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Effect of Levels of Manures on Performance of Growth and Yield Parameters of Aerobic Rice Sahbhagi Dhan (IR-74371-71-1-CRR-1)

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Abstract

An experiment has been conducted under field conditions at Organic Research Farm, Centurion University, Paralakhemundi, Gajapati, Odisha during Kharif season of 2019 to investigate the effect of two Organic Fertilizers (Vermicompost and Farm Yard Manure) on the performance of growth and yield parameters of aerobic rice, Sahbhagi dhan (IR-74371-71-1-CRR-1. The application of vermicompost and farm yard manure in absence and presence of Azotobacter results the maximum plant height (120 cm) and no. Of tillers/m^2 (162), no. Of panicles/m^2 (177) in 100% Vermicompost + Azotobacter (seed application) followed by 50 % Vermicompost + Azotobacter (Soil application). The maximum panicle length 25.6cm per m^2 was noticed with the 100% Vermicompost + Azotobacter (seed application). The treatment of 100% Vermicompost + Azotobacter (Seed application) had significantly maximum 1000 seed weight (24.2). The treatment of 100% Vermicompost + Azotobacter (seed application) produced significantly higher grain yield (19.26 quintal/ha) was recorded. The maximum straw yield was recorded with the 100% Vermicompost + Azotobacter (seed application) 12.95 quintal/ha.

Key words: FYM, Vermicompost, Azotobacter, Sahbhagi Dhan

Introduction

Rice is the predominant crop of Odisha with a total coverage of 4.0 million hectare which is about 65% of the total cultivable area of the state. Area under rice crop in Angul district of the state is 0.08 million hectare with a productivity of 9.89 q per ha which is 48% less than that of state (Anonymus 2012). Achieving self-sufficiency in rice production and maintaining price stability are important political objectives in low-income countries because of the importance of this crop in providing national food security and generating employment and income for low-income people (Ghosh et al., 2009). In Gajapati too Paddy is the major crop grown by small and marginal farmers. Total cultivated area under Paddy during kharif of 2013-14 was 38000 ha and the yield was 1338 kg per ha (Directorate of Agriculture and Food production, Odisha). CRRI (2016) reported that farmers either are unable to sow the Sahbhagi Dhan under early drought condition during the month of June and July due to delayed monsoon. Sahbhagi Dhan is an early medium duration varieties (105-120 days) can be transplanted using 15 days old seedlings up to September first week with basal application of 40:40:40 kg N, P_2O_5 and K_2O for better establishment in rained shallow lowlands.

Organic farming is the best practices through worldwide to maintain the ecosystem and food quality for sustainable agriculture. Currently, organic product demand increasing day by day in India and global market. Organic rice price is more than other rice but yield getting very less under organic farming.

Irrigated rice requires more water for puddling, transplanting and irrigation, it is estimated that it consumes 3000–5000 liters of water to produce 1 kg of rice (Barker et al., 1998). However, less water will be available for agriculture. If food security is to be maintained, ways of increasing the productivity of water must be found. According to Tuong and Bouman (2003), 15 million ha irrigated rice areas of Asia may experience “Physical water scarcity” and 22 million ha may face “Economic water scarcity”.

Further, higher emission of greenhouse gases in organic rice field is another problem that can be mitigate through water management practices. Different strategies are developed for reducing water consumption for rice cultivation, such as saturated soil culture on raised beds (Borrell et al., 1997), alternate wetting and drying (Bouman and Tuong, 2001), system of rice intensification (Stoop et al., 2002) and aerobic rice cultivation (Bouman et al., 2006). Out of these, aerobic rice is considered to be one of the most promising strategies in terms of water-saving (Tuong and Bouman, 2002).

Soil fertility is declining further due to intensive cropping and imbalanced use of fertilizers by the farmers (Biswas et.al.,2001., Dobermann and Fair hurst, 2000). In order to sustain the efficient growth and yield, soil fertility need to be maintained through organic manures. The incorporation of organic nutrients in the form of vermicompost and farmyard manure is known to influence favorably to the physical, chemical and biological properties of the soil thus resulting in enhanced crop growth and yield (Gour, 1992).

Hence, the present study was conducted with objective to evaluate the performances of growth and yield parameters Sahbhagi dhan (IR-74371-71-1-CRR-1) under this Agro-climatic region of Odisha, India.

Materials and methods

The experiment was carried out at Organic Research Farm of CUTM, Paralakhemundi, Gajapati district, Odisha. The test crop for the experiment is Rice variety Sahbhagi dhan (IR-74371-71-1-CRR-I). The treatments were comprised of control (No manure added), 50% FYM, 100% FYM 50% Vermicompost, 100% Vermicompost, 50% FYM + Azotobacter (Soil application), 100% FYM + Azotobacter (Seed application), 50 % Vermicompost + Azotobacter (Soil application), 100% Vermicompost + Azotobacter (Seed application). The treatments were laid out in Randomized Block Design and replicated thrice with 09 treatments combinations. Growth and yield parameters were recorded as per standard procedures and analyzed statistically.

Results and discussion

Growth attributes

Plant Height

At the initial stage of plant growth there was a minor deviation in plant height among the treatments. Due to the effect of Organic Manures the plant height during its growth period recorded highest in T9 (100% VC + Azotobacter (Seed)) with 120 cm followed by T8 (50% VC + Azotobacter (Soil)) with 118cm whereas T0 (Control) contributed the lowest value (98 cm).

No. of Tillers/m^2

The analysis of variance revealed highly significant difference on number of tillers/m^2 among treatments. The number of tillers/m^2 (162) was recorded in T9 (100% VC + Azotobacter (Seed)) followed by T8 (50% VC + Azotobacter (Soil)) with 158 tillers/m^2 while the lowest tillers/m^2 (105) was recorded in T0 (Control).

Yield attributes

No. of Panicles/m^2

The analysis of variance revealed highly significant difference on number of Panicles/m^2 among treatments. The number of panicles/m^2 (177) was recorded in T9 (100% VC + Azotobacter (Seed)) followed by T8 (50% VC + Azotobacter (Soil)) with 160 panicles/m^2 while the lowest 102 tillers/m^2 was recorded in T0 (Control).

Panicle length (cm)

Influence of different combination of Organic Manures was found in Panicle Length. The maximum panicle length 25.6cm per m^2 was noticed with the T9 (100% Vermicompost +Azotobacter (seed application)) followed by 24.1 cm per m^2 with T8 (50% VC + Azotobacter (Soil)) and the control was recorded the lowest panicle length 18.35 cm per m^2.

1000-seed weight (g)

The maximum test weight of 24.2g was noticed with the T9 (100% Vermicompost +Azotobacter (seed application)) followed by 23.5g with T8 (50% VC + Azotobacter (Soil)) and the T0 Control was recorded the lowest test weight of 20.3g.

Grain yield (quintal/ha)

Influence of different combination of Organic Manures was found in Grain Yield. The treatment of T9 (100% Vermicompost + Azotobacter (seed application)) recorded significantly higher grain yield (19.26 quintal/ha) followed by 18.99q/ha T8 (50% VC + Azotobacter (Soil)) and the T0 Control was recorded the lowest Grain Yield of 16.32q/ha.

Table 1 Effect of Manures treated with and without Azotobacter on Growth Parameters of Rice (Sahabhagi Dhan)

Treatments	No.of grains per panicle	Test Weight (g)	Grain Yield (q/ha)	Percentage Yield
Control	47	20.3	16.32	
50% FYM	50	20.85	17.02	4.11
100% FYM	56	20.9	17.38	6.09
50% VC	59	21.3	17.66	7.71
100% VC	63	21.8	18.16	10.01
50% FYM+ Azotobacter (Soil)	67	22.1	18.49	11.73
100% FYM + Azotobacter (Seed)	73	22.6	18.60	12.25
50% VC + Azotobacter (Soil)	76	23.5	18.99	14.06
100% VC + Azotobacter (Seed)	84	24.2	19.26	15.26
Sem	15.3	0.6	2.22	
CD (P=0.05)	45.8	1.8	6.6	

treatments	Plant Height (cm)	No.of Tillers/m^2	No. of Panicles/m^2	Panicle length(cm)
Control	98	105	102	18.35
50% FYM	100	121	112	19
100% FYM	103	124	125	19.78
50% VC	106	136	132	20.07
100% VC	108	139	141	21.5
50% FYM+ Azotobacter (Soil)	111	146	145	22.4
100% FYM + Azotobacter (Seed)	115	148	149	23.6
50% VC + Azotobacter (Soil)	118	154	160	24.1
100% VC + Azotobacter (Seed)	120	162	177	25.6
Sem	7.6	12.8	28.4	1.3
CD (P=0.05)	23.09	38.6	85.35	3.9

Table 2 Effect of Manures treated with and without Azotobacter on Yield Parameters of Rice (Sahabhagi Dhan)

Conclusion

It has been observed that raising Paddy treated with Vermicompost + Azotobacter (Seed treatment) results good yield over the remain treatments. Growing Paddy with organic nutrient management has good market scope in Urban areas, provided the farmer must have his own organic nutrient production unit then it will be cost effective. A farmer may face constraint at the initial years of organic cultivation but as there is growing market demand of organic goods can ensure farmer to accept this change in farming practice which can open a new dimension for their sustainable livelihood.

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