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On Farm Trials of Low Gi Rice Variety RNR 15048 in Gajapati District of South Odisha

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ABSTRACT

Large population in India consume rice as staple food and are suffering from type-2 diabetes. In general, most of the rice varieties have the GI of around 73 (white rice - polished) and 68 (brown rice - unpolished) which is responsible for a person to become diabetic. The rice variety RNR 15048 developed by Professr Jayashankar Telangana State Agricultural University is having Glycemic index of 51%. On farm trials were conducted during Kharif 2009 with low GI rice variety RNR 15048 in 290 farmers' fields of 10 villages of Gajapati district, Odisha. The farmers adopted both dry seeding and transplanting method of crop establishment, used different aged seedings for transplanting between July 16 to Aug 31 and applied varying levels of fertilizer. There was an increase of 5 % of paddy in dry seeded crop over that of transplanted crop. The grain yield of the crop sown between July 1 to 15 has recorded 26 and 11% higher yield (4228 kg ha^{-1}) than that of June 10-20 and June 20 to 30 respectively. The mean yield improvement observed was 3 % at higher N and P2O fertilizer application (113 kg N and 58 kg P_2O_5 ha^{-1}) (4379 kg ha^{-1}) as compared to low N and P2O fertilizer applied (43 kg N and 23 kg P2O5 ha^{-1}). The grain yield of rice was higher with transplanting between 16 to 31 July (5092 kg ha^{-1}) which was 18, 21 and 49 % higher over that transplanted between Aug 1 to 10, 11to 20 and 21to 31. There was decrease in grain yield with increase in average age of seedlings from 30 to 36 and 43 days. The grain yield of transplanted rice was higher in Lingipur village where soil N and P were lower as compared to village Chandanakhala where soil fertility was higher and grain yield was lower than that in former village.

KEY WORDS: AGE OF SEEDLINGS, DRY SEEDING, FERTILIZER LEVELS, KHARIF SEASON, TIME OF SOWING, TIME OF TRANSPLANTING.

INTRODUCTION

In India, as many as 50 million people are suffering from type-2 diabetes. Majority of them consume rice as staple food. In general, most of the rice varieties have the GI of around 73 (white rice) and 68 (brown rice). Several studies have reported that higher intake of rice is strongly associated with type 2 diabetes (Blaak et al., 2012 and Hu et al., 2012). The low GI rice varieties are packed and sold in India at a high price of rupees 90 to 120 per kg under the name of different brands. With technical support from M.S. Swaminathan School of Agriculture, the Last Mile Distribution India Pvt Ltd (LMDC) taken up the production of low GI rice variety in the farmers' fields of Gajapati district, Odisha. The Gajapati district is having 60% tribal population and 90% people depending on agriculture and the district ranks one among the 50 most backward districts of the country. The farmers were provided with the seed and technical advice on daily basis by the production team through app-based monitoring (Kalgudi) and regular SMS.

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The paddy crop is grown in 90% of the cropped area (4.46 million hectares) in Odisha (agriodisha.nic.in). The productivity of paddy ranges from 3750 to 4500 ha-1. The poor yield of rice crop is due to dependence on rainfall and irrigation through diversion of stream water for rice cultivation. The crop is cultivated as dry seeded and transplanted (Reddy and Panda, 1988). The crop suffers from weeds in dry seeded rice and delayed transplanting with aged seedlings in transplanted rice. The crop is fertilized at sub optimal level and rarely Zinc is applied. The varieties grown are coarse varieties like MTU 1001 and MTU 1010. The RNR 15048 (Telangana Sona) is a fine variety with 120-125 days duration, having tolerance to BLB and suitable for late sowing (July) (Vyavasaya Panchangam, PJTSAU, 2019). If sown early in June, it takes more time to mature and grows taller thereby there is scope for lodging.

The cultivation of low glycemic index variety was taken up to improve the productivity and income of farmers in the backward area of Gajapati district. The farmer's meetings were organized in 10 villages of 8 Panchayats of Gosani and Gumma blocks of Gajapati district, Odisha and convinced them to take up the production of low Glycemic Index paddy variety RNR 15048 (Prasanthi Prabhakaran Sobhana, et al., 2019). To facilitate the farmers in getting higher paddy production and realization of more income through technological guidance and marketing, the school has developed a network through which each individual farmer was contacted and his field was monitored through App Kalgudi.

MATERIAL AND METHODS

During 2019, an area of 480 acres of 290 farmers in 10 villages of Gajapati district, Odisha was cultivated with low GI paddy RNR 15048. The farmers were supplied foundation seed of RNR 15048. Before start of the season, the farmers were trained on production technology of this variety. The technical support was provided through the faculty of M.S. Swaminathan School of Agriculture, Centurion University of Technology and Management, Odisha and marketing team of Gram Tarang Foods Pvt. Ltd. The Last Mile Distribution India Pvt. Limited has developed network through which each individual farmer was contacted and his field was monitored through App Kalgudi.

The soil test was done in all the fields of the farmers for knowing the nutrient status of field. All the farmer's production activities were monitored by a specially designed social-networking app, named 'Kalgudi'. All the farmers were connected through this app and further it was connected to the technologists as well as monitoring team of Last Mile Distribution India Pvt. Limited. The Kalgudi app shows the GPS location and the time of posting of any photo or video, which made the monitoring team to respond promptly. Whenever, farmers needed any support, messages were communicated immediately. Regular field visit by monitoring team and update of each field on daily basis was done by the team and SMS alert was given to all farmers.

The package of practices was explained to the farmers in June before the start of the season. The recommended package of practices of RNR 15048 include sowing of nursery after July 10, transplanting in August first fortnight using 25-30-day old seedlings, application of 100 kg N, 60 kg P2O5 and 50 kg K2 O ha^{-1}. The farmers taken up the dry seeding at different times (Table 2) and provided water as and when required with stream water. In transplanted crop, the nurseries were raised from June last week to fourth week of July. The crop was transplanted with different aged seedlings on different dates (Table 5 and 6). The data of 58 farmers were collected and analyzed for different agronomical parameters as per the production package to assess the yield performance of RNR 15048.

RESULTS AND DISCUSSION

Dry seeded rice: Of the 58 farmers whose data was used for study, twelve farmers adopted dry seeding and 46 farmers adopted transplanting method of rice cultivation. There was an increase of 5 % of paddy in dry seeded crop over that of transplanted crop (Table 1).

Table 1. Effect crop establishment methods on grain yield of RNR 15048 in farmers' fields of Gajapati district, Odisha during Kharif 2019

Crop establishment method	Yield, kg ha^{-1}
Dry seeding	4357 (12)
Transplanting	4153 (46)

Figures in parenthesis are the number of farmers

Time of sowing: The time of sowing has considerable influence on grain yield of rice. The crop sown between June 10 to 20 has recorded 26 and 11 % lower grain yield than that sown between June 20 to 30 (3828 kg ha-1) and June 20 and 30. On the other hand, the grain yield of the crop sown between June 20 to June30 has recorded 14% higher yield (4228 kg ha-1) than that sown on June 10 to 20.

Table 2. Effect of dates of sowing on grain yield of of Dry seeded rice variety RNR 15048 in farmers fields of Gajapati district, during kharif season 2019

Date of Sowing	Yield, kg ha^{-1}
10 to 20 June	3359 (1)
20 to 30 June	3823 (8)
1 to 15 July	4228 (3)

Figures in parenthesis are the number of farmers

Fertilizer levels: The grain yield obtained in Bagusala village where soil fertility especially N and fertilizer applied was low as comparable to that in Lingipur village where soil N and P contents (Table 3) and fertilizer N applied were higher. The yield and nutrient levels observed in three villages followed in the order of Machamara > Kharsanda > Katalkhaita (Table 4). The mean yield improvement observed was 3% at higher soil and fertilizer N and P2O5 level (4379 kg ha-1) as compared to low N and P2O5 fertilizer applied plot having low N content (Table 4). This could be due to environmental conditions and rainfall received during kharif season. However, no relation could be found between soil fertility and fertilizer response which need further research.

Table 3. Grain yield of Dry seeded rice variety RNR 15048 at varied soil fertility and fertilizer application in farmers' fields of different villages of Gajapati district, during kharif season 2019

Village	Soil fertility			Fertilizer applied, kg ha-1			Grain yield, kg ha-1
	N	P	K				
Bagusala	20	10	198	82	30	60	4447(2)
Katalkaitha	80	22	298	115	58	52	3359(1)
Kharasandha	93	4.1	642	115	58	52	3789(1)
Machamara	160	18.2	890	115	58	52	3868(1)
Lingipur	101	9	472	102	58	52	4408(7)

Figures in parenthesis are the number of farmers

Table 4. Effect of fertilizers applied and soil fertility on grain yield of Dry seeded rice variety RNR 15048 in farmers' fields of Gajapati district, during kharif season 2019

Parameter	Fertilizer applied, kg ha^{-1}			Soil fertility, kg ha^{-1}			Grain Yield, kg ha^{-1}
Fertilizer	N	P_2O_5	K_2O	N	P	K	
high	113	58	54	102	9.3	498.2	4379 (10)
Low	43	29	53	80	40.8	769.5	4246 (2)

Figures in parenthesis are the number of farmers

Table 5. Grain yield of transplanted rice variety RNR 15048 in farmers' fields of different dates of planting in Gajapati district, during kharif season 2019

Date of Transplanting	Yield, kg ha^{-1}
16 to 31 July (6)	5092
1 to 10 Aug (21)	4298
11 to 20 Aug (18)	4225
21 to 31 Aug (1)	3415

Figures in parenthesis are the number of farmers

Transplanted crop

Date of Transplanting: The grain yield of rice was higher with transplanting between 16 to 31 July which was 18% higher over that transplanted between Aug 1 to 10 (Table 5). There was no difference in grain yield between the crop transplanted between Aug 1 to 10 and Aug 11 to 20. However, the grain yield decreased considerably (49%) when the crop was transplanted between Aug 21 to 31 as compared to that transplanted between August 21 and 31.

Age of seedlings: There was decrease in grain yield with increase in age of seedlings from 30 to 36 and 43 days. The decrease in yield was 20 and 23% when seedlings of 36 and 43 day old seedlings were used as compared to 30-day old seedlings (Table 6). Higher grain yield was reported by using 25 day old seedling due to more number of tillers and thereby panicles (Vijayalaxmi et al., 2016).

Fertilizer application: In transplanted rice, the N fertilizer application ranged from 110 to 115, P2O5 ranged between 52 to 57 and K2O varied between 47 to 55 kg ha-1 in all the farmers' fields except one field. The grain yield of transplanted rice in Lingipur village was higher as compared to that in Chandanakhala village. The soil N

and P were lower in the former village as compared to latter village.

Table 6. Grain yield of transplanted rice variety RNR 15048 in farmers' fields of different age of seedlings in Gajapati district, during kharif season 2019

Age of Days Seedling,	Average age of Seedlings, Days	Yield, Kg ha -1
21-30	30	5263 (13)
31-40	36	4226 (18)
41-50	43	4072 (13)

Figures in parenthesis are the number of farmers

The dry seeded crop resulted in 5% higher yield than transplanted rice. In general, the early establishment of the crop with dry seeding under favorable rainfall gives enough anchorage to the seedlings and establishment, higher ear bearing tillers and thereby grain yield (Reddy et al., 1993, Reamulu et al., 2020). However, the dry seeded crop needs proper weed management (Lateef Pasha et al., 2011, Kadiyala et al., 2012). The higher grain yield is due to higher panicles per unit area and thereby higher yield as that of transplanted conditions. For RNR 15048, sowing in July first fort night has been found suitable as the crop sown during this period has given 26 and 11 % higher yield over that sown between June 10 to 20 and June 20 to 30. Under dry seeded conditions, higher fertilization resulted in 3 % increase in yield over that of low level of fertilization. In South Odisha and adjoining areas of North Coastal A.P., the rice crop is grown under dry seeded as well as transplanted conditions (Reddy et al., 2006). The present study suggests that the low GI rice variety RNR 15048 is suitable for both dry seeded and transplanted conditions.

The Professr Jayashankar Telangana State Agricultural University recommended variety RNR 15048 (Telangana Sona) for late planted conditions in Telangana state (Vyayasaya Panchangam, PJTSAU 2019). Contrary to this, the grain yield of rice was higher with early transplanting between 16 to 31 July as compared to that in August. Further, transplanting with younger seedlings (30 Days) has resulted higher yield than older seedlings (36 and 43 days). The Recommended level of fertilizer has given 3.4 to 4.4 t grain yield. The yield obtained with RNR 15048 was 400 kg ha-1 higher than that of farmers yield in nearby fields. The on-farm trials suggest that growing of low glycemic index (GI) variety RNR15048 is suitable for kharif under both dry seeded and transplanted conditions. Sowing of RNR 15048 from July first fortnight in case of dry seeded rice gives higher yield than that sown at later date. Further, transplanting in July with 30-day old seedlings with recommended fertilizer level of 100 kg N, 60 kg P205 and 50 kg K20 ha-1 gives better yield.

Table 7. Grain yield of transplanted rice variety RNR 15048 at varied soil fertility and fertilizer application in in farmers' fields of different villages of Gajapati district, during kharif season 2019

Village	Soil fertility, kg ha^{-1}			Fertilizer applied, kg ha^{-1}			yield
	N	P	K	N	P_2O_5	K_2O	
Bagusala	76	64	430	115	57	112	3838(1)
Bomika	167	17	371	115	57	55	4330(18)
Chandanakhala	186	32	715	115	57	52	4006(3)
Kharasandha	88	36	528	110	52	47	4389(11)
Lingipur	71	7	521	115	57	52	5131(7)
Machamara	160	18	880	115	57	52	3827(4)
Patikota	130	12	350	115	57	52	3561(1)
R.Sitapur	93	9	475	115	57	52	3465(1)

Figures in parenthesis are the number of farmers

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