Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2676

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (2):** 854-857 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Economic Feasibility of Growing Aerobic Rice under Drip Fertigation

Gururaj Kombali[1*], Nagaraju[1], T. Sheshadri[1], M. N. Thimmegowda[1] and G. B. Mallikarjuna[2]

[1]Dept. of Agronomy, College of Agriculture, UAS, GKVK, Bengaluru – 560065 India

[2]Dept. of Agricultural Statistics, College of Agriculture, UAS, GKVK, Bengaluru – 560065 India

*Corresponding Author E-mail: rajck.kakol@gmail.com

Received: 13.03.2017 | Revised: 24.03.2017 | Accepted: 25.03.2017

ABSTRACT

A field experiment was conducted during Kharif 2012 at Zonal Agricultural Research Station, Bengaluru in red sandy loam soil (pH-6.9; OC-0.6 %) with medium available nitrogen (348 kg ha^{-1}), phosphorous (36.13 kg ha^{-1}) and potassium (244 kg ha^{-1}) to know the crop performance and economic feasibility of aerobic rice under drip fertigation. The experiment was laid out in Randomized Complete Block Design (RCBD) with 15 treatments. The variety used was MAS 946-1.. The results revealed that drip fertigation at 1.5 PE up to maturity with 100 % RDF through water soluble fertilizers (WSF) registered significantly higher dry matter production (118.40 g $hill^{-1}$), grain (6598 kg ha^{-1}) and straw yield (11084 kg ha^{-1}) over surface irrigation with soil application of fertilizers (81.30 g $hill^{-1}$, 3467 and 5995 kg ha^{-1}, respectively). Whereas, drip fertigation at 1.5 PE up to maturity with 100 % RDF through normal fertilizers (NF) recorded higher net returns and B:C ratio (Rs. 72621 ha^{-1} and 2.88, respectively) and hence found to be economic in rice production under aerobic condition.

Keywords: *Aerobic rice, drip fertigation, grain yield, economics*

INTRODUCTION

Rice (*Oryza sativa L.*) is the most important staple food crop in Asia and it occupies the enviable prime place among the food crops after wheat. Human consumption accounts 85 per cent of total production for rice and it deserves a special status among cereals as world's most important wetland crop. This global grain provides 20 per cent of world's dietary energy supply, while wheat and maize supplies 19 and 5 per cent, respectively[3].

The future of rice production which consumes a lion's share of water (85 %) used in irrigated agriculture[4] will therefore depend heavily on developing and adopting technologies and practices which will use less water with highest use efficiency. Any agricultural or water management technology that can achieve this objective must be viewed as an important contribution to sustainable development. Main cause for high water requirement under traditional flooding method of irrigation is greater loss through seepage and percolation due to the high hydrostatic pressure of ponded water.

Cite this article: Kombali, G., Nagaraju, Sheshadri, T., Thimmegowda, M.N. and Mallikarjuna, G.B., Economic Feasibility of Growing Aerobic Rice under Drip Fertigation, *Int. J. Pure App. Biosci.* **5(2):** 854-857 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2676

Fertilizer application in wetland rice farming is currently done manually through the soil application in split doses. The technique employed is imprecise and causes problems such as fluctuating nutrient supply and uneven fertilizer spread. It is labour intensive and makes use of expensive fertilizers. This leads to various losses of nutrients under submerged cultivation. Besides loss of water and fertilizers through seepage and percolation, impounding water in paddy fields has an important environmental impact by contributing to global warming through considerable emission of methane.

With this background, an investigation was carried out to know the effect of drip fertigation on growth and yield of aerobic rice with different levels of water and nutrients.

MATERIAL AND METHODS

The field experiment was conducted at the Zonal Agricultural Research Station, University of Agricultural Sciences, GKVK, Bengaluru and Karnataka during *Kharif* 2012. The soil was red sandy clay loam in nature and near neutral in reaction (pH: 6.9) and organic carbon (OC) content was high (0.60 %). The soil test results of the experimental site reveal that soil is medium in nitrogen, phosphorus and potassium, respectively. The average annual rainfall of site is around 926 mm. The field experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Treatment details are as follows; T_1: Surface irrigation with soil application of RDF*, T_2:Drip irrigation (1.5 PE**) with soil application of 100 % RDF, T_3 :Drip irrigation (1.0+1.5 PE) with soil application of 100 % RDF, T_4 : Drip fertigation (1.5 PE) with 100 % RDF through NF#, T_5 :Drip fertigation (1.5 PE) with 75 % RDF through NF, T_6 :Drip fertigation (1.5 PE) with 50 % RDF through NF, T_7 : Drip fertigation (1.0+1.5 PE) with 100 % RDF through NF, T_8 :Drip fertigation (1.0+1.5 PE) with 75 % RDF through NF, T_9 :Drip fertigation (1.0+1.5 PE) with 50 % RDF through NF, T_{10}: Drip fertigation(1.5) with 100 % RDF through WSF##, T_{11}: Drip fertigation (1.5) with 75 % RDF through WSF, T_{12}: Drip fertigation (1.5) with 50 % RDF through WSF, T_{13}: Drip fertigation (1.0+1.5 PE) with 100 % RDF through WSF, T_{14}: Drip fertigation (1.0+1.5 PE) with 75 % RDF through WSF, T_{15}: Drip fertigation (1.0+1.5 PE) with 50 % RDF through WSF.

(Note- RDF*: Recommended dose of fertilizers PE**: Pan Evaporation NF#: Normal fertlizers
WSF##: Water soluble fertilizers 1.5 PE: 1.5 PE up to maturity 1.0+1.5 PE: 1.0 PE up to tillering and 1.5 PE tillering to maturity)

Irrigation and fertilizer application

The irrigation was given through PVC pipe after filtering through the screen filter by 7.5 HP motor from the bore well. The pressure maintained in the system was 1.2 kg cm^{-2}. From the sub main, in-line laterals of 16 mm were laid at a spacing of 0.5m with 4 lph discharge rate emitters positioned at a distance of 40 cm. Drip irrigation was scheduled based on the open pan evaporation as per the treatment requirement after subtracting effective rainfall for that period. However, surface irrigation was scheduled based on recommended package of practices.

At the time of sowing, FYM was applied to all the treatments at the rate of 10 t ha^{-1}. Fertilizers were applied as per the treatment details. The soil application was done as per the recommendation. Out of total nutrients, 50 % N and the entire dose of P_2O_5 and K_2O were applied as basal and remaining 50 % N in two equal splits at 30 and 60 days after sowing (DAS), respectively. However, drip fertigation was given in eight equal splits at eight days interval as per treatment requirement. The fertilizers used for fertigation are Urea, DAP and MOP .The fertilizer recommendation for the crop is 100:50:50 kg NPK ha^{-1}

The direct sowing was done at 5 cm depth with 25x25 cm spacing. The experiment was maintained as per the standard package of practice of aerobic rice cultivation (Anon, 2007). The data obtained were subjected to statistical analysis given by Gomez and Gomez[6]. Least significant difference (LSD) values at p=0.05 were used to interpret the treatment differences.

RESULTS AND DISCUSSION

Grain yield and dry matter production

The results from the study (Table 1) reveal that the significantly higher dry matter (118. 40 g hill^{-1}) was produced under drip fertigation at 1.5 PE up to maturity with 100 % RDF through WSF which resulted in higher grain and straw yield (6598 and 11084 kg ha^{-1}, respectively) which was 90.3 per cent higher than surface irrigation with soil application of 100 % RDF (3467 kg ha^{-1}) which was significantly lower and recorded 45.83 and 41.85 per cent lower grain yield as compared to drip fertigation at 1.5 PE up to maturity with 50 per cent RDF through WSF (4917 kg ha^{-1}) or NF (4800 kg ha^{-1}). The increase in the yield is related to higher leaf area index and crop growth rate which are contributed for assimilation of more photosynthates and resulted in superior yield attributes and yield. This is mainly because of WSF through fertigation resulted in continuous supply of nutrients besides maintaining optimum water availability which leads to higher uptake of nutrients which in turn recorded higher growth attributes. This finding is in agreement with the findings of Bharambe *et al.*[5] in cotton and Govindan and Grace[7] in rice.

Economics

Gross return was higher in drip fertigation at 1.5 PE up to maturity with 100 % RDF through WSF (Rs. 135390 ha-1), whereas highest net returns (Rs. 72621 ha-1) and B:C ratio (2.88) were obtained with drip fertigation at 1.5 PE up to maturity with 100 % RDF through NF. Among different nutrient sources, fertigation through WSF recorded higher cost of cultivation than NF. Such findings are in consonance with the findings of Muralidhar9 and Latif8 in maize; Ali et al.1 in rice.

Table 1: Grain yield and economics of aerobic rice as influenced by drip fertigation

Treatments	Total dry matter production g hill^{-1}	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Gross returns (Rs. ha^{-1})	Cost of cultivation (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	B:C
1	81.30	3467	5995	71392	32860	38532	2.17
2	88.10	4567	7632	93648	37943	55705	2.47
3	84.54	4319	6640	87696	37943	49753	2.31
4	114.15	5451	8704	111168	38547	72621	2.88
5	108.45	5141	8549	105368	37540	67828	2.81
6	104.15	4800	7899	98248	36534	61714	2.69
7	106.45	4831	8166	99212	38547	60665	2.57
8	101.55	4731	7910	97016	37540	59476	2.58
9	95.80	4603	6789	93032	36534	56498	2.55
10	118.40	6598	11084	135390	68558	66832	1.97
11	114.90	5470	9680	112980	60048	52932	1.88
12	111.60	4917	8885	101840	51539	50301	1.98
13	113.48	5365	9168	110328	68558	41770	1.61
14	111.38	5131	8741	105464	60048	45416	1.76
15	109.80	4731	8235	97504	51539	45965	1.89
S.Em±	1.47	389	753	NA	NA	NA	NA
CD @ 5%	4.25	1129	2182	NA	NA	NA	NA

CONCLUSION

Results indicated that there could be a possibility of saving 50 per cent fertilizer through drip fertigation by achieving comparable net returns and B:C ratio as that of 100 % RDF. Further which is significantly higher as compared to surface irrigation with 100 % RDF through soil application.

REFERENCES

1. Ali, A., Zia, M. S., Hussain, F. and Salim, M., Efficacy of different methods of potassium fertilizer application on paddy yield, K uptake and agronomic efficiency, *Pak. J. Agric. Sci*., **42(1-2):** 27-32 (2005).
2. Anonymous, A new aerobic variety. University of Agricultural Sciences, GKVK, Bangalore, India, 13-16 (2007).
3. Anonymous, Rice is life, Food and agricultural organization of United Nations. p: 1123 (2010).
4. Barker, R., D. Dawe, T. P. Tuong, S. I. Bhuiyan and Guerra, L. C., The outlook for water resources in the year. Challenges for research on water management in rice production. In: *Assessment and orientation towards the 21st centuary. Procedings of 19th session of the International Rice Commission*. Cairo. Egypt. 7-9. Rome: FAO pp. 96-109 (1998).
5. Bharambe, P. R., Narwade, S. K., Oza, S. R., Vaishnava, V. G. and Jadhav, G. S., Nitrogen management in cotton through drip irrigation. *J. Indian Soc. Soil Sci.,* **43(4):** 705-709 (1997).
6. Gomez, K. A. and Gomez, A. A., 1984. Statistical procedures for agricultural research. Second Edition. John Wiley & Sons, New York, USA.
7. Govindan, R. and Grace, T. M., Influence of drip fertigation on growth and yield of rice varieties (*Oryza sativa* L.). *Madras Agric. J*., **99(4-6):** 244-247 (2012).
8. Latif, A., Effect of fertigation applied nitrogen and phosphorus on yield and composition of maize. *Pak. J. Soil Sci*., **19 (1-2):** 23-26 (2001).
9. Muralidhar, A. P., 1998, Effect of fertigation with normal and water soluble fertilizer compared to drip and furrow systems in capsicum-maize-sunflower cropping sequence. *Ph.D. Thesis*, University of Agricultural Sciences, Bangalore.