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Effect of different moisture regime and integrated nutrients management on yield attributes, yield and economics of hybrid rice (*Oryza sativa* L.)

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Abstract
A field experiment was conducted during two consecutive years of 2017-18 and 2018-19 at Agronomy research farm of ANDUAT, Kumarganj, Ayodhya to study the different moisture regime and integrated nutrients management on yield attributes, yield and economics of hybrid rice. Result data revealed that 7 cm irrigation given at 1 day after disappearance of ponded water produced significantly more yield attributes viz., length of panicles, number of grains per panicle, weight of grains per panicle and 1000 grain weight, yield viz., grain and straw yield and harvest index and economics of hybrid rice. Application of 75% NPK + 25% N through biocompost recorded significantly higher length of panicle, number of grains per panicle, weight of grains per panicle and 1000-grain weight, grain and straw yield, harvest index of hybrid rice as compared to rest of the nutrient management. Highest gross (Rs 143803.95 ha^{-1}) was fetched with 7cm Irrigation given at 1 day after disappearance of ponded water with 75% NPK + 25% N through biocompost (I_1N_2) followed by (Rs 135801.0 ha^{-1}) 7 cm Irrigation given at 1 day after disappearance of ponded water and 75% NPK + 25% N through FYM (I_1N_4). Highest net return (Rs 99380.01 ha^{-1}) and benefit: cost ratio (2.24) was fetched with 7cm Irrigation given at 1 day after disappearance of ponded water with 75% NPK + 25% N through biocompost (I_1N_2) followed by (Rs 90651.42 ha^{-1}) 7 cm Irrigation given at 4 day after disappearance of ponded water and 75% NPK + 25% N through biocompost (I_1N_2). Minimum net return (Rs 64104.26 ha^{-1}) and benefit: cost ratio (1.30) of hybrid rice was obtained with conventional irrigation and 50% NPK + 50% N through FYM (I_4N_5).
Keywords: Days after disappearance of ponded water (DADPW), biocompost, conventional irrigation, gross and net return, nutrient management.

Introduction
Rice (*Oryza sativa* L.) in a major staple food for the world's population. To meet the demands of increasing population and maintain this self- sufficiency, the present production level of around 116 million tones, needs to be increased up to 130 million tonnes by 2025. Hybrid rice possess 10 to 15 percent yield advantage over inbred varieties due to more vigorous and extensive root system increased growth rate during vegetative stage, more efficiency sink formation, faster rate of translocation of photosynthates and greater sink size. Integrated nutrient supply involving conjunctive use of fertilizers, organic sources of nutrients and biofertilizers assumes greater significance in India. Integration of organic and inorganic sources of plant nutrients which improves the soil physical as well as chemical properties of soils which contributes to soil fertility and productivity. Appropriate water management provides a favorable water and nutrient supply under anaerobic conditions. The proper use of available irrigation water and application of suitable dose of fertilizer nutrients in respect to available soil moisture may play an important role in minimizing the present large gap between yield achieved and yield achievable. Taking these views into consideration, the present experiment was, therefore, under- taken to assess the effect of different moisture regimes and nutrient management on yield attributes, yield and economics of hybrid rice (*Oryza sativa* L.).

Materials and methods
The present field investigation on effect of different moisture regime and nutrients management on yield and yield attributes of hybrid rice (*Oryza sativa* L.) was conducted

during *Kharif* season of two consecutive years of 2017-18 and 2018-19 at Agronomy Research Farm, Acharya Narendra Deva University of Agriculture & Technology, Narendra Nagar, (Kumarganj), Ayodhya. The treatment combinations comprised with four moisture regimes *viz.* 7cm irrigation given at 1 DADPW, 7cm irrigation given at 4 DADPW, 7cm irrigation given at 7 DADPW and conventional irrigation and five integrated nutrients management *viz.*100% NPK (150:75:60 kg/ ha) through inorganic fertilizer, 75% NPK + 25% N through biocompost, 50% NPK + 50% N through biocompost, 75% NPK + 25% N through FYM, 50% NPK + 50% N through FYM were executed in split plot design with three replications. The soil of the experimental field was silt loam in texture with low in organic carbon (0.30-0.31%), available nitrogen (185.0-189.0 kg ha^{-1}) and phosphorus (16.0-16.2 kg ha^{-1}) and high in available potassium (282-284 kg ha^{-1}). The hybrid rice (Arize 6444) was transplanted on 8th July and 12th July and harvested on 10th November and 14th November during first and second years of experimentation, respectively. The observations on yield and yield attributed and economics were taken after harvest of crop.

Results and Discussion

Yield attributes

Significantly highest length of panicle, number of grains panicle^{-1}, weight of grains panicle^{-1} and 1000 grain weight of hybrid rice was obtained with 7 cm irrigation given at 1 day after disappearance of ponded water as compared to rest of the moisture regimes (Table 1). The increase in yield attributes with increase in moisture regime might be due to favorable vegetative growth and development because it received adequate moisture during entire period of growth. As under adequate moisture the plant height, LAI and dry matter accumulation were highest which contributed to highest yield attributes, due to increased photosynthetic activity of leaves. Adequate moisture not only translocat photosynthats from source to sink but also increased higher uptake of nutrients led to better yield attributes. Lowest yield attributes were recorded under 7 cm irrigation given at 7 DADPW because plants were unable to extract more water and nutrients under moisture deficit condition which resulted in poor growth and yield attributes. These results are in close proximity of those obtained by Singh and Ingram (1995) [13] and Harbir Singh and Ingram (2000) [1].

The yield attributes *viz.,* length of panicle, number of grains panicle^{-1} and weight of grains panicle^{-1} were influenced significantly due to various integrated nutrients management. However, significantly higher value of all these yield attributes were recorded with the application of 75% NPK + 25% N through biocompost as compared to rest of integrated nutrients management (Table 1). This might be attributed due to adequate nutrients supplying system favoured vegetative growth and development which resulting from increased was highest which contributed higher yield attributes. The lowest value were obtained under 50% NPK through inorganic fertilizers +50%N through FYM because plants were unable to extract more nutrients, this integrated nutrients management which resulted poor growth and yield attributes. These results are in close accordance with the findings of Singh *et al.*, (2015) [12]; Singh *et al.*, (2017) [9] and Naorem *et al.*, (2018) [5]. Higher test weight (23.05 g) of hybrid rice was obtained with the application of 75% NPK + 25% N through biocompost followed by 75% NPK + 25% N through FYM (22.95 g), 100% NPK (150:75:60 kg/ ha) through inorganic fertilizer (22.85 g), 50% NPK + 50% N through biocompost (22.75 g) and 50% NPK + 50% N through FYM (22.65 g). Minimum test weight of hybrid rice was obtained with the application of 50% NPK + 50% N through FYM. These results are in close conformity with the findings of Naorem *et al.*, (2018) [5].

Table 1: Yield attributes of hybrid rice as affected by different moisture regime and integrated nutrients manegement (pooled of 2 years)

Treatments	Length of panicle (cm)	No. of grains panicle^{-1}	Weight to grains panicle^{-1} (g)	Test weight (g)
Moisture regime				
7cm irrigation given at 1 DADPW	26.28	216.79	5.10	23.75
7cm irrigation given at 4 DADPW	24.77	206.53	4.83	23.35
7cm irrigation given at 7 DADPW	23.07	190.41	4.18	21.95
Conventional irrigation	23.81	198.47	4.43	22.35
SEm±	0.57	4.13	0.09	0.51
CD at 5%	1.40	9.95	0.26	NS
Integrated Nutrients management				
100% RDF of NPK(150:75:60 Kg/ ha) through inorganic fertilizers	24.32	204.02	4.68	22.85
75% NPK + 25% N through Biocompost	26.93	218.62	5.06	23.05
50% NPK + 50% N through Biocompost	23.52	192.43	4.39	22.75
75% NPK + 25% N through FYM	24.64	206.54	4.75	22.95
50% NPK + 50% N through FYM	23.12	188.41	4.30	22.65
SEm±	0.50	4.11	0.10	0.50
CD at 5%	1.43	11.36	0.30	NS

Yield

Significantly highest grain (73.05 q ha^{-1}) and straw (84.90 q ha^{-1}) yield of hybrid rice was obtained with 7 cm irrigation given at 1 day after disappearance of ponded water as compared to other moisture regime (Table 2). Significantly more grain (69.12 q ha^{-1}) and straw (80.58 q ha^{-1}) yield of hybrid rice was produced with 7cm irrigation given at 4 days after disappearance of ponded water. Minimum grain (60.76 q ha^{-1}) straw (73.62 q ha^{-1}) yield of hybrid rice was obtained with 7 cm irrigation given at 7 days after disappearance of ponded water. Grain and straw yield with irrigations given at 1 and 3 DADPW was also higher than 7 DADPW due to greater dry matter accumulation associated with larger number of tillers/m^2 and taller and healthy shoots. The advantage in grain and straw yield due to relatively wet moisture regimes under frequent irrigation is likely due to higher net photosynthetic rate and dry matter accumulation in stem, leaves and grains. Similar results are in close conformity with the findings of (Pandey *et al.*, 2010 and Shekara *et al.*, 2010) [6, 8]. Highest harvest index (46.27%) of hybrid rice was recorded with 7cm irrigation given at 1 days after disappearance of ponded water followed by 7 cm

irrigation given at 4 day after disappearance of ponded water (46.17%), conventional irrigation (45.69%) and 7 cm irrigation given at 7 day after disappearance of ponded water (45.22%). The increase in harvest index of hybrid rice with increase in irrigation might be due to increase in grain and straw yield. Similar results have also been reported by Kumar *et al.* (2000) [2] and Shekara *et al.* (2010) [8].

Significantly higher grain (73.25 q ha^{-1}) and straw (83.99 q ha^{-1}) yield of hybrid rice was obtained with the application of 75% NPK + 25% N through biocompost as compared to rest of the treatments (Table 2). This might be due to increase in yield attributes *viz*. number of effective shoots per running meter, length of panicle, number of grains $panicle^{-1}$, weight of grains $panicle^{-1}$. The better vegetative growth coupled with higher yield attributes resulted in higher grain and straw yield of rice. Higher value of grain and straw yield of rice at higher fertility level may be owing to greater availability of nutrient in soil, improvement of soil environment resulting in higher root proliferation leading to better absorption of moisture and nutrient ultimately resulting in higher grain and straw yield (Kumar *et al.*, 2013 and Singh *et al.*, 2015) [3, 12]. Significant enhancement in grain yield of rice over absolute control owing to the application of different organic sources of nutrients with significant increase in uptake of nutrients in the grains was observed by Singh *et al.* (2011) [11]. Highest harvest index (46.14%) of hybrid rice was obtained with the application of 50% NPK + 25% N through biocompost followed by 50% NPK + 50% N through FYM (46.04%), 100% RDF of NPK through inorganic fertilizer (45.89 %), 75% NPK + 25% N through FYM (45.89%) and 50% NPK + 50% N through biocompost (45.84%). It might be due to proportionately increased grains over straw by and large these poor harvest index is indicated of the fact that most of the energy of the plant is retained in vegetative parts and less translocated to fruiting organs. The significant enhancement in harvest index of rice with the application of organic and inorganic sources of plant nutrients was earlier observed by Singh *et al.*, (2011) [11]; Manjunath *et al.*, 2016 [4] and Naorem *et al.*, 2018) [5].

Table 2: Grain and straw yield and harvest index of hybrid rice as affected by different moisture regime and integrated nutrients manegement (pooled of 2 years)

Treatments	Grain yield(qha^{-1})	Straw yield(qha^{-1})	Harvest index (%)
Moisture regime			
7cm irrigation given at 1 DADPW	73.05	84.90	46.27
7cm irrigation given at 4 DADPW	69.12	80.58	46.17
7cm irrigation given at 7 DADPW	60.76	73.62	45.22
Conventional irrigation	65.78	78.20	45.69
SEm±	1.30	1.56	-
CD at 5%	3.19	4.18	-
Integrated Nutrients management			
100% RDF of NPK(150:75:60 Kg/ ha) through inorganic fertilizers	67.80	77.92	46.53
75% NPK + 25% N through Biocompost	73.25	83.99	46.59
50% NPK + 50% N through Biocompost	64.38	76.21	45.79
75% NPK + 25% N through FYM	69.02	79.22	46.56
50% NPK + 50% N through FYM	63.06	75.06	45.66
SEm±	1.40	1.63	-
CD at 5%	4.02	4.72	-

Economics

Highest gross (Rs 143803.95 ha^{-1}) was fetched with 7cm Irrigation given at 1 day after disappearance of ponded water with 75% NPK + 25% N through biocompost (I_1N_2) followed by (Rs 135801.0 ha^{-1}) 7 cm Irrigation given at 1 day after disappearance of ponded water and 75% NPK + 25% N through FYM (I_1N_4). Highest net return (Rs 99380.01 ha^{-1}) and benefit: cost ratio (2.24) was fetched with 7cm Irrigation given at 1 day after disappearance of ponded water with 75% NPK + 25% N through biocompost (I_1N_2) followed by (Rs 90651.42 ha^{-1}) 7 cm Irrigation given at 4 day after disappearance of ponded water and 75% NPK + 25% N through biocompost (I_1N_2). Minimum net return (Rs 64104.26 ha^{-1}) and benefit: cost ratio (1.30) of hybrid rice was obtained with conventional irrigation and 50% NPK + 50% N through FYM (I_4N_5) (Table 3).Similar findings have also been obtained by Yadav and Meena, (2014) [14] Singh *et al.*, (2018) and Ram bharose *et al.*, (2018) [7].

Table 3: Economics of various treatment combinations of hybrid rice as influenced by various combination of moisture regime and integrated nutrients management (pooled of 2 years)

Treatment combinations	Gross return (Rs.ha^{-1})	Net return (Rs.ha^{-1})	Benefit: cost ratio (Rs. Re^{-1} invested)
I_1N_1	132479.00	89667.18	2.10
I_1N_2	143803.95	99380.01	2.24
I_1N_3	127747.90	81711.76	1.78
I_1N_4	135801.00	90582.07	2.00
I_1N_5	125153.90	77527.78	1.63
I_2N_1	124281.55	84899.73	2.16
I_2N_2	131645.35	90651.42	2.21
I_2N_3	121549.05	78942.93	1.85
I_2N_4	129213.70	87424.77	2.09
I_2N_5	119088.30	74892.16	1.70
I_3N_1	116425.25	77900.93	2.02
I_3N_2	122276.15	82139.70	2.05
I_3N_3	112259.70	70511.06	1.69

I_3N_4	119341.15	78409.72	1.92
I_3N_5	109979.60	66640.96	1.54
I_4N_1	120091.40	75564.58	1.70
I_4N_2	127961.75	81822.80	1.78
I_4N_3	115798.40	68047.28	1.42
I_4N_4	123096.90	76162.97	1.62
I_4N_5	113445.40	64104.26	1.30

References

1. Harbir Singh, Ingram KT. Sensitivity of rice (*Oryza sativa* L.) to water deficit at three growth stage. Crop Research Hissar 2000;20(3):355-359.
2. Kumar R, Singh G, Walia SS. Long term effect of manures and fertilizers on rice yield and soil fertility status in rice-wheat system. Environment and Eco 2000;18(3):546-549.
3. Kumari Niru, Singh CS, Prashad J, Singh MK, Kumar R. Influence of organic nutrient sources on productivity of rice (*Oryza sativa*) based cropping system in Jharkhand. Indian Journal of Agronomy 2013;58(3):277-281.
4. Manjunath BL, Mahajan Gopal R, Ramesh R, Singh NP. Effect of improved nutrient management on grain yield of rice (*Oryza sativa*) and soil health under organic management. Indian Journal of Agronomy 2016;61(1):25-32.
5. Naorem LC. Effect of Organic Manures and Chemical Fertilizers on the Yield of Rice Seed Lalat Int J Curr. Microbiol. App. Science 2018;7(10):2161-2166.
6. Pandey VP, Singh MM, Singh GR. Effect of moisture regime and integrated nutrient supply system performance and water use efficiency of transplanted rice. Abs. National Seminar on Soil security for Sustainable Agriculture 27-28, at college of Agriculture, Nagpur 2010, 23.
7. Ram Bharosae, Kumar S, Kumar M, Kumar R, Sarita, Kumar D. Effect of organic and inorganic sources of nutrient on productivity, nutrient uptake and economics of rice (*Oryza sativa* L.) Annals of Plant and Soil Research 2018;20(1):69-72.
8. Shekara BG, Sharnappa KN. Effect of irrigation schedule on growth and yield of aerobic rice (*Oryza Sativa*) to soil moisture regime and weed control. Indian Journal of Agronomy 2010;43(1):82-86.
9. Singh H, Singh AK, Alam S, Singh T, Singh VP, Parihar AKS *et al*. Effect of Various Integrated Nutrient Management Models on Growth and Yield of Wheat in Partially Reclaimed Sodic Soil. International Journal of Current Microbiology and Applied Sciences 2017;6(3):803-808.
10. Singh C, Zaidi SFA, Kumar M, Singh R, Singh V, Singh MK. Effect of INM Modules and Different Cultural Practices on Properties of Silty Clay Loam Soil. International Journal of Current Microbiology and Applied Science 2018;7(1):653-658.
11. Singh CS, Singh AK. Growth and yield response of rice to varying levels of fertility, sulphur and Zinc under transplanted condition. Environment and Ecology 2011;29(3):978-984.
12. Singh SK, Thakur R, Singh MK, Singh CS, Pal SK. Effect of fertilizer level and seaweed sap on productivity and profitability of rice (*Oryza sativa*). Indian Journal of Agronomy 2015;60(3):420-425.
13. Singh H, Ingram KT. Sensitivity of rice to water deficit at different growth stages. Philippine J of Crop Science 1995;16(1):511.
14. Yadav L, Meena RN. Performance of aromatic rice (*Oryza sativa*) genotypes as influenced by integrated nitrogen management. Indian Journal of Agronomy 2014;59(2):251-255.