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Original Research Article

Long Term Influence of Organics and Inorganic Fertilizer on Distribution and Transformation of Boron under Rice-Wheat Cropping System in Calciorthents

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Keywords

Organics, Inorganic fertilizer, Boron, Calciorthents

A B S T R A C T

An experiment was conducted under lab and field conditions during the year 2008-09 and 2009-10 for studying the management of *Alternaria* blight of Ashwagandha through fungicides, organic manure and biofertilizer. Maximum growth inhibition occurred in Carbendazim and Chlorothalonil after eight days (0.0 mm) at 500 ppm concentration *in vitro*. Minimum PDI of 5.0 and 5.4 was observed in Vitavax Power and Mancozeb *in vivo*. Maximum yield was recorded in Vitavax Power (7.48 q/ha) and Mancozeb (6.77 q/ha) followed by Chlorothalonil (5.75 q/ha). Evaluation of seven amendments of biofertilizes for management of disease under field conditions revealed that minimum PDI was observed in FYM and RDF + FYM. Maximum increase in yield was recorded in FYM followed by RDF + FYM.

Introduction

Among all the micronutrient deficiency, boron occupies second rank after Zn in soils of Bihar. Most of the plant available B comes from decomposition of soil organic matter and from B adsorbed on the surface of soil colloid. The incorporation of FYM in the experimental soil, maintained a higher availability of Boron (Chander *et al*., 2007).B is found in soil in various forms and is distinguished in many categories. However, only few forms are available to plant and their determination is important for estimation of its availability to plant. The supply of soil B to plants depends upon relative abundance of different forms and equilibrium among them. Owing to narrow limit between the sufficiency and the toxicity levels of B, its availability in calcareous soil that received fertilizers alone or with manure and crop residue assumes importance. The supply of soil B to plants depends upon relative abundance of

different forms and equilibrium among them as influenced by environmental condition, soil management practices and physiochemical properties of soils. It is therefore desirable to study different forms and transformation of B and their relationship with soil characteristics.

Materials and Methods

A long-term field experiment is in progress since *rabi* 1988-99 at Experimental farm of RAU, Pusa, Bihar and the present investigation was carried out during 2005-06. The initial properties of surface soil were pH 8.4, EC 0.36 dSm^{-1}, organic carbon 5.0 g kg^{-1}, free $CaCO_3$ 34.2% and available boron 0.52 mg kg^{-1}. Four fertility levels consisting of control, low fertility level, medium fertility level and high fertility level were used as treatment in main plots. Each main plot was divided into four sub-plots in which sub treatments:-

1. No crop residue or compost; 2. Compost @ 10 t ha^{-1}; 3.Crop residue (100%); and 4. Compost @ 10 t ha^{-1} + Crop residue (100%) was superimposed. The crop investigated and reported in this paper was35th crop of rice (*cv*. Rajshree) in *kharif* and 36th crop of wheat (*cv*. UP 262). Available boron in post-harvest soil of 36th crop wheat was determined by the method described by Berger and Truog, 1939 and subjected to calorimetric estimation following reaction with carmin reagent.

Results and Discussion

The available B content in surface soil (0-15 cm) varied from 0.43 to 0.75 mg kg^{-1}, while that in 15-30, 30-45, 45-60, 60-90 and 90-120 cm depths ranged from 0.39 to 0.70, 0.33 to 0.64, 0.12 to 0.55, 0.03 to 0.43 and 0.01 to 0.31 mg kg^{-1}, respectively. The total boron remained in residual form (3.4 to 6.54 mg kg^{-1}) and the quantity of other forms like readily soluble-B, specifically adsorbed-B; oxide bound-B and organically bound-B were very low and varied from 0.065 to 0.166, 0.056 to 0.138, 0.075 to 0.174 and 0.274 to 0.620 mg kg^{-1}, respectively (Table-1).The grain and straw yield of rice and wheat increased significantly with increasing levels of NPK fertilizer in both the years. Maximum grain and straw yield of both the crops in both years were obtained with 150 per cent NPK which were at par with yield obtained with 100 per cent NPK. The yield of rice and wheat also increased with the application of organics in order of compost + crop residue > compost > crop residue > no manure. More or less similar yield due to incorporation of compost as well as crop residue indicated that compost @ 10 t ha^{-1} could be substituted with crop residue (Table 2 & 3).

Table.1 Radial growth of *Alternaria alternata* on PDA medium amended with five fungicides at three concentrations

Readily soluble-B					
Treatment	No Organics	Compost @ 10 t ha^{-1}	Crop residues	Compost + Crop residues	Mean
0 % NPK	0.130	0.184	0.160	0.211	0.171
50 % NPK	0.142	0.204	0.174	0.246	0.191
100 % NPK	0.152	0.226	0.216	0.307	0.225
150 % NPK	0.168	0.260	0.248	0.384	0.265
Mean	0.148	0.218	0.199	0.287	

Specifically adsorbed- B					
Treatment	No Organics	Compost @ 10 t ha^{-1}	Crop residues	Compost + Crop residues	Mean
0 % NPK	0.168	0.297	0.279	0.550	0.323
50 % NPK	0.210	0.436	0.337	0.696	0.401
100 % NPK	0.252	0.436	0.414	0.825	0.481
150 % NPK	0.294	0.526	0.481	1.010	0.577
Mean	0.231	0.405	0.377	0.770	
Oxide bound - B					
Treatment	No Organics	Compost @ 10 t ha^{-1}	Crop residues	Compost + Crop residues	Mean
0 % NPK	0.202	0.232	0.213	0.302	0.237
50 % NPK	0.253	0.283	0.270	0.358	0.291
100 % NPK	0.305	0.340	0.329	0.408	0.345
150 % NPK	0.353	0.407	0.394	0.467	0.405
Mean	0.278	0.315	0.301	0.383	
Organically bound-B					
Treatment	No Organics	Compost @ 10 t ha^{-1}	Crop residues	Compost + Crop residues	Mean
0 % NPK	0.657	0.861	0.816	1.220	0.888
50 % NPK	0.696	0.904	0.856	1.278	0.933
100 % NPK	0.733	0.936	0.897	1.323	0.972
150 % NPK	0.768	0.972	0.925	1.380	1.011
Mean	0.713	0.918	0.873	1.300	
Residual -B					
Treatment	No Organics	Compost @ 10 t ha^{-1}	Crop residues	Compost + Crop residues	Mean
0 % NPK	8.531	8.641	8.640	9.297	8.777
50 % NPK	9.392	9.795	9.856	10.640	9.920
100 % NPK	10.293	10.993	11.008	11.697	10.997
150 % NPK	11.470	12.787	12.143	12.655	12.263
Mean	9.921	10.554	10.411	11.072	
Total -B					
Treatment	No Organics	Compost @ 10 t ha^{-1}	Crop residues	Compost + Crop residues	Mean
0 % NPK	9.688	10.215	9.999	11.580	10.370
50 % NPK	10.693	11.550	11.493	13.218	11.729
100 % NPK	11.735	12.931	12.864	14.560	13.022
150 % NPK	13.053	14.952	14.191	15.896	14.523
Mean	11.292	12.412	12.136	13.813	

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