

Organic Farming Package for Rice based Cropping System in Godavari Delta Region of Andhra Pradesh

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Abstract

Field experiments were conducted during 2014 and 2015 Kharif season in deltaic alluvial soils at APRRI & RARS, Maruteru, Andhra Pradesh to develop suitable organic farming package for rice based cropping systems for enhancing productivity. Treatments mainly comprise of combination of organic and inorganic fertilizers. Significantly higher tiller count, panicle count and grain yields were realized with 100% NPK+micronutrients through inorganic followed by 50% NPK through inorganic and 50% N through FYM. Among organic sources, 100% N through organic sources+organic practices for weed and pest control recorded highest grain yield followed by 100% N through organic sources+Bio-fertilizers in both the years. This clearly indicates conjunctive use of organic and inorganic fertilizers improves grain yield besides soil health.

Keywords: Organic and inorganic source nutrients; Rice cropping system; Yields

suitable organic farming package for rice based cropping system for enhancing the productivity of rice.

Introduction

Rice is cultivated in diverse ecosystems spread over 43.97 million ha in India with a production of 104.32 million tons of milled rice with average productivity of 2372 kg ha⁻¹ [1]. In Andhra Pradesh, rice is grown in an area of 41.9 lakh ha with an annual production of 97.46 lakh tons and a productivity of 2930 kg ha⁻¹ [2]. Godavari delta is the Rice bowl of Andhra Pradesh, which is one of major contributors of rice production in the country. The production and productivity of rice growing areas are fluctuating every year due to different biotic and abiotic constraints. Besides climate change, continuous cultivation of rice for longer periods with low system productivity, and often with poor crop management practices, results in loss of soil fertility due to emergence of multiple nutrient deficiency [3] and deterioration of soil physical properties [4] and decline in factor productivity and crop yields in high productivity areas [5]. Source of nutrients influences the performance of rice through its effect on growth and development [6]. In Godavari delta, deltaic alluvial soils under canal irrigated conditions rice-rice is the most predominant cropping system. The response to fertilization is increasing day by day due to low to medium available status of nutrients in the soil. Organic farming is one of the better options to improve the nutrient availability in deltaic alluvial soil by way of improving the microbial activity in the soil. Available literature shows that, more number of tillers/m² are produced in organically enriched soils. Nutrient management provides an approach for feeding the plants with nutrients as and when required. Hence, the present experimentation was carried out to find out the development of

Material and Methods

Field experiments were conducted at Andhra Pradesh Rice Research Institute & Regional Agricultural Research Station, Maruteru, West Godavari district, Andhra Pradesh during Kharif, 2014 and Kharif, 2015 seasons under coastal irrigated ecosystem in deltaic alluvial soils. The experiment was laid out in Randomized Block Design and replicated thrice. The treatments mainly comprise of combination of organic and inorganic fertilizers. The experimental soil was clay loam in texture, slightly alkaline in reaction, low in organic carbon (0.43%) and available nitrogen (188 kg ha⁻¹), medium in available phosphorus (34.4 kg ha⁻¹) and high in available potassium (225.4 kg ha⁻¹). The test rice variety is BPT 5204 (Samba Mahsuri) which is of 150 days with fine grain and good cooking quality.

Results and Discussion

The results revealed that, significant response was observed among the treatments and within the treatments of organic sources of nutrients. Significantly higher number of tillers/m² 558 and 343 and higher number of panicles/m² 400 and 282 in 2014 and 2015 respectively was observed with 100% NPK+micronutrients through inorganic chemicals and which is significantly superior to organic alone and in organic combinations (Table 1). Increasing nitrogen application either organic or inorganic sources will improve tiller number in rice or the same was also reported by Madhav et al. [7].

Treatment details	No. of Tillers/m ²		No. Panicles/m ²		Panicles Weight (g)		Test Weight (g)		Grain Yield (kg/ha)		Straw Yield (kg/ha)	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015

T1	50% NPK+50% N as FYM	513	320	367	282	2.36	2.4	14.3	14	4827	3209	6325	4680
T2	Different organic sources each equivalent to 1/3 of rec. N (FYM+VC+Neem cake)	459	261	360	258	2.12	2.81	12.8	12.2	3829	2913	5493	3717
T3	T2+Intercropping with Sesbania	426	248	362	282	2.01	2.68	13.2	12	4161	2862	6159	3521
T4	T2+Organic practices for weed and pest control	417	253	330	268	2	2.25	12.9	11.8	3995	3071	5576	3947
T5	50% N as FYM+Biofertilizer for N+Rock Phosphate for P+PSB	483	276	360	286	2.2	2.4	13.4	12.6	3912	2866	5826	3604
T6	T2+Biofertilizer containing N & P carriers (Azolla+PSB)	447	259	361	264	2.3	2.55	13.8	13	3995	2963	5160	3829
T7	100% NPK+Micronutrients	558	343	400	273	2.8	3.4	15.4	16.4	5160	3995	6825	5435
T8	T1+Organic pest control	474	238	354	267	2.22	2.26	13.6	12.4	3745	2876	5476	3619
	SE (m ±)	12.5	10.9	10.1	8.8	0.25	0.2	0.33	0.41	313	365	587	685
	CD (0.05)	40.2	38.6	31.4	28.6	NS	NS	NS	NS	103.9	100.4	201	263
	CV (%)	5.32	4.12	4.2	5.35	6.78	6.15	3.36	3.65	8.5	8.1	7.4	7.2

Table 1: Yield attributes and yields of rice as influenced by organic treatments during Kharif, 2014 and Kharif, 2015.

The data pertaining to panicle weight and test weight indicated that there was no significant difference among and across the organic and inorganic treatments. The mean data on grain yields of rice-rice cropping system revealed that, significantly higher grain yield of 5160 kg ha⁻¹ and 3995 kg ha⁻¹ during Kharif 2014 and 2015 seasons respectively was recorded with 100% NPK+micronutrients through inorganic chemicals followed by 50% NPK through inorganic and 50% N through FYM (4827 kg ha⁻¹ and 3209 kg ha⁻¹ during Kharif 2014 and 2015 seasons respectively). Among different organic farming treatments, application of 100% N through FYM, vermicompost, neem cake+organic practices for weed and pest control recorded highest grain yield followed by 100% N through FYM, vermicompost, neem cake+biofertilizers in both the years of Kharif and rabi seasons. Straw yield also followed the similar trend. This clearly shows that with the increase in number of productive tillers and panicles were improved with conjunctive use of organic and inorganic nutrients which in turn increase the grain and straw yields in both the years of Kharif season. Results of several long term fertilizer trials conducted in different parts of the country have also reported that the favorable effects of combined application of chemical fertilizers and organic manures on crop yields and soil ecosystems. These results have conclusively shown the need for meeting the nutrient requirements of plants at least partly through organic manures. This helps ultimately in achieving the goal of environmentally benign sustainable agriculture. The nutrient leaching losses are less because of more intense microbial activity leading to mineralization, immobilization turnover of nutrients in soil by microbes. The increase in grain yield with application of nitrogen through FYM could be attributed to increase in photosynthesis since nitrogen is the constituent of Chlorophyll, which in turn, might have resulted in accumulation of photosynthates in vegetative portion of plants and ultimately enhanced the plant growth, attributes and grain yield Swarna et al. [8]. These findings are in close accordance with those reported by Singh and Jain [9] and Aruna and Reddy [10].

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