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Developing nutrient management package for organic farming in rice involving non-basmati quality cultivars

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ABSTRACT

Organic farming has emerged as an important priority area globally in view of the growing demand of safe and healthy food and long-term sustainability; and concern on environmental pollution associated with indiscriminate use of agrochemicals. A Field experiment was conducted to study the effect of organic farming in Non-basmati quality varieties during samba season (September-February) 2008 at Agricultural College and Research Institute, Madurai, Tamil Nadu. The experiment was laid out in split plot design with three replications. The study revealed that, cultivation of variety white ponni with the combined application of organic manures, such as green manure, FYM, poultry manure and neem cake (N_6) has improved the growth parameters, yield parameters and yield (8550 kg ha^{-1}) of low N requiring rice crop. The DMP and LAI (14945 kg ha^{-1} and 5.43) was significantly higher in White Ponni (V_3) compared to other varieties tested. With regard to combined application of organic manures, application of green manure, FYM, poultry manure and neem cake (N6) recorded significantly higher DMP (14499kg/ha) and LAI (5.41). Highest number of panicles /m2 (404), panicle length (25.20) were observed with Kitchli Samba (V2) while highest thousand grain weight (17.53) and higher yield (5086 kg ha^{-1}) was recorded with white ponni (V_3). The yield parameters such as number of panicles /m2 (470), panicle length (26.62cm), highest thousand grain weight (13.97) and yield (4210 kg ha^{-1}) were significantly higher in combined application of green manure, FYM, poultry manure and neem cake (N6).

Key words: *Organic farming, non -basmati quality rice, manures, growth, yield parameters and yield*

Organic farming has been much emphasized in agriculture, but comprehensive evaluation of its efficiency and applicability in Asian countries, especially in India, is still required. Organic farming has emerged as an important priority area globally in view of the growing demand of safe and healthy food and long-term sustainability; and concern on environmental pollution associated with indiscriminate use of agrochemicals. Though the use of chemical inputs in agriculture is inevitable to meet the growing demand for food in the world there are opportunities in the selected crop niche areas where organic production can be encouraged to tap the domestic export market (Venkatashwarlu, 2008). Application of compost/manure and biofertilizers are two major components of organic farming, which offers an economically attractive and ecologically sound means of reducing external inputs and improving internal resources (Pathak *et al.*, 1997 and Ramesh, 2008).

Scented rice popularly called as "princes of rice" occupies a lofty status in rice cultivation and enjoys a special place in domestic and international market due to its several outstanding qualities (Murali and Shetty, 2001). Among the scented rice, traditional non-basmati rice varieties are of low N requiring crops with low production level. Hence, it is highly imperative to develop agronomic package on the production of non-basmati export quality rice with special reference to organic farming.

MATERIAL AND METHODS

Field experiment was conducted to study the effect of organic farming in Non - basmati rice varieties such as

Jeeraga samba, Kitchili samba and improved white ponni during *samba* season (*September-February*), 2008 at Agricultural College and Research Institute, Madurai, Tamil Nadu. The soil was sandy clay loam in texture with pH of 7.57 and the organic matter content was 0.24 per cent. The soil was low in available N (210 kg/ha), medium in P (16.8 kg/ha) and high in available K (615 kg/ha). The experiment was laid out in split plot design with three replications. Three cultivars such as Jeeraga Samba (V_1), Kitchili Samba (V_2) and White Ponni (V_3) formed the main plot treatments and six different combinations of organic manures such as Green manure (80% of recommended dose of N) + Neem cake (20% of recommended dose of N) (N_1), FYM (80% of recommended dose of N) + Neem cake (20% of recommended dose of N) (N_2), Poultry manure (80% of recommended dose of N) + Neem cake (20% of recommended dose of N) (N_3), Green manure (40% of recommended dose of N) + FYM (40% of recommended dose of N) + Neem cake (20% of recommended dose of N) (N_4), Green manure (40% of recommended dose of N) + Poultry manure (40% of recommended dose of N) + Neem cake (20% of recommended dose of N) (N_5) and Green manure (40% of recommended dose of N) + FYM (20% of recommended dose of N) + Poultry manure (20% of recommended dose of N) + Neem cake (20% of recommended dose of N) (N6) constituted the sub plot treatments. The recommended dose of fertilizer for low N requiring rice was 75.0:37.5:37.5 kg of N, P_2O_5, and K_2O per hectare.

Green manure (*Sesbania aculeata*) grown in nearby field was incorporated a week before transplanting and allowed for decomposition. Well-decomposed FYM was applied to the treatment plots one week prior to transplanting. Well-decomposed poultry manure and well-powdered neem cake were applied to the treatment plots. The N content of manures on dry weight basis were *Sesbania aculeata* - 0.62%, FYM -0.5%, poultry manure -1.0% and neem cake - 2.0% respectively. All the manures were applied based on N equivalence as per treatments. Uniform need based plant protection measure was adopted using organic pesticide, neem seed kernel extract (NSKE 2 %) to all the plots.

RESULTS AND DISCUSSION

The plant height was significantly higher in jeeraga samba (V_1) at harvest (126.4 cm), followed by Kitchili samba (V_2) and white ponni (V_3). Among different combination of organic manures, the plant height was significantly higher with combined application of green manure, FYM, Poultry manure and Neem cake (N_6) (129.2 cm) at harvest. The next best was combined application of green manure + FYM + Neem cake (N^4) (Table 1).

The dry matter production was significantly higher in white ponni (V_3) at harvest (14954 kg ha^{-1}). This was followed by Kitchili samba (V_2) and the least dry matter production was recorded in jeeraga samba (V_1). Combination of organic manures has highly influenced the dry matter production. Combined application of green manure, FYM, Poultry manure and Neem cake (N_6) has recorded significantly higher DMP in all the stages and the DMP at harvest was 14499 kg ha^{-1}. The next best was application of green manure along with FYM+ neemcake (N_4), and the lowest DMP was recorded in poultry manure + neem cake (N_3).

Significantly higher leaf area index was obtained with white ponni (V_3) at harvest (5.43) and the LAI was lowest with the jeeraga samba (V_1) (4.12).

Table 1. Effect of organics on growth parameters of non-basmati quality cultivars

Treatments	Plant height (cm) at harvest	Dry Matter Production (kg ha^{-1}) at harvest	LAI
Rice varieties			
V_1	126.4	10766	4.12
V_2	119.2	11862	4.56
V_3	110.7	14945	5.43
SEd	0.45	125.30	0.03
CD (P>0.05)	1.26	347.90	0.10
Organic manures			
N_1	119.5	12166	4.44
N_2	117.6	11784	4.26
N_3	116.6	11582	4.70
N_4	123.2	13054	5.10
N_5	107.5	12060	4.32
N_6	129.2	14499	5.41
SEd	0.25	37.79	0.20
CD (P>0.05)	0.52	77.19	0.42

Among various combinations of green manure, FYM, poultry manure and neem cake (N6) has recorded significantly higher LAI (5.41) at harvest. The lowest LAI (4.26) was recorded in FYM + neem cake (N2) at harvest.

Increased plant vigor with initial growth was due to higher absorption of nutrients resulted in higher dry matter production. The highest DMP obtained with the addition of green manure with biofertilizers and neem cake could be attributed due to increased net photosynthetic rate (Singh *et al.*, 1987) and rapid mineralization of N from green manure and absorption by rice crop (Buresh *et al.*, 1982). There are reports to confirm that application of N through green manures increased the leaf area index and dry matter production (Balasubramaniyan *et al*, 1989; Vaiyapuri *et al.*, 1995).

The yield parameters like panicle/m^2, panicle length and thousand grain weights were significantly influenced by the variety and combination of manures. Highest number of panicles /m2 (404), panicle length (25.20) were observed with kitchli samba (V_2) while highest thousand grain weight (17.53) was recorded with white ponni (V_3) (Table 2). Among various combinations of manures highest panicle length (26.62 cm) thousand grain weights (13.83 g), more no of panicles (470) were recorded with combined application of green manure, FYM, Poultry manure and Neem cake (N_6). This was followed by application of GM + FYM + Neem cake (N_4). The lowest was observed in Poultry manure + neem cake (N_3). Meelu and Morris (1987) reported that incorporation of green manure increased the filled grain and reduced chaffy grains due to slow release of solubilizing nutrients from the reserve source.

Significant variation in grain yield was observed among the varieties and combinations of organic manures tested. The grain yield was significantly higher in White Ponni (V_3) (5086 kg ha^{-1}), followed by Kitchili samba (V_2) (2051 kg ha^{-1}) and jeeraga Samba (1435 kg ha^{-1}) (Table 3). Among the various combinations of organic manures, highest grain yield was recorded in combined application of green manure, FYM, Poultry manure and neem cake (N_6) (4210 kg ha^{-1}). The grain yield was lowest with the application of Poultry manure + neem cake (V_3) (2015 kg ha^{-1}).

The interaction was highly significant among the treatments. The interaction effect showed that, the variety White Ponni has performed better with the combined application of organic manures, green manure, FYM, Poultry manure and Neem cake (N_6) in all the

Table 2. Effect of organics on yield and yield attributes of non-basmati quality cultivars

Treatments	Panicles m^{-2} (No m^{-2})	Panicle length (cm)	Thousand grain weight (g)
Rice varieties			
V_1	326	24.08	10.16
V_2	404	25.20	12.94
V_3	396	24.30	17.53
SEd	2.48	0.03	0.21
CD (P>0.05)	6.89	0.08	0.60
Organic manures			
N_1	365	24.93	13.60
N_2	331	24.01	13.40
N_3	321	23.00	13.17
N_4	414	24.93	13.77
N_5	354	23.68	13.33
N_6	470	26.62	13.97
SEd	2.19	0.04	0.01
CD (P>0.05)	4.48	0.08	0.02

Table 3. Effect of organics on grain yield of non-basmati quality cultivars

Treatments	N_1	N_2	N_3	N_4	N_5	N_6	Mean
V_1	1458	1416	1081	1783	1208	1666	1435
V_2	1832	1718	1316.	2312	2712	2416	2051
V_3	4024	3978	3650	6004	4312	8550	5086
Mean	2438	2370	2015	3366	2744	4210	-
SED	CD (P>0.05)						
V	113.12	314.08					
S	38.14	77.14					
V x N	128.19	335.10					
N x V	66.06	134.90					

yield parameters and yield. Balasubramaniyan (2003) also reported increase in yield attributing characters of rice cv. *White ponni* due to green manuring with neem cake.

Hence it can be concluded that cultivation of white ponni applied with organic manures *viz*., green manure (40%RDF) + FYM (20% RDF) + poultry manure (20% RDF) and neem cake (20% RDF) was found to be better in improving the yield.

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