

Effect of Phosphono Butane tri carboxylic acid on germination of *Triticum aestivum* crop in saline soil

SHRIKANT H. PAWAR

DR. ISHWAR B. GHORADE

Department of Environmental Science

Dr. Babasaheb Ambedkar Marathwada University

Aurangabad (M.S.)

India

Abstract:

*Salination of soil is a serious environmental problem that affects crop production in arid and semi-arid region as it effects the soil fertility. In this study germination of *Triticum aestivum* under the salt stress with different Phosphono Butane tri carboxylic acid concentrations of (20 ppm, 40 ppm, 60 ppm, 80ppm, and 100 ppm) prepared under laboratory conditions. Lowest germination (10%) was observed in control without any treatment after 24 hours while highest (75%) germination was observed in 60 ppm. Seed germination up to 95% was observed in the treatment of Phosphono Butane tri carboxylic acid with 60 ppm concentration after 48 hours while the least germination was observed in control consisted of saline-alkaline soil without any treatment. Thus study supports the use of Phosphono Butane tri carboxylic acid for highest productivity.*

Key words: Phosphono Butane tri carboxylic acid, Saline soil, soil amendment, seed germination.

Introduction:

Land and soil are valuable basic resources. It is not a happy future that in an agricultural caring like India. There is

expensive soil degradation. Soil resources are basic to the prosperity and biomass culture of the country. Soil is of outmost importance that soil deterioration should be accurately and suitable remedial measures for the environmental problems related soil erosion and deterioration should receive highest priority at national level. In India, about 6.73 million hectares are lying barren or produce very low and uneconomical yields of various crops due to excessive accumulation of salt (Sharma, et al. 2004). Seed germination is the initial and the most crucial stage in the life cycle of plants (Grime and Campbell, 1991). Different abiotic factors such as temperature, soil salinity, photoperiod and soil moisture affect germination of halophytes (Noe and Zedler, 2000). However, the effect of soil salinity seems to dominate other factors in saline areas (Keiffer and Ungar, 1997). The ability for seeds to recover in non-saline solution following transfer from saline solution plays an also important role in saline area, which has been reported for several halophytes (Ungar, 1978; Hanslin and Eggen, 2005).

Material and Methods:

Study area and soil sampling

Kharasoli the area under investigation fall in Pandharpur taluka of Solapur district of Maharashtra and represent weathered basaltic soil. The soil sample was collected from Kharasoli, District Solapur. The upper layer (25cm) of saline soil sample was collected. The soil sample was collected in polythene bags. These saline soil samples were analyzed for physico-chemical parameters for the comparative study, the pH, electrical conductivity, sodium, total alkalinity etc. physico-chemical parameters using standard methods (Trivedy and Goel, 2000; P. K. Gupta, 2002). The *Triticum aestivum* seeds of variety- MACS-3125 were procured from local market for the present study.

Nature of Phosphono Butane tri carboxylic acid

It abbreviated as PBTC. Its chemical formula is $C_7H_{11}O_9P$ and molecular weight is 270. It is colorless or light pale yellow liquid having specific gravity 1.3+ 0.01 at 25°C. The pH of 1% solution is less than 2 due to active acidic nature. It has wide applications in cooling water treatment, boiler water treatment; Phosphono Butane tri carboxylic acid was investigated as soil amendment for saline soil reclamation.

Experimental method

The experimental work was carried out under laboratory conditions. The healthy seeds were selected, sterilized with 0.05 N $HgCl_2$ and seeds were germinated in Petri plats. Total of 20 seeds were kept for germination in each sterilized Petri plate. At the bottom of each Petri plate wet filter paper were placed and 20 seeds of *Triticum aestivum* were arranged on it. The papers were replaced every two days to prevent accumulation of salts (Rehman et al. 1996). A set of control without any treatment was arranged for comparison with only saline soil suspension. Treatments were (11) control i.e., there was no addition any chemicals only saline soil suspension and sets 1 to 10 were treated with different ppm concentrations viz. 20ppm, 40ppm, 60ppm, 80ppm, and 100ppm concentrations were prepared.

Results and Discussion:

The Physico-chemical parameters of saline alkaline-black cotton soil were studied. Salinity indicator parameters, electrical conductivity and exchangeable sodium values of soil were determined 4.26ds/m and 14.4 respectively.

Table 1: Physico-Chemical Properties of Saline Alkaline-Black Cotton Soil

Sr. No.	Properties	Average values
1	pH	10.6
2	Electric conductivity	4.26 ds/m.
3	Total alkalinity	28 g/lit.
4	Exchangeable sodium	14.4 mg/kg.
5	chloride	17.5 g/lit.

Phosphono Butane tri-carboxylic acid was used for the treatment of saline alkaline-black cotton soil. Ten different concentrations vary from 20 ppm, 40 ppm, 60 ppm, 80 ppm and 100 ppm were used for the treatment of saline soil.

Table 2: Effect of Phosphono Butane tri-carboxylic acid on seed germination percentage of *Triticum aestivum* after 24 and 48 hrs.

Treatments Conc. Of Phosphono Butane tri- carboxylic acid	Percentage of Germination after 24 Hrs. (%)	Percentage of Germination after 48 Hrs. (%)
20 ppm	30	65
40 ppm	45	70
60 ppm	75	95
80 ppm	60	80
100 ppm	55	65
Control	10	30
Fertile soil	80	100

After first treatment of Phosphono Butane tri-carboxylic acid (20 ppm) 30% growth in seed germination was observed out of 20 seeds after 24 hours. After second treatment (40 ppm) 45% seed germination was observed. In the third treatment (60 ppm) highest 75% growth in seed germination was observed after 24 hours respectively. It observed that germination was decreasing after the treatment with higher concentration of Phosphono Butane tri-carboxylic acid than 60 ppm concentration indicating the toxic effect or hindering effect on seed germination evidenced by reduced percentage of seed germination. After fourth and fifth treatment it observed that germination was decreasing with 60% and 55% respectively. In

saline soil (Control) without any treatment 10% seed germination was observed and in fertile soil 80% germination was observed after 24 hours.

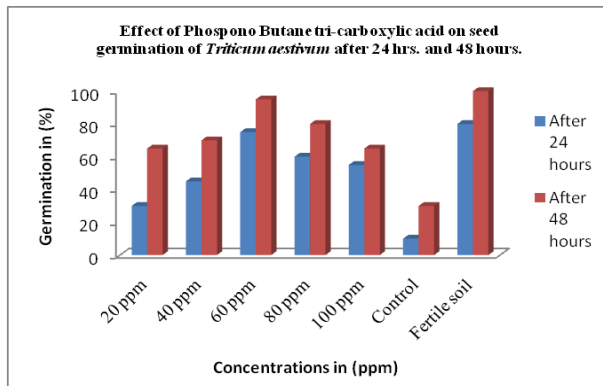


Fig:- 1 Effect of Phosphono Butane tri carboxylic acid on seed germination of *Triticum aestivum* after 24 and 48 hrs.

Conclusion:

The germination was increased after 48 hours and then 24 hours. After the treatment of Phosphono Butane tri-carboxylic acid with 20 ppm concentration to the saline soil, the growth in the average seed germination observed was 65% with 20 seeds exposed to the each treatment in each set after 48 hours. In the second set, the treatment with 40 ppm concentration, the germination was 70%. The third with (60 ppm) concentration 100% seed germination was observed out of 20 seeds after 48 hours. In the fourth set treated with 80 ppm and 100 ppm concentrations of Phosphono Butane tri carboxylic acid and higher concentrations it was decreased with 85% and 65% respectively. In the saline-alkaline black cotton soil without any treatment 30% seed germination was observed which was control and in fertile soil 100% germination was observed treated as for the comparison.

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