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EFFECT OF PRESSMUD COMPOST, BRASSINOLIDE AND BORON ON ENZYME ACTIVITIES IN THE POST- HARVEST SOIL OF SOYBEAN

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Abstract

A field experiment was conducted to study the effect of pressmud compost, brassinolide and boron on enzyme activities in the post-harvest soil of soybean. The experiment comprised of ten treatments *viz.,* T_1- Control; T_2- 100% RDF ; T_3- 75% RDF; T_4 – 75% RDF + pressmud compost @ 10 t ha^{-1}; T_5 - 75% RDF + brassinolide @ 2ppm; T_6 - 75% RDF + boron @ 0.2%; T_7 - 75% RDF + pressmud compost + brassinolide; T_8 - 75% RDF + brassinolide + boron; T_9 - 75% RDF + pressmud compost + boron; T_{10} - 75% RDF (NPK) + pressmud compost + brassinolide + boron with three replications. The statistical design of the experiment was randomized block design (RBD). The enzymes viz., Urease, phosphatase and dehydrogenase activity were estimated with different treatments in the post-harvest soil of soybean. The results revealed that all the enzyme activities were high with the application of T_{10} - 75% RDF (NPK) + pressmud compost @ 10 t ha^{-1} + brassinolide @ 2ppm + boron @ 0.2% followed by T_9 - 75% RDF + pressmud compost @10 t ha^{-1} + boron @ 0.2% compared to the control.

Key words: Soybean, enriched pressmud compost, brassinolide, boron & soil enzyme activities

Introduction

Soybean *Glycine max* L. Merrill belonging to the family Papilionaceae, possess a very high nutritional value. It contains 40-42% crude protein, 18-20% cholesterol free oil, 21% carbohydrate, 0.69% phosphorus, 4% saponins and 5% fibre. The oil contains about 0.5-1.0% lecithin which is essential for building up of human nerve tissues (Anitha *et al.,* 2013). Pressmud (filter cake), is an organic waste is a rich source of calcium (61% $CaCO_3$) and organic matter (26%). It is a good source of plant nutrients, reported to have 2.4 percent nitrogen, 1.47 percent phosphorus and 1.31 percent potassium. It is also used as soil conditioner and ameliorant in acid and alkali soils. It slowly releases nutrients to plant and has mulching properties (Yadavinder singh *et al.,* 2008). Brassinosteroids (BRs) are a group of plant originated steroidal lactones that exert pronounced growth promoting activities (Srivastava, 2011). Boron is required for proper development of tissues and helps in cell maturation by regulating the formation and lignifications of cell wall. The present investigation was undertaken with the objective to find out the effect of composted pressmud, brassinoloide and boron with inorganic fertilizers on soil enzyme activities of soybean.

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Materials and Methods

A field experiment was conducted to study the effect of different combinations of pressmud compost, brassinolide and boron with inorganic fertilizers on soybean cv. CO_3 during February, 2016 at Sivapuri, Chidambaram Taluk, Cuddalore District, Tamilnadu. The initial-soil of the experimental field was sandy clay loam in texture with a pH of 7.1 and EC of 0.40 dSm^{-1}. The fertility status of soil with respect to nitrogen, phosphorus and potassium availability were 208 (low), 10.4 (low) and 300 (high) kg ha^{-1}, respectively. Pressmud was collected and composted by using *pleurotus* sp. It was applied @ 10 t ha^{-1} to the respective plot and mixed thoroughly. Viable seeds were selected and sown in each plot at spacing of 10 ×x30 cm with three replications. Boron @ 0.2% and brassinolide @ 2ppm were sprayed @ 20 and 40 DAS, respectively. The experiment comprising of ten treatments T_1- Control; T_2- 100% RDF (NPK); T_3- 75% RDF. Soybean cv.CO 3 grown as test crop with the

following ten treatments T_1- Control; T_2- 100% RDF ; T_3- 75% RDF; T_4 – 75% RDF + pressmud compost @ 10 t ha^{-1}; T_5 - 75% RDF + brassinolide @ 2ppm; T_6 - 75% RDF + boron @ 0.2%; T_7 - 75% RDF + pressmud compost + brassinolide; T_8 - 75% RDF + brassinolide + boron; T_9 - 75% RDF + pressmud compost + boron ; T_{10} - 75% RDF (NPK) + pressmud compost + brassinolide + boron with three replications. The statistical design of the experiment was randomized block design (RBD). The enzymes *viz.,* urease (Tabatabai and Bremner, 1972), phosphatase (Tabatabai and Bremner, 1969) and dehydrogenase (Casida *et al.,* 1964) activities in the post-harvest soil of soybean were analyzed for the different treatments.

Results and Discussion

Urease (µg NH4-N g^{-1} h^{-1})

The urease activity is increased with the application of different combinations of inorganic fertilizers, pressmud compost, brassinolide and boron.

Urease enzyme is an important extracellular enzyme which influences the availability of plant utilizable form of nitrogen in soil. Application of 75% RDF (NPK) + pressmud compost + brassinolide + boron (T_{10}) recorded the higher value of urease activity (184 µg NH4-N g^{-1} h^{-1}). The next best treatment was 75% RDF (NPK) + pressmud compost + boron (T_9) registered a value of 173 µg NH4-N g^{-1} h^{-1}. It was on par with 75% RDF (NPK) + pressmud compost + brassinolide (T_7) registered a value of 169 µg NH4-N g^{-1} h^{-1}. The lowest value of urease 103 µg NH4-N g^{-1} h^{-1} was observed under the control (T_1).

The increased activity of urease might be due to biomaterials added to the soil as well as root exudates which promoted the nitrogenase substances which induced the synthesis of urease. These results are in conformity with Garcia *et al.,* (1994).

Phosphatase (µg *p*-nitrophenol g^{-1}soil h^{-1})

The phosphatase activity of the soil as influenced by different combinations of inorganic fertilizers, pressmud compost, brassinolide and boron are presented in Table 1.

Among the different treatments tried, application of 75% RDF (NPK) + pressmud compost + brassinolide + boron (T_{10}) recorded the highest phosphatase activity of 159 µg PNP g^{-1} h^{-1}. The next best phosphatase activity of 151 µg PNP g^{-1} h^{-1} was recorded 75% RDF (NPK) + pressmud compost + boron (T_9). The lowest phosphatase activity of 98 µg PNP g^{-1} h^{-1} was observed under the control (T_1).

The increase in the phosphatase activity might be due to the quality and changes in soil phosphoryl substrates (Rao and Tarafdar, 1992).

Dehydrogenase (µg TTF g^{-1} $24h^{-1}$)

The dehydrogenase activity determined in the post - harvest soil of soybean presented in Table 1. The highest amount of dehydrogenase activity of 1.72 µg TTF g^{-1} $24h^{-1}$ was recorded with the application of 75% RDF (NPK) + pressmud compost + brassinolide + boron (T_{10}) followed by 75% RDF (NPK) + pressmud compost + boron (T_9) registered a value of 1.63 µg TTF g^{-1} $24h^{-1}$. This was on par with the application of 75% RDF (NPK) + pressmud compost + brassinolide + (T_7) registered a value of 1.59 µg TTF g^{-1} $24h^{-1}$. The lowest amount of dehydrogenase was observed under the control (T_1). There was a significant differences were observed between T_1, T_2 and T_4 treatments but non-significant differences were found to be with T_5, T_6 and T_8, treatments.

The maximum dehydrogenase activity occurred might be due to the incorporation of organic manures to soil which stimulated the varied categories of microorganism and their activity in soil which has responsible for increased dehydrogenase activity in the soil. This results was in conformity with the finding of Rao

Table 1: Effect of pressmud compost, brassinolide and boron with inorganic fertilizers on enzyme activity in the post-harvest soil of soybean cv. CO_3

T. No.	Treatment details	Urease activity (µg NH4 g^{-1} h^{-1})	Phosphatase activity (µg PNP g^{-1} h^{-1})	Dehydrogenase activity (µg TTF g^{-1} $24h^{-1}$)
T_1	Control	103	98	0.88
T_2	100% RDF	144	131	1.37
T_3	75% RDF	115	109	1.09
T_4	75% RDF + Pressmud	158	139	1.49
T_5	75% RDF + Brassinolide	117	111	1.11
T_6	75% RDF + Boron	128	119	1.24
T_7	75% RDF + Pressmud + Brassinolide	169	149	1.59
T_8	75% RDF + Brassinolide + Boron	134	122	1.28
T_9	75% RDF + Boron + Pressmud	173	151	1.63
T_{10}	75% RDF + Pressmud + Brassinolide + Boron	184	159	1.72
	S.Ed	2.01	3.10	0.03
	CD (P = 0.05)	4.00	6.51	0.06

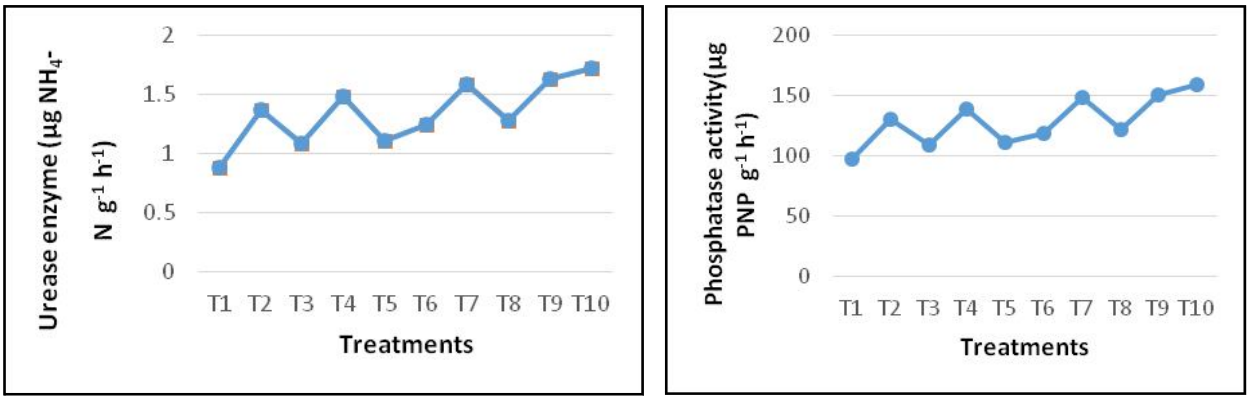

Fig. 1. Effect of pressmud compost, brassinolide with boron on urease, dehydrogenase activity in the post-harvested soil of soybean cv. CO3

and Pathak (1996).

Conclusion

The present work is accentuating the possibilities of using the organic waste in promoting the crop productivity. Composted pressmud produced by the degradation of ligno-cellulolytic fungi (*pleurotussp*) was found to be efficient organic manure as it enhanced the enzyme activity in the soil. Utilizing of this industrial waste reduce the quantity of the waste accumulation in the disposal site. This technology provides an alternate solution for the disposal of pressmud from the industries. The soil enzymes *viz*., urease, phosphatase and dehydrogenase activity were significantly increased with 75% RDF (NPK) + pressmud compost + brassinolide + boron compared to control.

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