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Performance of Pusa Rice Hybrid 10 with variable sources of manuring

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ABSTRACT

Performance of Pusa Rice Hybrid – 10 with variable sources of manuring" was conducted on a Mollisol at Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar, India. Twelve treatments (9 Pure organic and three checks) treatments viz. Sesbania green manuring (GM @ 20 t and 30 t ha^{-1} alone, sesbania 20 t + FYM 5 t and 10 t and 10 t ha^{-1}) were studied against recommended NPK (100 Kg N, 60 Kg $P_2$05, and 40 Kg K_2O ha^{-1}, 50 percent recommended NPK and control (unfertilized). Newly evolved aromatic hybrid variety PRH-10 (115 days) was used. Green manuring of Sesbania aculeata 30 t + FYM 5 t ha^{-1} produced the highest grain (4.4 t ha-^{1}), straw (4.6 t ha^{1}) and dry matter yield (9.0 t ha^{-1}) which was significantly higher than control. This combination of organic nutrients had increased grain yield by 13 percent over recommended NPK and 51 percent over control.

Key words : Basmati rice, PRH-10, organic, inorganic, manuring combination.

Basmati, is unique among thousands of rice cultivars differing with respect to plant type, seed size, texture, aroma, cooking quality and suitability to diverse agro-ecological situations, a small proportion called Basmati rice exclusively restricted to Indian Sub-continent and traditionally grown in Himalayan foot hills of India and Pakistan.

The experiment was conducted at the Govind Ballabh Pant University of Agriculture and Technology, (Uttrakhand), India where total rainfall during the crop season was 1417 mm. The soil of the experimental site was silt loam (Aquic Hapludoll), rich in organic carbon (1.06%) and total N (0.12%) medium in both available P (16 Kg ha^{-1}) and K (220 Kg ha^{-1}). Sprouted seed of PRH-10 was raised in the wet nursery @ 400 g dry seeds per 10m^2. Spraying of $ZnSO_4$ (0.5%) solution was done in nursery to avoid the khaira disease (zinc deficiency), 15 days after sowing for obtaining healthy seedlings. Twelve treatments consisting of different organic sources of nutrients and a recommended inorganic sources of NPK (100, 60, 40 Kg. N, $P_2$05 and K_2O ha^{-1}, respectively), 50% of recommended NPK through inorganic sources and an absolute check were tested in a Randomized Block Design with four replications. The 12 treatments were Control, Recommended NPK (100:60:40), GM 30 t ha^{-1}, GM 30 t + wheat straw 5 t ha^{-1}, GM 30 t + FYM 10 t ha^{-1}, Neemax 5 t ha^{-1}, GM 20 t ha^{-1}, GM 30 t + FYM 5 t ha^{-1}, GM 20 t + FYM 5 t ha^{-1}, GM 20 t + FYM 10 t ha^{-1}, 50% recommended NPK, FYM 10 t ha^{-1}.Gross and net plot size was 4.0 m x 3.6 m and 3.2 m x 1.8 m, respectively. Initial soil analysis and after harvest of crop the plant analysis was done using standard procedures. The growth and yield attributes of rice recorded were analysed. Rice yields were corrected to 14% moisture.

Traditional varieties are tall, sensitive to photo-period, poor yielder and get lodged if high dose of nitrogenous fertilizers are applied, while newly bred high yielding and hybrid varieties are short, fertilizer responsive and contributes great in productivity. Their fertilizer demand is high. Recently released, Pusa rice hybrid-10 (PRH-10) has been found good aromatic rice variety. It contains all quality parameter of Basmati rice. Pusa rice hybrid-10 was found to respond high doses of NPK fertilizers (DRR, 2005). Organic sources of nutrients in rice production system include mainly animal waste, FYM, compost and green manures (Hobbs, 1994). Green manure crop of *sesbania* with biomass 30 t ha^{-1} alone produced the highest grain yield (4.4 t ha^{-1}) which was significantly higher than recommended dose of NPK (100 Kg N, 60 Kg $P_2$05, and 40 Kg K_2O

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Effect of different sources of nutrients on grain yield, straw yield, total dry matter yield of Pusa Rice Hybrid-10

Treatment	Total N (kg ha^{-1})	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Total dry matter yield (t ha^{-1})	Grain : straw ratio	Harvest index (HI)
Control	0	2.9	3.5	6.4	0.82	0.45
Recommended NPK (100:60:40)	100	3.9	4.2	8.1	0.92	0.48
GM 30t ha^{-1}	100	4.1	4.5	8.6	0.92	0.47
GM 30t + wheat straw 5t ha^{-1}	120	4.1	4.4	8.5	0.93	0.48
GM 30t + FYM 10t ha^{-1}	150	4.3	4.4	8.7	0.99	0.49
Neemax 5t ha^{-1}	100	3.2	3.4	6.6	0.92	0.48
GM 20t ha^{-1}	80	3.7	3.8	7.5	0.99	0.49
GM 30 t + FYM 5t ha^{-1}	125	4.4	4.6	9.0	0.96	0.48
GM 20t + FYM 5t ha^{-1}	105	4.0	4.1	8.1	0.98	0.49
GM 20t + FYM 10t ha^{-1}	130	4.2	4.4	8.6	0.95	0.48
50% recommended NPK	50	3.5	3.6	7.1	0.96	0.49
FYM 10t ha^{-1}	50	3.8	3.9	7.7	0.97	0.49
S/Em.±		0.2	0.2	0.3	0.44	0.92
CD at 5%		0.6	0.6	1.0	NS	NS
CV (%)		10.6	10.0	8.5	9.5	3.8

ha^{-1}). The highest growth and yield attributes were recorded in the treatment with green manure @ 30 t ha^{-1} + FYM @ 5 t ha^{-1}. The next was green manure @ 30 t ha^{-1} + FYM @ 10 t ha^{-1}.

Green manure @ 30 t ha^{-1} + FYM @ 5 t ha^{-1} gave the highest grain yield (4.4 t ha^{-1}) which was found significantly higher than control (2.9 t ha^{-1}), Neemax @ 5 t ha^{-1} (3.2 t ha^{-1}), 50% recommended NPK (3.5 t ha^{-1}) and green manure @ 20 t ha^{-1} (3.7 t ha^{-1}) but statistically at par with the treatments @ FYM 10 t ha^{-1} (3.8 t ha^{-1}), recommended NPK 100:60:40 (3.9 t ha^{-1}), G.M. 20 t ha^{-1} + FYM 5 t ha^{-1}) (4.0 t ha^{-1}), GM 30 t ha^{-1} (4.1 t ha^{-1}), GM 30 t ha^{-1} + wheat straw 5 t ha^{-1} (4.1 t ha^{-1}), GM 20 t + FYM 10 t ha^{-1} (4.2 t ha^{-1}) and gm 30 t + FYM 10 t ha^{-1} (4.3 t ha^{-1}). Yield increased under FYM applied treatments might be associated with the better root development and root length density that increased the capacity of rice plant to extract nutrient from the deeper soil layer (Singh *et al*, 2000).

The data recorded for straw yield has found to be followed the similar trend as the grain yield. The highest straw yield was recorded in the treatment with 30 t GM + 5 t FYM ha^{-1} (4.6 t ha^{-1}) which being statistically at par with recommended NPK (3.9 t ha^{-1}), GM 30 t ha^{-1} (4.1 t ha^{-1}), GM 30 t + wheat straw 5 t ha^{-1} (4.1 t ha^{-1}), GM 30 t + FYM 10 t ha^{-1} (4.3 t ha^{-1}), GM 20 t + FYM 5 t ha^{-1} (4.0 t ha^{-1}) and GM 20 t + FYM 10 t ha^{-1} (4.2 t ha^{-1}) was significantly superior over the treatments Control (2.9 t ha^{-1}), Neemax 5 t ha^{-1} (3.2 t ha^{-1}), 50% recommended NPK (3.5 t ha^{-1}) and FYM 10 t ha^{-1} (3.8 t ha^{-1}).

The effect of treatments consisting of various sources of nutrients and their combination did not influence grain: straw ratio significantly. Grain to straw ratio varied from 0.82, the lowest value in unfertilized control to 0.99 in green manure @ 30t ha^{-1} + FYM @ 10t ha^{-1} and difference among treatments were non significant. The value of harvest index varied from 0.45 in control (unfertilized) to 0.49 with FYM @ 10 t ha^{-1} did not differ significantly.

Thus it may be concluded that PRH-10 can be taken organically with growing a good crop of S*esbania* having green biomass 30 t ha^{-1} or more. It is also recommended that FYM @ 5 t ha^{-1} should be applied before S*esbania* sowing as GM 30t ha^{-1} + FYM 5t ha^{-1} had resulted in highest grain (4.4.t ha^{-1}), straw (4.6t ha^{-1}) and has capacity to replaced recommended NPK inorganic fertilizers.

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