evolution and dynamics of microbial load were found to to be more in treatments inoculated with combined inocula besides mixed with AS (Table 3). However CO_2 evolution was found to be higher in treatments having more properties of ETP sludge, during the initial stages because of high cellulosic materials and NPK per cent in ETPS and thus respond to cellulolytic fungi for accelerating the composting process.

The result suggested that the bagasse pith could be converted as biomanure which is suitbale for land application by mixing it with BP with AS and ETPS Sludge at 2:1:1 ratio. Bagasse pith compost is valued as a better product when compared to Farm Yard Manure in terms of nutrient status and C/N ratio Evaluation of bagasse pith biomanure to different crops is in progress.

REFERENCES

BELLAMY, K.L. CHONG, C. and CLINE, R.A. (1995 Paper Sludge Utilizaiton in Agriculture and Cutiane Nursery Culture. J. Environ. Qual., 24 : 1074 - 108.

DOLAR, S.G., BOYLE, J.R. and KEENEY, A.D. (1972 Paper Mill Sludge Utilization on Soils. Effect on the yield Mineral Nutrition of Oats (Avena sativa J. Environ. Qual, 1 : 405 - 409.

GAUR, A.C. (1982). Beginning of the organic method. In Manual of rural composting FAO/ONDP Regional Project. RAS / 75 / 004.

PANDEY, G.N. (1997). Environmental Managemen Vikas Publishign House Pvt. Ltd. New Delhi. p. 392

RINTALA, J.A. and PUHAKKA, J.A. (1994). Anaerobi treatment in Pulp and Paper Mill Waste Management A Review. Bioresource Technology, 47 : 1 - 18.

(Received December 1998; Revised: September 199

Madras Agric. J.. 86(4-6): 198 - 201 April - June 1999
https://doi.org/10.29321/MAJ.10.A00580

SOURCES OF BASAL N AND TIMES OF UREA -N SPLITS ON YIELD ATTRIBUTES AND YIELD OF IRRIGATED LOWLAND RICE

G. DHEEBAKARAN[1], and S. RAMASAMY[2],
Agricultural Research Station Ramanathapuram 623 501

ABSTRACT

Field experiments were conducted at TNAU, Coimbatore during Nov.'95 to Sept.'96 to study the effect of two sources (green manure and urea) as basal N in combination with different times of urea splits on yield attributes of rice. The conjunctive use of green manure, on equal N basis as basal, was equally effective but did not have any yield advantage over the urea N. Split application of urea at active tillering was vital, when the basal N was applied as GLM, but not for urea N basal. Nitrogen to a medium duration rice variety may be applied in five splits. First top dressing after the basal (AT stage) is vary if basal N is given through green manure without starter N. But, when fertiliser N is applied as basal, an optimum dose of 20 kg N at active tillering is sufficient to maintain the tiller production. Higher N (40 kg) at AT stage increases the biomass production through unproductive tillers and that ultimately leads to poor HI. On the other hand, low N status critically reduces the tillering too. An additional dose of 20 kg a week after AT was found to be beneficial to improve the panicle efficiency and ultimately the grain yield, irrespective of basal N sources. Split application of N at heading stage seems so delicate. Increasing the rate of N more than 20 kg i.e., 30 or 40 kg N /ha resulted in poor grain yield by increased sterility.

Key words : Green leaf manuring, Nitrogen, Urea N, Heading N, Basal N, equal N basis

Among the nutrients essential for rice growth, N is the only nutrient element giving positive response in all types of soil, climate and management. The concept of integrated nutrient management (INM) seeks to sustain soil fertility through an integration of different available sources of nutrients and their application methods that will produce maximum crop yield per unit input use (De Datta *et al.*, 1990). Though there is sufficient research work on integrated N management on partial substitution of fertiliser N with organic N, the substitution of basal fertiliser N (urea) with green manure on equal N basis is rather limited. Therefore, in order to study the possibilities of substituting basal N requirements through a green leaf manure (GLM) on equal N basis and also to find out optimum times of urea split doses, the present investigation was carried out.

MATERIALS AND METHODS

Field experiments were conducted by using cv. IR72 under irrigated lowland conditions of Wetland, Farm, T.N.A.U., Coimbatore, India, from November 1995 to September, 1996. The soil of experimental field was medium in available N (320 and 336 kg/ha) and P (12.4 and 12.3 kg/ha), high in avilable K (540 and 560 kg/ha), with a pH of 7.7 and 7.6 and the organic carbon content of 0.50 and 0.51 per cent in Expt 1 and Expt 2 respectively. the experiments were laid out in a radomized bolck design with three replications. There were nine treatments including a control (no N application). In the Expt 1. the other eight treatments were two sources of N to supply 40 kg N/ha as basal (urea, and GLM - *Sesbania rostrata*) and in combination with 40-40-0, 0-40-40, 20-40-20 and 40-40-30 kg N/ha applied at active tillering, panicle initation and at heading stages respectively,. Based on the results of 1995, treatments were reconstituted during 1996. Nitrogen at active tillering (AT) was reduced from 40 to 20 kg N/ha. Accordingly, for the two sources of N, 20-40-20, 20-40-30; 20-40-40 and 20-20-40-20 were the combinations. In the last combination during 1996, 20 kg was applied one week after active tillering stage (30 DAT). All the treatments received 60 kg each of P_2O_5 and K_2O per ha. Full P_2O_5 was applied as basal and K_2O was applied in three equal splits as basal, Panicle initiation (PI), and heading stages along with urea. Fifty days old *Sebania rostrata* was applied on equal N basis, two days before transplanting. Irrigation was given by maintaining 5 cm depth of water till panicle initiation (PI), then 5 cm depth only after disappearance of ponded water. Samples were collected from the field with an interval of 10 days and a week for Expt 1 and Expt 2 respectively. Agronomic efficiency (AE) and physiological efficiency (PE) were calculated as suggested by Yoshida (1981). The N content was determined as per Humphries (1956) and statistical analysis was done as per Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Green manuring *Sesbania rostrata* (GLM) on equal N basis to supply 40 kg, applied as basal manuring was comparable with fertilizer N applied provided that was followed by a fertiliser N split at active tillering. Beneficial effects of green manuring to substitute fertiliser N and other essential nutrients were reported by many workers (Descalsota *et al.*, 1986; and Rajput, 1995). The slow growth in the initial periods by GLM basal recorded in these experiments is well known facts, (Panda *et al.*, 1995), but a split application of N at that time inevitable rather than at heading.

Limiting the ATN split from 40 kg to 20 kg did not adversely affect the tiller production. Rather, applying the 20 kg of saved N at the time of heading was found more useful to increase the grain yield, irrespective of basal N. It is evident from these experiments that a controlled initial biomass production is the ultimate need to build positive grain yield, rather a vigorous, robust initial biomass production through heavy N manuring the these actually met with the poor grain yield and HI (Table). It could be confirmed, that the N application at AT may be less than grain yield and HI (Table). It could be confirmed, that the N application at AT may be less than 40 kg i.e., 20 kg. irrespective of the sources of the basal N. Withholding the N split dose at AT had no negative effect on the grain yield when urea N was basal applied at 40 kg/ha. The result is in confirmation with Ramasamy et al., (1996). They reported that split application of N at basal, PI and at first flowering are mean it for tiller number, panicle weight and filled grains, respectively.

An additional split of N employed after AT, exactly a week later, was found improving the N content of shoot, was under the process of dilution due to higher leaf and stem biomass production. a compensatory action as opined by Thiyagarajan *et al.* (1994). This additional split was able to

Table 1. Effect of treatments on yield attributes of rice

Expt 1

Treatment	N (kg/ha)				Productive	Panicle	1000 grain	Harvest	Grain yield
	B	AT	PI	H	tillers No./m²	efficiency (%)	wt. (g)	index HI	(kg/ha)
T1	40	20	40	20	9.3	92.6	21.0	0.54	5412
T2	40	40	40	0	10.1	86.4	18.6	0.53	4266
T3	40	0	40	40	7.2	93.4	20.1	0.54	4708
T4	40	40	40	30	8.6	89.6	19.0	0.51	4611
T5	40*	20	40	20	8.9	91.0	21.0	0.54	5209
T6	40*	40	40	0	9.0	91.6	18.1	0.51	4706
T7	40*	40	40	30	8.4	85.5	20.3	0.52	4358
T8	40*	40	40	30	8.8	89.5	20.6	0.51	4737
T9	0	0	0	0	5.5	84.3	18.3	0.48	3305
SE_d							0.8		172
CD (p=0.05)							1.8		365

Expt 2

Treatment	N (kg/ha)					Productive	Panicle	1000 grain	Harvest	Grain yield
	B	AT	WA	PI	H	tillers No./m²	efficiency (%)	wt. (g)	index HI	(kg/ha)
T1	40	20	0	40	20	10.7	88.6	17.7	0.48	5635
T2	40	20	0	40	30	10.4	88.6	17.9	0.44	5804
T3	40	20	0	40	40	10.8	91.3	18.0	0.44	5940
T4	40	20	20	40	20	10.8	92.4	18.2	0.46	6486
T5	40*	20	0	40	20	10.7	85.2	17.8	0.46	5233
T6	40*	20	0	40	30	10.6	89.4	17.9	0.44	5670
T7	40*	20	0	40	40	9.8	90.4	17.4	0.46	5199
T8	40*	20	20	40	20	10.9	91.8	18.0	0.46	6021
T9	0	0	0	0	0	8.3	85.8	16.1	0.44	3757
SE_d								0.8		204
CD (p=0.05)								1.6		432

* green leaf nitrogen

B - basal ; AT - active tillering ; WA - week after AT ; PI - panicle initiation ; H - heading

produce higher grain yield through increased filled grains per panicle with better panicle efficiency. Avoiding N application at the time of heading had no adverse effect when the basal manuring was done through GLM, whereas, there was reduction in the final grain yield if the basal manuring was applied through urea. This might be due to slower but longer availability of N from green leaf manure which required top dressing at early active tillering stage as a starter dose. On the contrary, when fertiliser N was applied, due to quicker availability of N during early stages, more biomass was produced than GLM basal, but to keep up the biomass already produced, a top dressing during heading became essential.

Nitrogen application at the time of heading was found to influence the grain yield through the mechanism of improved grain filling process, but the response depends on the presence of active green leaf biomass and root N concentration. Nitrogen concentration of the roots is an indicator of healthy root system (Ramasamy *et al.*, 1994), which highlights the consequences of N application at heading. According to them the N applied at the time of heading is found to increase the number of filled grains only under well drained soil, where roots are comparatively active till maturity.

In the present investigation, 20 kg/ha at heading was found optimum. Any increase in the rate of split application was found to affect the grain yield by increased sterility and poor panicle efficiency.

The higher grain yield recorded in these experiments was not necessarily associated with higher biomass, or higher N uptake. But the influence was primarily by green leaf N concentration ($r^2 = 0.87^{**}$) root N concentration ($r^2 = 0.78^{**}$) and root biomass ($r^2 = 0.47^{*}$). The grain yield increase was also attirbuted by improved grain weight ($r^2 = 0.83^{**}$) and productive tillers ($r^2 = 0.68^{**}$).

CONCLUSION

For medium duration rice variety, N may be applied into five split doses. First top dressing after the basal (AT stage) is very vital if basal N is given through green manure without basal fertiliser N. When fertiliser N is basal applied without green manure an optimum dose of 20 kg N at active tillering is sufficient to maintain the tillers production. Forty kg at AT stage increases the biomass production through unproductive tillers and that ultimately leads to poor HI. However low N reduces the tillering too. An additional dose of 20 kg a week after AT was found more beneficial to improve the panicle number and ultimately the grain yield, irrespective of basal N sources. Split appliction of N at heading stage needs further study. Increasing N more than 20 kg had poor grain yield by increased sterility.

REFERENCES

DE DATTA, S.K., BURESH, R.J. AND MAMARIL, C.P. (1990). Increasing nutrient use efficiencty in rice with changing needs. **Fert. Res., 26:** 157-167.

DESCALSOTA, J.P. CALABIO, J.C., EVANGELISTA, R.C., AMARANTE, S.T. AND DE DATTA, S.K.. (1986.) Integration of inorganic and organic nitrogen sources for lowland rice. **Philipp. J. Crop Sci., 11:** 97-106.

GOMEZ, K.A. AND GOMEZ, A.A. (1984). Statistical procedures for agricultural research II. Edn. Johm Wiley and Sons., New York., 68p.

HUMPHRIES, E.C., (1956). Mineral component and ash analysis. *In*: Modern methods of plant analysis, Springer Verlag, Berlin., pp. 468-502.

PANDA, M.M., MOISER, A.R. MOHANTY S.K. AND CHKARAVORTI.S.P. (1995). Nitrogen utilization by lowland rice as affected by fertilization with urea and green manure. **Fert. Res., 40:** 215-223.

RAJPUT, A.L., (1995). Effect of fertilizer and organic manure on rice (*Orsza sativa*) and their residual effect on wheat (*Triticum aestivum*). **Indian. J. Agron., 40(2):** 292-294.

RAMASAMY, S., PURUSOTHAMAN, S AND RAJAGOPAL, A. (1994). The effect of drainage, Plant density and yield of irrigated low land rice. *In*: ten Berge, H.F.M., Wooperies, M.C.S. and Shinm, J.C.. (Eds).. SARP Research proceedings. Nitrogen economy of irrigated rice : field and simulation studies., ISBN 90-733-22-2: 165-184.

RAMASAMY, S., THIYAGARAJAN, T.M., MURUGESA BOOPATHY, P., BALASUBRAMANIAM, N. AND RAJA, D. (1996). Effect of split application of N and green manure on N absorption, demobilization and utilization in IR. 72 under regualted irrigation management. *In*: P.K. Aggarwal, Lansigan, E.P. Thiyagarajan, T.M., and Rubia, E.G. (Eds). SARP Research proceeding: Towards integration of simulation modesl in rice research. ISBN:90-73384-42-7:93-104.

THIYAGARAJAN, T.M., SIVASAMY, R. AND TEN BERGE, H.F.M. (1994). Time courses of leaf nitrogen concentration required to attain target yields in transplanted rice. *In*: SARP Research Proceedings. Rice - Nitrogen 1994. pp 267-282.

(Received : August 1998 Revised : August 1999)