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Effect of age of seedling, organic manures and nitrogen levels on the yield and yield contributing characters of rice cv. GURJARI

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ABSTRACT

A field experiment was conducted at Agricultural Research Station for irrigated crops, Anand Agricultural University, Thasra, Gujarat during *Kharif* season of the year 2006 and 2007 to find out the effect of age of seedling, organic manures and nitrogen on the yield of transplanted *Kharif* rice named Gurjari.The treatments consisted of two seedling ages *viz*., A_1 (10 to 12 days old seedling) and A_2 (25 to 30 days old seedling), five levels of organic manures M_1 (No organic manure), M_2 (FYM 10 t ha^{-1}), M_3 (Vermicompost 2 t ha^{-1}), M_4 (FYM 10 tha^{-1} + Bio fertilizer) and M_5 (Vermicompost 2 t ha^{-1} + Bio fertilizer) and two nitrogen levels N_1(75 kg Nha^{-1}) and N_2 (100 kg Nha^{-1}).The highest plant height, effective tiller plant^{-1},panicle length, panicle weight, number of grain panicle^{-1} and test weight were found in 10 to 12 days old seedling. 100 kg Nha^{-1} (N_2) was the best performer in respect to growth attributes, yield attributes and yield. Panicle length, panicle weight and test weight were the highest than 75 kg Nha^{-1} (N_1). Finally 10 to 12 days old seedling demonstrated the best performance in respect of grain yield and this variety may preferably be cultivated with the application of Vermicompost@ 2 t ha^{-1}+ Bio-fertilizer (*Azotobacter* ABA-1 + Phospho solublizing bacteria PSB-16 each @ one liter ha^{-1} at 3 DATP) and application 100 kg Nha^{-1} in three split to obtain appreciably good yield in *Kharif* season.

Key words : Gurjari, Rice, Seedling age, Nitrogen, Yield parameter

INTRODUCTION

Rice (*Oryza sativa* L.) is the foremost cereal of the world. It belongs to the grass family Poaceae, sub-family Oryzoideae. Among the cereals, rice occupies a second position, next to wheat with regard to food value. Rice is major source of protein in the Asian diets. Three fourth of the total population of India depends mainly on rice. In Gujarat, major rice growing areas are confined in Navsari, Valsad, Surat, Dang, Panchmahal, Vadodara, Kheda, Anand and Ahmedabad districts.Seedling age plays a key role in deciding the productivity of rice. Transplanting is done at an early stage of seedling which enhances the tillering ability of the plant. Due to uncertainty of monsoon rains, the transplanting of rice gets prolonged. Under such situation, comparative evaluation of young versus aged seedlings needs to be done, to make the crop more accommodative in the system and to obtain the good yields. The use of chemical and off farm inputs in intensive agriculture is fast increasing, resulting in deterioration of soil health and increase environmental pollution. There is a need to integrate organics with chemical fertilizers for sustainable crop production, maintenance of soil fertility and conservation of natural resources. Due to regular use of chemical fertilizers, the fertility of soil is also decreasing.

MATERIALS AND METHODS

An experiment was conducted at the Agricultural Research Station for Irrigated Crops, Anand Agricultural University, Thasra, Dist. Kheda (Gujarat) during two consecutive *Kharif* seasons of the year 2006 and 2007. The soil of the experimental field was sandy clay loam in texture, having good drainage capacity. It was low in organic carbon and nitrogen, medium in available phosphorus and high in available potash. The experiment consisted of twenty treatment combinations, comprised of two age of seedlingsA_1(10 to12 days old seedling)andA_2 (25 to 30 days old seedling), five levels of organic manures M_1 (No organic manure), M_2 (FYM 10 t ha^{-1}), M_3 (Vermicompost 2 t ha^{-1}), M_4 (FYM 10 tha^{-1} + Bio fertilizer) and M_5 (Vermicompost 2 t ha^{-1} + Bio fertilizer) and two nitrogen levels N_1(75 kg Nha^{-1}) and N_2 (100 kg Nha^{-1}). The seeds in nursery were seeded on 20th June, 2006.After fifteen days, second nursery was seeded on 4th July, 2006 for getting low age seedling. Same procedure was carried out during the second year 2007. The nursery was seeded on 21st June and 5th July, 2007. To obtain vigorous healthy seedling, ammonium sulphate was applied @ 250g /10 m^{-2}. Full dose of phosphorus from diammonium phosphate was applied at the time of transplanting as a basal dose. Nitrogen was applied in the form of urea in three splits, 40 per cent at transplanting,

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40 per cent at tillering and remaining 20 per cent at panicle initiation stage. Uprooting and transplanting of seedlings were done on the same day. One healthy seedling was transplanted at each hill.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Effect of age of seedling:

Age of seedling had significant effect on growth, yield attributes and yield of rice (Table 1). The plant height, effective tiller plant^{-1}, panicle length, panicle weight, number of grains per panicle, test weight were recorded significantly higher under age of seedling treatment A_1 (10 to 12 days old seedling) as compared to treatment A_2 (25 to30 days old seedling). Grain yield was significantly affected due to age of seedling. Treatment A_1 (10 to 12 days old seedling) registered significantly the highest grain yield (5287 kg ha^{-1}) as compared to treatment A_2 (25 to30 days old seedling).The per cent increase in grain yield under treatment A_1 was at the extent of 2.7 per cent. It might be due to transplanting of younger seedlings from initial stage provided sufficient plant nutrients for vegetative growth and also for reproductive phase which ultimately led to increase yield attributes, there by increased grain yield. The above findings are akin to those reported by Avilkumar *et al.* (2006), Vijay Kumar *et al*. (2006).

Effect of organic manures:

The results indicated that (Table 1) different organic manures exerted significant influence on growth attributes, yield attributes and yield *viz*., plant height, effective tiller plant^{-1}, panicle length, panicle weight, number of grains per panicle, test weight. These attributes were higher under treatment M_5 (Vermicompost @ 2 t ha^{-1}+ Bio-fertilizer) being at par with treatments M_4 (FYM10 t ha^{-1}+ Bio-fertilizer) and M_3 (Vermicompost @ 2 t ha^{-1}) as compared to treatments M_2 (FYM10 tha^{-1}) and M_1 (No organic manure). Significantly higher grain (5376 kg ha^{-1}) was recorded under the treatment M_5 (Vermicompost@ 2 tha^{-1}+ Bio-fertilizer), but it was at par with treatments M_4 (FYM 10 t ha^{-1} + Bio fertilizer),

Table 1 : Effect of age of seedlings, organic manures and nitrogen levels on growth attributes, yield attributes and yield of rice

Treatments	Plant height (cm)	Effective tiller plant^{-1}	Panicle length(cm)	Panicle weight (g)	No. of grain panicle^{-1}	Test weight (1000 grains, g)	Grain yield (kg ha^{-1})
Age of seedlings (A)							
A1 : 10 to 12 Days	101.63	9.63	23.00	6.87	146.53	31.11	5287
A2 : 25 to 30 Days	99.88	9.05	22.59	6.46	141.13	30.75	5140
S.E. ±	0.34	0.08	0.08	0.06	0.43	0.10	46.92
C.D. (P= 0.05)	0.96	0.21	0.22	0.17	1.20	0.29	131.46
Organic manures(M)							
M_1- No organic manure	97.80	8.47	21.82	6.05	135.22	29.97	4839
M_2- FYM 10 t ha^{-1}	100.85	9.34	22.89	6.65	144.00	31.03	5235
M_3- Vermicompost 2 t ha^{-1}	101.28	9.47	22.97	6.83	145.72	31.16	5286
M_4- FYM 10 t ha^{-1}+ Bio-fertilizer*	101.72	9.66	23.08	6.84	146.75	31.03	5333
M_5 Vermicompost 2 t ha^{-1} + Bio-fertilizer*	102.13	9.75	23.24	6.94	147.44	31.47	5376
S.E. ±	0.54	0.12	0.13	0.10	2.40	0.17	74.19
C.D. (P= 0.05)	1.52	0.33	0.35	0.27	NS	0.46	207.85
Nitrogen levels (N)							
N_1- 75 kg N ha^{-1}	99.42	8.88	22.38	6.40	138.65	30.48	5045
N_2-100 kg N ha^{-1}	102.09	9.80	23.21	6.92	149.00	31.39	5382
S.E. ±	0.76	0.34	0.08	0.06	1.87	0.10	46.92
C.D. (P= 0.05)	NS	NS	0.22	0.17	NS	0.29	131.46
C.V. %	3.05	7.21	3.14	8.15	2.66	3.03	8.05

NS-Non significant

M_3 (Vermicompost 2 t ha^{-1}) and M_2 (FYM 10 t ha^{-1}).The magnitude of increase in grain yield was to the tune extent of 11.10 per cent over the treatment M_1 (No organic manure).The increase in grain yield under treatment M_5 (Vermicompost@ 2 tha^{-1}+ Bio-fertilizer) might be due to the fact that organic manure, which improved physical, chemical and biological properties of soil resulting in increased uptake of nutrients that to better vegetative growth of plant, higher photosynthesis, higher dry matter production and as a result higher grain yield. Similar results were also reported by Channabasavanna *et al*. (2001) and Kumar and Yadav (2008).

Effect of nitrogen:

The panicle length, panicle weight, number of grains per panicle, test weight was significantly influenced due to levels of nitrogen. Application of 100 kg N ha^{-1} (N_2) recorded higher values for all these attributes than 75 kg N ha^{-1}(N_1). The results in respect to grain yield revealed that nitrogen level had pronounced effect on grain yield. Application of 100 kg N ha^{-1} (N_2) produced significantly the highest grain yield as compared to treatment N_1 (75 kg N ha^{-1}). The increase in grain yield under treatment N_2 (100 kg N ha^{-1}) was at the extent of 6.68 per cent over treatment N_1 (75 kg N ha^{-1}). All these yield attributes might have cumulatively produced higher grain yield under higher level of nitrogen. The results obtained in the present study are in accordance with the results reported by Salem (2006), Zaheen Manzoor (2006) and Islam *et al*. (2008).

Interaction effects:

Among the possible interactions with respect to number of grain panicle^{-1}, only M × N (Organic manures ×Nitrogen levels) interaction effect was significant on pooled analysis (Table 2).

Table 2 : Number of grains panicle^{-1} as influenced by M× N interaction (Pooled)

Treatments	Nitrogen (N)	
Organic manures (M)	N_1 (75 kg N ha^{-1})	N_2 (100 kg N ha^{-1})
M_1 - (No organic manure)	132.00	138.44
M_2 - (FYM 10 t ha^{-1})	137.69	150.31
M_3 - (Vermicompost 2 t ha^{-1})	140.06	151.38
M_4 - (FYM 10 t ha^{-1}+ Bio-fertilizer*)	140.94	152.56
M_5 - (Vermicompost 2 t ha^{-1}+ Bio-fertilizer*)	142.56	152.31
S.E. ±	0.96	
C.D. (P= 0.05)	2.68	
C.V. %	2.66	

Data presented in Table 2 indicated that significantly higher number of grains panicle^{-1} (152.56) was recorded under treatment combination M_4N_2 (FYM 10 t ha^{-1} + Bio fertilizer with 100 kg N ha^{-1}) which remained at par with treatment combinations M_5N_2 (Vermicompost 2 t ha^{-1} + Bio fertilizer with 100 kg N ha^{-1},152.31), M_3N_2 (Vermicompost 2 t ha^{-1}, with 100 kg N ha^{-1},151.38) and M_2N_2 (FYM 10 t ha^{-1}, with 100 kg N ha^{-1}, 150.31). While the treatment combinations M_5N_1 (Vermicompost 2 t ha^{-1} + Bio fertilizer with 75 kg N ha^{-1},142.56),M_4N_1 (FYM 10 t ha^{-1} + Bio fertilizer with 75kg N ha^{-1}, 140.94) and M_3N_1 (Vermicompost 2 t ha^{-1}, with 175kg N ha^{-1}, 140.06) were not differed significantly with each other, The treatment combination M_1N_2 (No organic manure with 100kg N ha^{-1},138.44) and M_2N_1 (FYM10 t ha^{-1}, with 75 kg N ha^{-1}, 137.69) differed significantly with each other. The significantly less number of grains panicle^{-1} (132.00) was recorded under treatment combinationM_1N_1 (No organic manure with 75 kg N ha^{-1}) on pooled data.

Conclusion:

From the above results, it can be concluded that for securing maximum grain yield of rice (cv. GURJARI), it is advisable to use 10 to 12 days old seedlings with the application of Vermicompost@ 2 t ha^{-1}+ Bio-fertilizer (*Azotobacter* ABA-1 + Phospho solublizing bacteria PSB-16 each @ one liter ha^{-1} at 3 DATP) and application of 100 kg N ha^{-1} in three equal splits under middle Gujarat conditions.

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