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Effect of distillery effluent-based pressmud compost alone and in combination with inorganic fertilizer on growth and productivity of basmati rice (*Oryza sativa* L.)

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ABSTRACT
A field experiment was conducted during *kharif* 2000 and 2001 to study the influence of distillery effluent based pressmud compost at different quantity alone and in combination with inorganic fertilizer on growth and productivity of Basmati Rice. Application of pressmud at 3 t/ha in combination with 25% of the recommended dose of NPK nutrients resulted the highest grain yield of 51.65 q /ha which however was comparable with alone application of six ton /ha of pressmud and 100% of recommended dose of inorganic fertilizers (NPK).

Key words : Rice, Distillery effluent, Pressmud, Grain yield.

INTRODUCTION

Sustainable production of rice can be assured through integration of organic and inorganic sources of plant nutrients (Modgal *et.al*.1995). Unjudicious use of inorganic fertilizer has becoming unsafe to human beings and our soil health. Addition of organic sources in combination with inorganic could help in improving soil health and reducing cost of fertilizer material and increasing nutrient use efficiency. Huge quantity of distilleries waste effluents containing considerable amount of plant nutrient is being disposed off at various parts of the country and polluting our rivers, ponds and soils, could be utilized in combination with other sources of plant nutrients . In view of their proper utilization as organic source of supplying plant nutrients to rice crop alone and in combination with inorganic fertilizer, the present investigation was conducted at Seed Production Unit, Indian Agricultural Research Institute, New Delhi to study the effect of distillery effluent press mud on the growth and productivity of semi dwarf variety of basmati rice and optimization of their doses.

MATERIALS AND METHODS

A field experiment was conducted at the Research farm of Seed Production Unit, Indian Agricultural Research Institute, New Delhi during *kharif* season of 2000 and 2001 and the soil chemical analysis was carried out at the Division of Environmental Science, IARI, New Delhi. The experiment was laid out in randomized block design with four replication comprising six treatments of different amount of distillery effluent based pressmud compost alone (1.5, 3, & 6 ton / ha) and in combination with different proportion of recommended dose of NPK (1.5 ton + 50% NPK and 3 ton +25%NPK) along with recommended dose of NPK. The recommended dose of NPK (120:60:60 kg/ha) used in this experiment was treated as control. The cultivar Pusa Basmati-1 was transplanted on 15, July 2000 and 12, July 2001 with proper package of practices. Random soil samples were collected before the transplanting of seedlings. The soil of the experimental field was sandy loam in soil texture. Other soil characteristics are presented in table 1.

The physico-chemical property of the distillery effluent

Table 1 : Physico –Chemical properties of the experimental field .

S.N.	Determination	values	Method	Reference
1	PH(1:2,soil:water)	8.00	Potentiometric	Jackson (1973)
2	Electrical Conductivity (dSm^{-1})	0.37	Conductometric	Jackson (1973)
3	Available Nitrogen (kg/ha)	251.0	Mineralisable nitrozen method	Subbiah & Asija (1956)
4	Available Phosphorus (kg/ha)	47.4	Extraction: Olsen´s reagent Estimation: Ascorbic Acid method	Watanable and Olsen (1965)
5	Available Potash (kg/ha)	3.30	Ammonium Acetate method	Hanway and Heidel (1952)
6	Organic Carbon (kg/ha)	0.30	Walkey and Black method	Walkey, A and Black, I .A (1934)
7	Soil Texture	Sandy loam		

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based pressmud compost used in this experiments are presented in Table 2.The data related to different parameters

Table 2 :Physico –Chemical properties of distillery effluent based press mud compost.

S. N.	Parameters	Analysis
1	Nitrogen (%)	3.36
2	Phosphorus (%)	1.3
3	Potassium (%)	2.5
4	Sulphate (%)	1.6
5	Calcium (%)	2.5
6	Magnesium (%)	1.06
7	Iron (ppm)	100-150
8	Manganese (ppm)	500-700
9	Zinc (ppm)	400-600
10	Organic matter (%)	45
11	Moisture (%)	32
12	Ph	7.59
13	Fiber (%)	15-30
14	Crude protein (%)	5-15
15	Total Ash (%)	9.2-20.5
16	SIO_2 (%)	4-10

of climate are presented in Table 3. The data related to growth attributes like plant height, number of tillers and productive tiller, days to 50% flowering, and panicle length were recorded before the harvest of the crop. The data of yield attributing characters like number of filled grain and total grain /panicle, test weight, grain yield and harvest index were also recorded and subjected to statistical analysis.

RESULTS AND DISCUSSION

Growth attributes:

The results revealed that all the growth attributes were significantly influenced by the application of varying levels of inorganic and organic sources of nutrients, alone and in combination. Maximum plant height (71.40 cm) was recorded with the combined application of press mud at 3t/ha and 25% recommended dose of fertilizer(NPK) which was at par with alone application of 6t/ha of press mud and full recommended dose of inorganic fertilizer (Table 4) .The increase in plant height was possibly attributed to internode's elongation due to the availability of all nutrients to the plants from both sources.

Application of press mud (3t/ha) + 25% recommended dose of fertilizer took significant shorter period for 50 per cent flowering, produced the highest number of tillers (19/hills) and panicle length (31.9cm) and was found at par with the alone application of the highest dose of press mud and 100% recommended dose of fertilizer. This might be due to the increase in soil available nutrient and their continuous absorption by plant throughout the crop growth because of reduced volatilization and leaching losses. This observation is in agreement with the findings of (Khan et al 1992). However, the lowest dose of press mud at 1.5t/ha could not improve rice yield significantly.

Yield and yield attributes :

The combined application of pressmud at 3t/ha and 25% of the recommended dose of fertilizer (25% of 120:60:60NPK) produced the highest number of productive tillers (19/hills) however this treatment was comparable with alone application of pressmud at 6 t/ha and 100% of the recommended rate of applying nutrients (NPK) (Table 5). The effect of pressmud (3t/ha) +25% recommended dose of fertilizer treatments on the number of total (193) and filled grain (155) per panicle and test weight (21.04g) followed a similar trend.

The supermacy of yield component due to combined application of organic source (press mud @3t/ha) and inorganic sources (25% recommended dose of NPK) might be due to continuous and controlled supply of nutrients thought the crop growth.(Choudhary and Thakuria, 1996).

The highest grain yield (51.65q/ha) and harvest index (41.73%) was obtained with the combined application of press mud at 3t/ha +25% recommended dose of NPK, which was at par with alone application of pressmud at 6 t/ha and 100% recommended dose of fertilizer and it also confirms the results of (Sharma *et al*.2002) that the application of compost @ 3.5 ton +25% NPK gives highest grain and biological yield under rice and wheat crop rotation .

The higher yield under this treatment was owing to better performance of growth attributes due to higher production of photosynthate and their increased translocation to reproductive parts and yield attributes.

Table 3 : Meteorological data during experiment.

Months	2000							2001						
	Temperature ^{0}C			R.H.%			Rain fall	Temperature ^{0}C			R.H.%			Rain fall
	Max	Min	Mean	Max	Min	Mean	(mm)	Max	Min	Mean	Max	Min	Mean	(mm)
May	40.1	27.2	32.4	58.0	37.0	48.0	20.6	38.4	25.0	31.7	60.0	36.0	50.0	76.2
June	37.0	26.7	31.7	73.0	53.0	63.0	87.9	33.5	25.3	30.3	80.0	60.0	70.0	156.2
July	33.2	26.2	29.6	87.0	69.0	79.0	306.2	34.0	27.0	30.5	83.0	70.0	77.0	161.9
August	34.0	26.4	30.2	80.6	65.8	73.2	270.8	34.4	26.5	30.5	79.0	63.0	71.0	110.0
September	34.0	23.9	29.4	79.6	58.3	69.0	29.8	35.9	23.6	28.7	70.0	44.0	55.4	77.4
October	34.7	18.1	26.4	83.6	45.5	63.0	00	33.5	23.1	26.0	80.0	35.8	58.3	18.2
November	29.7	12.6	20.8	85.8	41.9	63.4	0.8	28.9	11.7	20.1	77.0	29.0	54.0	0.5
December	23.9	5.8	14.8	83.4	39.9	61.6	4.0	22.7	7.9	15.3	88.0	41.9	65.0	0.0

Table 4 : Effect of distillery effluent based pressmud on the growth of Basmati rice (pooled data).

S. No.	Treatments	Characters				
		Plant height at 30DAT (cm)	Plant height at harvesting stage (cm)	Total tiller per hill (No.)	Days to 50% Flowering	Panicle length (cm)
1	Press mud compost 1.5 t /ha	65.0	97.8	13	96	26.3
2	Press mud compost 1.5 t /ha + 50% NPK	70.1	104.0	16	95	28.6
3	Press mud compost 3 t /ha	68.6	100.6	15	95	27.1
4	Press mud compost 3 t /ha +25%NPK	71.4	111.2	19	94	31.9
5	Press mud compost 6 t /ha	69.7	109.3	17	95	29.1
6	Control (100% NPK)	70.1	108.6	17	96	30.7
	SEM	0.85	1.29	0.72	0.44	0.69
	CD(LSD=0.05)	2.47	3.73	2.07	1.29	2.00

Table 5 : Effect of distillery effluent based pressmud on the yield and yield attributes of Basmati rice (pooled data).

S. No.	Treatments	Characters					
		Productive tiller per hill (No.)	Filled grain (No.)	Total grain/ panicle (No.)	1000 Seed weight (gm)	Grain Yield (qt./ha)	Harvest Index %
1	Press mud compost 1.5 t /ha	13	133	169	19.09	38.53	36.92
2	Press mud compost 1.5 t /ha + 50% NPK	16	143	189	19.58	46.03	39.14
3	Press mud compost 3 t /ha	15	139	176	19.41	43.10	37.17
4	Press mud compost 3 t /ha +25%NPK	17	155	193	21.04	51.65	41.73
5	Press mud compost 6 t /ha	17	155	191	20.42	49.29	40.00
6	Control (100% NPK)	17	155	192	20.91	51.08	41.05
	SEM	0.719	3.94	3.59	0.27	0.95	0.6
	CD(LSD=0.05)	2.07	11.38	10.37	0.80	2.75	1.81

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