₂O₅ and 40 kg K₂O per hectare (332 mg P₂O₅ and 176 mg K₂O/pot). Nitrogen was provided in the form of urea at different levels as detailed in Tables 1 and 2. The soil based algal inoculum containing a mixture of *Tolypothrix tenuis*, *Aulosira fertilissima*, *Nostoc* sp. *Anabaena* sp. and *Plectonema boryanum*^{14,15} was applied at the rate of 44 mg (dry wt.)/pot (10 kg dry wt./ha) to the algal series. Nitrogen estimations were done by the conventional microkjeldahl method and vitamin C determinations were based on the A.O.A.C.² method.

Variety Pusa Rubi (August–December). Table 1 summarizes the yield data. The application of algae alone in the absence of added chemical nitrogen resulted in 57.21% increase in the yield of fresh fruits and 63.93% in the shoot yield. With the addition of nitrogen at 60 N/h and 100 N/h levels, the yield of fresh fruits increased significantly by 30.97 and 156.33% respectively over the control. When 60 N was supplemented with algal

Table 1. Effect of algal inoculation on tomato variety Pusa Rubi (August–December) (Values average of five replications)

Treatments	Fresh wt. fruits (g/pot)	Dry wt. shoot (g/pot)	Soil nitrogen (%)	Nitrogen in shoot (%)	Vitamin C (mg/ml juice)
0 N (control)	68.19	9.01	0.025	0.397	0.52
0 N + Algae	107.20	14.77	0.035	0.456	0.54
60 N	89.31	12.22	0.033	0.511	0.50
60 N + Algae	134.33	16.01	0.035	0.582	0.48
100 N	174.79	21.58	0.027	0.458	0.51
100 N + Algae*	159.08	15.92	0.038	0.521	0.41
C.D. at 5%	5.99	2.88	NS	NS	NS

* The plants in this series were affected by viral infection; NS, non-significant.

inoculation, the yield increased by 45.02% over the application of 60 N alone (Table 1). There were, however, no significant differences either in the percentage nitrogen of the shoot or in the residual nitrogen in the soil or in the Vitamin C content of the fruits.

Variety selection 120 (March–June). Like Pusa Rubi, this variety also significantly responded to algal inoculation, both in the absence and presence of nitrogen. In the absence of added nitrogen, an increase of 86.36% in the yield of fresh fruits was observed due to algal inoculation over the control (Table 2). Supplementation of different levels of nitrogen with algae increased the yield significantly over the respective nitrogen levels. Here too, there was no significant difference in the vitamin C content of the fruits among the treatments.

Table 2. Effect of algal inoculation on tomato variety Selection 120 (March–June) (Values average of five replications)

Treatments	Fresh wt. fruits (g/pot)	Dry wt. shoot (g/pot)	Vitamin C (mg/ml juice)
0 N (control)	11.00	5.82	0.70
0 N + Algae	20.50	8.79	0.66
30 N	42.12	7.95	0.54
30 N + Algae	47.42	10.90	0.51
60 N	61.34	9.50	0.51
60 N + Algae	70.70	10.50	0.60
100 N	87.10	11.90	0.57
100 N + Algae	99.76	13.25	0.67
C.D. at 5%	7.06	1.05	NS

Ns, non-significant.

The present trials clearly indicate that crops like tomato respond positively to algal inoculation. Noteworthy was the observation that a combined application of nitrogenous fertilizer like urea and algae was more effective than the individual application of urea alone. The earlier observations of Aiyer *et al.*¹ who reported a significant increase in the vitamin C content of the fruits in the *Sioux* variety of tomato due to algal inoculation could not, however, be confirmed in the present investigation. An advancement in the ripening of the fruits by a week was also observed in the algalized series.

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References

- 1 Aiyer, R. S. *et al.* 1964 *Sci. Cult.* **30**, 556.
- 2 Alexander, M. 1961 *Introduction to Soil Microbiology*, John Wiley & Sons Inc. N.Y.
- 3 Association of Official Agricultural Chemists 1965 *Official Methods of Analysis*. Ed. W. Horwitz. Pub. A.O.A.C. Washington, D.C. p. 764.
- 4 Dadhich, K. S. *et al.* 1969 *Plant and Soil* **31**, 377.
- 5 Fuller, W. H. *et al.* *Trans. 7th Intern. Cong. Soil Sci.* (*cited from Shtina*¹²).
- 6 Gupta, A. B. and Gupta, K. K. 1970 *Labdev J. Sci. Technol.* **8**, 151.
- 7 Gupta, A. B. and Kushwaha, A. S. 1970 *Labdev J. Sci. Technol.* **8**, 105.
- 8 Kogan, S. I. and Osmanova, R. S. 1972 *In Method of Study and practical Use of Soil Algae. Report Kirov Agric. Inst. Kirov* p 195. (*In Russian*).
- 9 Kushwaha, A. S. and Gupta, A. B. 1970 *Hydrobiologiya* **35**, 203.
- 10 Periminova, G. N. 1964 (*cited from Shtina*¹²).
- 11 Periminova, G. N. 1972 *In Methods of Study and practical Use of Soil Algae. Report Kirov Agric. Inst. Kirov* p 221. (*In Russian*).
- 12 Shtina, E. A. 1965 *In Ecology and physiology of Blue-green algae*. Acad. Sci. USSR. Moscow.
- 13 Umarova, S. V. and Umanova, Z. V. 1972 *In Methods of Study and practical Use of Soil Algae. Report Kirov Agric. Inst. Kirov* p 203. (*In Russian*).
- 14 Venkataraman, G. S. 1972 *Algal Biofertilizers and Rice Cultivation*. Pub. Today & Tomorrow's Printer & Publishers, New Delhi.
- 15 Venkataraman, G. S. 1977 *Proc. Natl. Symp. Nitrogen Assimilation and crop Productivity*, Hissar, p 132.