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INFLUENCE OF DIFFERENT RICE CULTIVATION METHOD ON GROWTH CHARACTERS

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ABSTRACT

The research trial was laid our in split plot design with four methods of rice cultivation method I.e. conventioanal method (M1). SRI raised bed method (M2), SRI flat bed method (M3),aerobic (M4). Rice was cultivated in main plot in kharif season and three fodder crops i.e. oat, berseem and lathyrus after rice in rabi season in sub plot with 3 replication. In kharif season taller rice plant (124.5 cm) and maximum tiller m^{-2} (397.7) were observed in SRI- raised bed, respectively. which were at par with height (122.3 cm) and tiller number (381.7 m-2) recorded in SRI flat bed system. Dry matter accumulation (982.2 gm-2) at harvest was the highest for SRI raised bed but on at par with that of SRI-flat bed system (963.9 g m-2). Optimum plant population and geometry under SRI led to availability of more resources to the plants that resulted in increased plant height and more number of tillers Minimum number of tillers were recorded under aerobic rice cultivation due to lack of adequate soil moisture and method of land preparation. More dry matter accumulation occurred in both the SRI methods of cultivation, which may be due to better uptake of nutrients and availablility of space

KEYWORDS: Growth Characters, Dry Matter, Conventional Method, Sri- Raised Bed Method, Aerobic

INTRODUCTION

The people of India depend on rice as staple food which has tremendous influence on agrarian economy of India. In India, rice is cultivated round the year in one or the other part of the country in diverse ecologies spread over 44.6 mha (CACP-2015) with a production of 104.22MT and average productivity of 2.437tha^{-1}(CACP-2015). It is difficult to replace rice by any other crop in rainy (*kharif*) season due to prevailing soil and climatic condition. Puddling is practiced by farmers presumably to minimize weed density and create a condition suitable for rapid transplanting of rice seedling and to reduce nutrient loss caused through percolation (De Datta and Barker, 1978). But transplanting is a resource and cost intensive method, since the preparation of nursery bed and operation of transplanting are labour intensive job and require more water. Besides, transplanted rice production also affects soil physical condition which is induced by puddling. Increasing water scarcity warrants alternative methods of rice cultivation that aims at higher water and crop productivity. There is an urgent need to diversify the rice based cropping system aimed with higher productivity, efficient use of water, need based higher profit and competitiveness at both domestic and international market, improving soil health, protecting environment and facilitating better cropping system. In the era of shrinking resource base (land, water and energy), resource use efficiency is an important aspect for considering the suitability of a cropping system. Intensification through crop sequence also provides greater opportunity for labour engagement.

Material Method

A field experiment entitled "production potential of rice- fodder potential cropping sequence under various rice cultivation method” was conducted during 2013-2014 at central research system, Orissa University of Agriculture and Technology Bhubaneswer. The experiment was laid out in split plot design with four methods of rice cultivation method I.e. conventioanal method (M1).SRI- Raised bed method (M2), SRI- Flat bed method (M3), aerobic (M4) were assigned to main plot in kharif season and three fodder crops i.e oat, berseem and lathyrus after the rice crop in rabi season in sub plot with 3 replication. The soil of the experiment plot was sandy loam in texture with BD 1.72 Mg m-3, PD 2.85 Mg m-3, pH 5.6 Organic carbon3.4 g kg -1 and available nitrogen, phosphorus, potassium content of 215.0, 12.1 and 118.0 kg h-1 respectively.

Water management Practices:

- Conventional method: Puddled and transplanted, standing water throughout the season
- SRI(raised bed): Puddled and transplanted, water only in channels
- SRI(flat bed): Puddled and transplanted, beds kept moist to saturation condition
- Aerobic rice: Non puddled, direct sown, irrigation as and when required.

The data pertaining to different growth characters were recorded as per the days of maturity

RESULTS AND DISCUSSIONS

The physiological processes involved in the events of the growth and yield of rice plant are directly affected by temperature, solar radiation and rainfall. In general the temperature regime recorded in tropics is suitable for rice growth throughout the year. The mean atmospheric temperature during crop growing period ranged from 21.0 to 29.25 ^{0}C in *kharif* and 21.0 to 26.05 ^{0} C in *rabi* season. Yoshida (1978) studied the rice plant and temperature variation at different growth stages and reported ranges of 25-30, 25-28, 25-31 and 20-29^{0}C as the optimum for crop establishment, rooting, tillering and ripening stages, respectively.

The mean relative humidity was 90.5, 85.12, 86.30, 88.75 and 68.05 per cent in the months of July, August, September, October and November, respectively in *kharif* season. Angladette (1966) reported that 70-80 per cent relative humidity is the most favourable condition for rice crop. Relative humidity modifies the plant physiological processes like transpiration and nutrient translocation. High relative humidity decreases transmission and hence nutrient uptake by the plant. On the other hand, low relative humidity increases energy use due to accelerated transpiration. This might be one of the reasons for lower dry matter accumulation and yield in both the seasons.

Growth of a plant is a complicated process which may be expressed as the division of cell and the enlargement of the newly divided cells. It depends upon the genetic potential as well as the prevailing environmental conditions in which the plant grows. Though increase in plant height is the most obvious manifestation of growth, in grain crops accumulation of dry matter in non grain component is important in producing a plant capable of high grain yield (Brown, 1984). Growth in a community differs in many ways from individually grown plant and is influenced by interaction of plants for space, light, nutrient and water.

Plant height of rice crop progressively increased till maturity irrespective of cultivation practice with an average of 120.2 cm. There was no significant difference in plant height from 45 to 75 DAS. There after till harvest, taller plants were observed in SRI raised bed and was at par with SRI flat bed. Initially plant height was less in conventional method due to transplanting at 21 DAS and shock of transplanting that caused slow initial growth. The number of tillers increased up to 75 DAS and declined thereafter. At early stages, tiller number was more in aerobic and conventional methods. However, towards the later stages and at harvest more tillers were observed in SRI. This may be due to optimum available of space, light, nutrient and water that resulted in more tillers and less degeneration of tillers at harvest. Optimum plant population and geometry under SRI led to availability of more resources to the plants that resulted in increased plant height and more number of tillers (Koma and Siny, 2003). Minimum number of tillers were recorded under aerobic rice cultivation due to lack of adequate soil moisture and method of land preparation (Geethalakshmi, 2009). LAI increased linearly up to 75 DAS and decreased thereafter towards harvest because of ceasation of vegetative growth, loss of leaves and senescence. The dry matter accumulation increased with the advancement of growth but the rate was maximum at 60 to 75 DAS. More dry matter accumulation occurred in both the SRI methods of cultivation, which may be due to better uptake of nutrients and availablility of space. Water shortage limits the leaf expansion in aerobic rice which affects the dry matter accumulation. CGR and RGR increased up to 75 DAS up to grand growth stage and decreased thereafter due to maturity and senescence.

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APPENDICES

Table 1: Effect of Various Ricecultivation Methodson Plant Height (Cm), Tillers Per M^2 of Rice

Treatments	Days after Sowing							Days after Sowing						
	30	45	60	75	90	105	Harvest	30	45	60	75	90	105	Harvest
M_1(Conventional)	42.2	64.7	92.9	105.7	113.2	115.6	118.3	148.3	199.0	307.7	389.7	383.7	372.0	368.7
M_2(SRI-raised bed)	46.2	67.4	96.9	112.3	119.2	121.8	124.5	97.3	169.0	331.7	415.3	412.0	403.7	397.7
M_3(SRI-flat bed)	45.9	66.0	94.7	109.3	116.4	118.0	122.3	91.0	164.7	321.7	402.3	393.3	386.7	381.7
M_4(Aerobic)	47.6	65.4	91.0	100.1	110.2	112.6	115.7	125.7	170.0	295.7	378.3	356.7	341.3	334.0
SEm ±	1.18	1.73	1.81	3.55	1.06	1.71	1.25	3.04	4.39	7.17	9.32	6.29	7.47	7.06
CD (p=0.05)	**4.08**	**NS**	**NS**	**NS**	**3.66**	**5.90**	**4.34**	**10.52**	**15.19**	**24.80**	**32.24**	**21.77**	**25.84**	**24.44**
C_1	44.5	66.4	93.3	106.5	115.3	117.3	120.2	115.5	178.8	311.3	398.0	386.0	376.3	371.5
C_2	45.4	66.5	95.0	106.9	114.1	117.0	120.1	113.5	170.8	312.0	391.5	387.5	376.0	370.5
C_3	46.5	64.7	93.3	107.2	114.9	116.8	120.3	117.8	177.5	316.3	399.8	385.8	375.5	369.5
SEm ±	0.90	0.78	1.44	1.38	1.51	0.82	0.28	1.49	3.73	4.19	4.36	6.23	5.50	5.42
CD(p=0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Table 2: Effect of Various Ricecultivation Methodson Leaf Area Index, Drymatter Content (Gm^{-2}) of Rice

Treatment	Days after Sowing						Days after Sowing						
	30	**45**	**60**	**75**	**90**	**105**	**30**	**45**	**60**	**75**	**90**	**105**	**Harvest**
M_1(Conventional)	1.80	3.18	4.03	4.71	4.06	3.07	72.5	220.9	401.0	595.7	721.4	817.2	857.6
M_2(SRI-raised bed)	1.55	2.60	3.66	5.03	4.69	3.60	66.8	223.9	438.0	683.5	820.7	930.7	982.2
M_3(SRI-flat bed)	1.43	2.32	3.53	4.97	4.44	3.13	66.0	220.7	429.4	672.8	809.6	918.5	963.9
M_4(Aerobic)	2.17	3.24	4.12	4.53	3.85	2.72	78.4	221.6	368.6	549.6	663.1	753.4	786.7
SEm ±	0.03	0.09	0.13	0.16	0.16	0.21	1.41	1.15	3.17	3.72	3.71	3.88	5.34
CD(p=0.05)	**0.09**	**0.31**	**0.45**	**NS**	**0.56**	**0.72**	**4.88**	**NS**	**10.98**	**12.88**	**12.82**	**13.42**	**18.45**
C_1	1.80	2.85	3.90	4.86	4.33	3.23	70.8	221.5	409.5	625.6	753.5	854.6	897.5
C_2	1.74	2.84	3.82	4.80	4.27	3.16	71.6	222.5	409.2	625.5	754.2	854.9	897.6
C_3	1.68	2.80	3.78	4.77	4.19	3.01	70.3	221.4	409.0	625.1	753.4	855.4	897.8
SEm ±	0.07	0.10	0.19	0.21	0.18	0.19	1.21	1.16	1.21	0.88	0.79	1.10	0.98
CD(p=0.05)	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**