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Growth and yield of rice as influenced by age of seedlings and integrated N management for late planted situation

A. UPENDRA RAO*, K.M. DAKSHINA MURTHY AND T.V. SRIDHAR[1]
Andhra Pradesh Rice Research Institute, Maruteru, WEST GODAVARI (A.P.) INDIA

ABSTRACT

A two-year field investigation conducted on a sandy clay loam showed that the crop transplanted with 45-day-old seedlings in rice resulted in significantly higher dry matter production at harvest, filled spikelets, and grain yield as compared to that of 30 and 60 day old seedlings. The increase was 5.9 and 13.0 per cent during I st year, 3.6 and 13.4 per cent during II nd year compared to the crop planted with 30 and 60 day old seedlings, respectively. Application of 75% RDFN+ 25 kg GM-N+ 25 kg PM-N resulted in significantly higher number of tillers, panicles /m^2, filled spikelets / panicle and grain yield over that of application of 75% RDFN+25 kg GM-N/FYM/VC and 100%RDFN during both the years and was at par to all 125% RDN treatments. During both the years no significant differences were observed among different sources of nitrogen application either in excess or in recommended dose in growth, yield attributes and grain yields. This indicates there was possibility of substitution of 50 kg of 125% RDN and 25kg of 100% RDN through different organic sources.Application of 75% RDFN+25 kg PM-N (100% RDN) resulted in comparable grain yield to that of 125% RDN supplied through different sources indicating the saving of 25 kg N/ha.

Key words : Rice, INM, Age of seedlings,Growth, Yield

INTRODUCTION

In many parts of the country especially tail end areas under canal system and also under irrigation tanks, whose re-charging depends on the receipt of rainfall, often the farmers to transplant rice late beyond august using over aged seedlings. Under late planted conditions nitrogen management practices as well as proper utilization of seedlings is important to get better crop yields (Raju and Rao, 1984). Application of indiscriminate nitrogen fertliser to the aged seedlings to coupe up the crop results in environmental pollution. Usefulness of integrated nitrogen management under normal planting is fairly well established fact, but limited information is available on the effect of integrated nutrient management in late planted rice with different seedling ages. Hence, the present experiment was conducted to find out the optimum age of seedlings and integrated N management practices for late-planted rice.

MATERIALS AND METHODS

A field experiment was conducted during two consecutive years of 2003 and 2004 on a sandy clay loam having pH of 7.9, 230 kg/ha of available N, 23 kg/ha of available P_2O_5 and 232 kg/ha of available K_2O to assess the effects of age of seedlings, organic and inorganic sources of nitrogen on rice. The experiment was laid out in split-plot design, replicated thrice with three age of seedlings (30, 45 and 60 day old) planted on single date in main plots and nine nitrogen management practices (75% RDFN + 25 kg GM-N, 75% RDFN + 25 kg FYM-N, 75% RDFN + 25 kg VC-N, 75% RDFN + 25 kg PM-N, 75% RDFN + 25 kg GM-N + 25 kg FYM-N, 75% RDFN + 25 kg GM-N + 25 kg VC-N, 75% RDFN + 25 kg GM-N + 25 kg PM-N, 100% RDFN and 125% RDFN) in subplots. Nutrient content in different organic sources was taken into consideration to supply 25% and 50% recommended N on equal nutrient basis. Rice variety samba mashuri (BPT 5204) of 145 days duration was planted at a spacing of 15x10 cm using two seedlings per hill.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Age of seedlings:

During both the years, transplanting of 30 day old seedlings produced significantly higher number of tillers / m^2 and LAI than that of 60 day old seedlings. There was no significant difference in number of tillers /m^2 and LAI between planting of 30 and 45 day old seedlings. Days to 50% flowering (planting onwards) decreased significantly with increase in the age of seedlings from 30 to 45 and 60 days (Table 1) Results are in agreement with the earlier observations of Mandal *et al.* (1984). Data on yield attributes reveal (Table 2) that during both the years, crop transplanted with 30-day-old seedlings produced

*** Author for correspondence.**
[1]Department of Soil Science, Andhra Pradesh Rice Research Institute, Maruteru, WEST GODAVARI (A.P.) INDIA

significantly higher number of panicles than that of both 45 and 60- day- old seedlings. The number of filled spikelets in the crop transplanted with 45-day-old seedlings was comparable with that of 60-day-old seedlings and significantly superior over that of 30-day-old seedlings. With respect to age of seedlings, the 1000-grain weight was unaffected. The observations of Murthy *et al.* (1983) have been in conformity with the present study. Transplanting 30-day-old seedlings resulted higher spikelet sterility and was lower in the crop transplanted with 45-day-old seedlings.

The crop transplanted with 45-day-old seedlings resulted significantly higher grain yield over that of 30 and 60 day old seedlings. The increase was 5.9 and 13.0 per cent during Ist year, 3.6 and 13.4 per cent during IInd year compared to the crop planted with 30 and 60 day old seedlings, respectively. The higher grain yield in former treatment was due to higher dry matter production at harvest and more number of filled grains per panicle. There was a strong positive correlation between grain yield and dry matter production at harvest as well as filled grains per panicle indicating that increase in these parameters improved the grain yield in the crop transplanted with 45-day-old seedlings. Pattar *et al.* (2001) also reported similar result of better performance of 45 day old seedlings under later planted conditions. On the other hand lower grain yields with 30 day old seedlings compared to that of 45 day old seedlings in spite of better growth till flowering and more panicles per square meter was due to lesser number of filled spikelets per panicle as a result of higher spikelet sterility (29.5 and 26% during Ist and IInd years, respectively). The minimum temperature prevailed during flowering to grain filling of crop transplanted with 30-day-old seedlings for a period of 30 days was 13.9^{0}C during 1st year and 14.6^{0}C during 2nd year, 45-day-old seedlings for a period of 26 days was 15.0^{0}C during 1st

Table 1 : Influence of age of seedlings and N management practices on growth and yield of rice

Treatments	Tillers/m^2		LAI		Days to 50% Fl		DMPH (kg/ha)		Grain yield (kg/ha)	
	Ist year	IInd year	Ist year	IInd year	Ist year	IInd year	Ist year	IInd year	Ist year	IInd year
Age of seedlings (days)										
A_1	583	562	4.05	4.20	111	111	8857	8951	3144	3333
A_2	547	532	3.93	4.19	121	121	9380	9230	3341	3459
A_3	518	518	3.81	3.93	133	134	8671	8772	2908	2995
S.E. ±	14	15	0.04	0.04	1.5	1.2	96	77	48	38
C.D. (P=0.05)	38	41	0.12	0.12	4.0	3.2	268	215	134	105
N management practices										
N_1	524	532	3.82	3.85	122	122	8573	8465	2959	3108
N_2	498	518	3.75	3.83	122	122	8527	8413	2918	3088
N_3	521	520	3.84	3.86	122	122	8731	8565	3002	3131
N_4	537	537	3.90	3.97	122	122	8827	8795	3058	3170
N_5	575	550	4.03	4.37	122	122	9292	9397	3283	3388
N_6	578	544	4.08	4.42	122	122	9423	9501	3320	3446
N_7	585	559	4.14	4.47	121	122	9496	9687	3353	3478
N_8	505	521	3.84	3.83	122	122	8545	8519	2968	3122
N_9	560	542	3.96	4.35	121	122	9308	9517	3320	3426
S.E. ±	17	12	0.05	0.05	1.4	1.3	251	164	165	169
C.D (P=0.05)	31	23	0.10	0.09	NS	NS	492	329	323	330
AxN										
S.E. ±	106	31	0.06	0.13	1	0.5	308	238	201	207
C.D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

N management
N_1= 75% RDFN+25 Kg N ha^{-1} Green manure
N_2= 75% RDFN+25 Kg N ha^{-1} FYM
N_3= 75% RDFN+25 Kg N ha^{-1} Vermicompost
N_4= 75% RDFN+25 Kg N ha^{-1} Poultry manure
N_5= 75% RDFN+25 Kg N ha^{-1} Green manure + 25 Kg N ha^{-1} FYM
N_6= 75% RDFN+25 Kg N ha^{-1} Green manure + 25 Kg N ha^{-1} Vermicompost
N_7= 75% RDFN+25 Kg N ha^{-1} Green manure + 25 Kg N ha^{-1} Poultry manure
N_8=100% RDFN
N_9=125 % RDFN

NS – Non significant

Age of seedlings (days)
A_1 = 30
A_2 = 45
A_3 = 60

year and 15.7^{0}C during 2nd year and 60-day-old seedlings for a period of 22 days 17.4^{0}C during 1st year and 16.8^{0}C during 2nd year. The minimum temperature around 14^{0}C at the meiotic stage of pollen mother cells causes very high sterility in rice (Venkataraman, 1986). Lon duration varieties transplanted late suffers due to low temperatures less than 15^{0}C at flowering resulting in poor panicle exertion and high sterility as well as low yields (Yoshida, 1988). There was strong negative correlation between spikelet sterility and grain yield. The crop transplanted with 30-day-old seedlings resulted in significantly higher grain yield over that of 60-day-old seedlings. The higher grain yield in the former treatment was due to more number of panicles m^{-2} (14%) over that of latter treatment. The lower grain yield in the crop transplanted with 60-day- old seedlings over that of 45 and 30- day- old seedlings was due to reduction in panicle number by 6 and 14%, respectively.

N management:

Application of 75% RDFN+25 kg GM-N+ 25 kg PM-N resulted in significantly higher grain yield over that of application of 75% RDFN+25 kg N /ha through GM / FYM/VC and 100%RDFN due to higher number of tillers, leaf area, dry matter production, panicles /square meter, filled spikelets/ panicle and was at par to application of 125% RDN through different sources during both the years. Rice crop supplied with adequate N produce more number of tillers, leaf area, dry matter, yield attributes and there by higher yields (Blaise and Prasad, 1996). During both the years, application of 125 and 100% RDN through different sources resulted in comparable grain

Table 2 : Influence of age of seedlings and N management practices on yield attributes and spikelet sterility in rice

Treatments	Panicle m^{-2}		Total spike lets panicle^{-1}		Filled spikelets panicle^{-1}		1000 grain weight (g)		Spikelet sterility (%)	
	Ist year	IInd year	Ist year	IInd year	Ist year	IInd year	Ist year	IInd year	Ist year	IInd year
Age of seedlings (days)										
A_1	440	469	101.0	106.2	71.3	78.8	13.2	13.6	29.5	25.8
A_2	407	426	102.0	103.1	84.2	82.8	14.0	13.2	17.5	20.3
A_3	381	403	100.5	102.4	82.8	81.4	13.5	13.1	17.6	20.5
S.E. ±	10	7	1.3	1.8	1.4	1.1	0.3	0.4	-	-
C.D. (P=0.05)	28	20	NS	NS	3.9	2.9	NS	NS	-	-
N Management practices										
N_1	376	419	99.6	102.1	77.6	80.0	13.2	13.1	22.0	21.6
N_2	366	411	99.6	101.2	77.0	79.6	13.2	13.0	22.6	21.1
N_3	389	420	100.4	102.7	78.2	80.6	13.3	13.1	22.1	21.5
N_4	397	426	101.3	103.8	79.1	81.1	13.5	13.2	21.9	21.8
N_5	433	447	102.8	106.2	81.0	82.1	13.7	13.4	21.2	22.6
N_6	436	451	103.1	107.1	82.0	82.3	13.9	13.4	20.4	23.1
N_7	448	457	103.8	107.2	82.4	82.9	14.0	13.5	20.6	22.6
N_8	400	418	98.7	101.0	77.1	79.6	13.3	13.1	21.8	19.8
N_9	436	444	101.7	106.1	80.4	81.0	13.7	13.4	20.9	23.6
S.E. ±	5.0	7	2.2	2.5	1.5	1.6	0.3	0.1	-	-
C.D. (P=0.05)	10.0	13	4.3	5.0	4.2	3.2	0.5	0.2	-	-
AxN										
S.E. ±	38	26	1.4	4.1	4.0	3.2	0.8	0.5	-	-
C.D (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	-	-

N management
N_1= 75% RDFN+25 Kg N ha^{-1} Green manure
N_2= 75% RDFN+25 Kg N ha^{-1} FYM
N_3= 75% RDFN+25 Kg N ha^{-1} Vermicompost
N_4= 75% RDFN+25 Kg N ha^{-1} Poultry manure
N_5= 75% RDFN+25 Kg N ha^{-1} Green manure + 25 Kg N ha^{-1} FYM
N_6= 75% RDFN+25 Kg N ha^{-1} Green manure + 25 Kg N ha^{-1} Vermicompost
N_7= 75% RDFN+25 Kg N ha^{-1} Green manure + 25 Kg N ha^{-1} Poultry manure
N_8=100% RDFN
N_9=125 % RDFN

Age of seedlings (days)
A_1 = 30
A_2 = 45
A_3 = 60

NS – Non significant

yield within the applied nutrient level.

During both the years no significant differences were observed in growth, yield attributes and grain yields with application of nitrogen through different sources either in excess or in recommended dose. This indicates there was possibility of substitution of 50 kg of 125% RDN and 25kg of 100% RDN through different organic sources. These results showed the importance of realizing higher yields by supplying a part of N requirement with available organic sources

Application of 75% RDFN+25 kg PM-N resulted in comparable grain yield to that of 125% RDN supplied through different sources indicating the saving of 25 kg N/ha. The superiority of poultry manure over other organic sources due to faster mineralization of N from poultry manure as compared to other organic sources because of its narrow C:N ratio. Further substitution of 25 kg N / ha through poultry manure registered improved yields over FYM and green manuring in terms of growth, yield attributes and yield but was at par to vermicompost. The present findings are in conformity with earlier observations of Vanaja and Raju (2002).

Among different N management practices application of 25 % RDFN+25 kg FYM-N recorded the lower growth, yield attributes and grain yield. This may be due to slower decomposition of FYM than that of green manure, vermicompost, poultry manure owing to its wide C:N ration (Singh, 1984).

During both the years interaction effect between age of seedlings and N management practices on different growth, yield parameters and grain yield was not significant as the crop response was more or less similar to different source of N regard-less of age of seedlings.

REFERENCES

Blaise, D. and Prasad, R. (1996). Relative efficiency of modified urea fertilizers wetland rice (*Oryza sativa*). *Indian J. Agron*., **41**:373-378

Mandal, B. K., Sainik, T. R. and Ray, P. K. (1984). Effect of age of seedling and level of nitrogen on productivity of rice. *Oryza,* **21**: 225-232.

Murthy, K. K., Pillai, K. G., Srinivasan, T. E. and Ramaprasad, A. S. (1983). Rice varieties and technological improvements for later planting during the main *Kharif* season. *Seeds & Farms*, **9**: 9-13.

Pattar, P.S., Reddy, B.G.M. and Kuchanur, P. H. (2001). Yield and yield parameters of rice (*Oryza sativa*) as influenced by date of planting and age of seedlings. *Indian J. agric. Sci*., **71**(8): 521-522.

Raju, M. S. and Rao, C. P. (1984). Effect of nitrogen, spacing and age of seedlings on rice yield. *Andhra agric. J.,* **31**: 349-350

Singh, N. T.(1984). Green manures as source of nutrients in rice production. In : *Organic matter and rice*. IRRN, Losbenos, Philippines., pp. 217-218.

Vanaja, M. and Raju, A.S. (2002). Integrated nutrient management performance in rice crop. *Ann. agric. Res. New Series,* **23**:51-56.

Venkataraman, S. (1986). Agrometeorological aspects of growth yield and water relations with special reference to rice weather and rice. IRRI, Los Banos, Philippines: pp 47-54

Yoshida, S. (1988). Climatic environment and its influence. In : *Fundamentals of rice crop science*. IRRI, Los Banos, Philippines: pp 65-110.

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