

EFFECT OF BIO FERTILIZER (AZOLLA) AND UREA N ON GROWTH AND YIELD OF LOWLAND RICE (Co. 43)

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Studies were conducted at TNAU, Coimbatore during *kharif* and *rabi* 1984 to study the combined effect of azolla and urea N on growth and yield of lowland rice, Co. 43. USG, PU and azolla alone or in combinations at 100 kg N/ha were compared with a control in a randomized block design replicated four times. USG alone at 100 kg N/ha or in combination with azolla in the ratio of 25:75 enhanced the growth and yield of rice.

The lowland rice recovers only 25 to 35% of the applied N (Prasad, 1979). The placement of urea in the reduced zone of rice field resulted in the increase of its efficiency up to 40 per cent (IRRI, 1976). In the international net work on soil fertility and fertilizer efficiency for rice (INSFFER) trials conducted in 8 countries including India, the urea super granules (USG) gave higher yields than prilled urea (IRRI, 1975). Attention has also been focussed on biological means of providing N for increased crop production. *Azolla anabaena* system seems quite suitable for rice production. The interaction of prilled urea (PU) with azolla has

been reported to give positive response (Kannan, 1982 and Shanmugham, 1983). Adequate information about the effect of USG and azolla on the growth and yield of rice is lacking. Hence the present investigation was taken up with the objective of finding out the individual and combined effect of biofertilizer (azolla) and urea N on growth and yield of rice.

MATERIALS AND METHODS

The experiment was conducted in wetlands, Tamil Nadu Agricultural University, Coimbatore during *kharif* and *rabi* seasons of 1983-84. The treatment details are as follows:

- T1 - No nitrogen (control)
- T2 - 100 kg N as PU
- T3 - 25 kg N as azolla+75 kg N as PU
- T4 - 50 kg N as azolla+50 kg N as PU
- T5 - 75 kg N as azolla+25 kg N as PU
- T6 - 100 kg N as USG
- T7 - 25 kg N as azolla+75 kg N as USG
- T8 - 50 kg N as azolla+50 kg N as USG
- T9 - 75 kg N as azolla+25 kg N as USG
- T10 - 100 kg N as azolla

The experiment was laid out in a randomized block design with four replications. As per the treatments, PU was split applied viz., 50% basal, 25% at active tillering and 25% at panicle initiation stages. USG was point placed in the centre of four hills, a week after transplanting. Azolla multiplied in the nursery was incorporated, a week before planting. Phosphorus and potash were basal applied each at 50 kg/ha. The soil was clay loam low in available N (261 kg/ha), medium in available P (15.9 kg/ha) and high in available K (461 kg/ha) and the pH was 7.9. The rice variety Co. 43 was planted with a spacing of 20x10cm. Plant height and LAI were recorded at flowering stage while the other parameters were recorded at harvesting stage. The grain yield was computed at 14% moisture.

RESULTS AND DISCUSSION

Growth components

1. Plant height: In both the seasons, 100 kg N as USG recorded highest plant height. Sustained supply of N through USG fertilizer probably enhanced the N uptake and consequently increased the plant height. Among the combinations, azolla to supply 25 kg N with 75 kg N as USG (T7) was found to be on par with 100 kg N as USG. Azolla to supply 50 kg N along with 50 kg N as USG (T8) was superior or equal to 100 kg as PU (T2). Plants were shorter in the treatments T3, T4, T5, T9 and T5. The control plots (T1) recorded the least plant height.

2 Leaf area index (LAI):

USG either alone or in combination with azolla increased the LAI over control. Maximum LAI of 7.2 and 6.2 were recorded with 100 kg N/ha in the form of USG in *kharif* and *rabi* respectively. Application of USG alone was found to be superior to any other combinations of USG or urea with azolla in respect of LAI. The LAI of the treatments T3, T4, T9 and T5 were comparatively lesser than rest of the treatments. This may be due to insufficiency of readily available N at the crucial periods of growth in these treatments.

3. Dry matter accumulation (DMP)

Maximum dry matter accumulation was recorded with 100 kg N as USG (T6). Mahendran (1980) and Somasundaram (1982) reported increased dry matter accumulation with the application of USG. Among the combinations, azolla to supply 25 kg N with 75 kg N as USG (T7) was on par with 100 kg N/ha (T6) as USG. Azolla to supply 50 kg N along with 50 kg N as USG recorded the same amount of dry matter accumulation as that of 100 kg N as PU. Kannan (1982) and Shanmugham (1983) reported higher amount of dry matter accumulation due to azolla and PU. The least dry matter production was recorded in control plots.

Yield components:

1. Number of panicles per m²

In both the seasons, the USG significantly increased the number of panicles/m² compared to PU on equal

Table 1. Effect of azolla and urea N on rice, Co. 43 (Kharif 1984)

Treat-ments	Plant height (cm)	LAI	DMP (Q/ha)	Panicles/m ²	Filled grains/panicle	1000 grain weight (g)	Grain yield (Q/ha)	Straw yield (Q/ha)
T1	73	3.2	64	245	69	21.9	25.2	40.4
T2	85	6.1	135	502	91	21.9	59.2	77.4
T3	81	5.4	110	413	88	22.1	49.7	63.7
T4	81	5.3	110	407	87	21.7	47.7	63.3
T5	78	5.1	109	390	87	21.2	45.8	62.3
T6	93	7.2	152	618	100	22.8	70.5	90.1
T7	88	7.1	151	565	100	22.4	69.5	88.5
T8	85	6.2	139	507	92	23.4	61.1	79.1
T9	79	5.2	110	397	87	21.2	45.8	65.3
T10	76	4.1	90	315	81	22.6	37.9	52.4
CD (0.05)	6	0.6		53	4	NS	6.5	4.9

N basis. This was probably due to increased number of tillers per hill in the initial stage of the crop due to the continuous and steady supply of N and higher N uptake. This was in accordance with the findings of Nagarajah (1979) who reported that the number of panicles/m² was more when N was applied through USG in the reduced zone. Substitution of 25 kg as azolla, with 75 kg N as USG was on par with 100 kg N as USG. Application of 50kg N as azolla and 50kg N as USG was found to be equal or superior to 100 kg N as PU. Incorporation of azolla to supply 100 kg N/ha recorded 288 panicles/m² which was higher than control but not equal to either 100kg as USG or PU.

2. Filled grains :

Maximum number of filled grains of

100 and 89 were recorded in *kharif* and *rabi* respectively at 25 kg N as azolla with 75 kg N as USG (T7). This was on par with 100 kg N as USG alone. USG along with azolla increased the number of filled grains might be due to steady supply of N to the crop (Mahandran, 1980) and also better availability of N from fresh azolla as a result of mineralization in rice soils. Kannaiyan (1978) and Singh (1978) observed similar results due to the application of azolla along with PU. Azolla application alone (T10) did not influence the number of filled grains as that of inorganic N fertilizer [T6, T2]. However combination of N through azolla with PU and USG. [T7, T8, T3, T4, T9, T3] produced more grains.

3. Thousand grain weight :

The 1000 grain weight was not

statistically significant due to any of the treatments as this character is mostly governed by genetic make up.

Grain yield:

Application of N either as USG or PU in combination with azolla exhibited a pronounced effect on grain yield. Placement of USG at 100 kg N/ha recorded the highest grain yield. Mahendran (1980) and Somasundaram (1982) reported increased yields due to the application of USG over control. Substitution of N through azolla to the tune of 25 kg/ha along with 75 kg N as USG recorded equal yield that of 100kg N as USG. The slow and continuous availability of N from azolla decomposition and mineralization might have helped for the

increased yield. Azolla and urea combinations (T3, T4, T5) were on par with each other. However, all were inferior to 100 kg N as USG or PU, but significantly superior to 100 kg N as azolla alone (T10). Azolla alone has not increased the grain yield. This may be due to the non-synchronisation of the mineralization of azolla N and the supply of N during the critical periods of growth. Kannan (1982) suggested that it would have been due to the poor build up of NH_4^+ N in the rice eco-system.

Straw yield

The straw yield followed the same trend as that of grain yield. In both the seasons, application of 100 kgN/ha as USG (T6) has been found to be

Table : 2. Effect of azolla and urea N on rice, Co. 43 (rabi 1984)

Treatments	Plant height (cm)	LAI	DMP (Q/ha)	Panicles/m ²	Filled grains/panicle	1000 grain weight (g)	Grain Yield (Q/ha)	Straw yield (Q/ha)
T1	64	3.0	61	212	63	21.5	22.5	39.6
T2	79	5.3	131	483	83	21.4	55.0	76.2
T3	71	4.9	107	397	80	21.6	45.1	62.5
T4	71	4.8	106	387	79	21.5	44.3	61.9
T5	70	4.3	105	367	78	21.2	43.1	60.4
T6	82	6.2	148	598	87	22.2	65.3	84.5
T7	81	6.0	146	560	89	22.0	64.0	84.2
T8	79	5.4	133	488	83	21.3	55.6	78.3
T9	70	4.6	105	368	82	21.5	44.0	61.3
T10	66	3.8	73	288	68	21.5	30.8	41.5
C.D (0.05)	1	0.4	5	56	4	NS	5.1	3.0

superior to all treatments. Among the different combinations 25 kg N as azolla and the remaining 75kg N with USG recorded significantly higher straw yield and was on par with 100 kg N as USG. Azolla to supply 50 kg N along with 50 kg N as USG was found superior to or on par with 100 kg N as PU. Kannan (1982) and Shanmugham (1983) observed that the incorporation of azolla along with

urea N increased the straw yield. Azolla in combination with urea and USG (T3, T4, T9 & T5) at reduced N levels recorded lower straw yield.

From the results of the study, it could be concluded that the application of USG solely or in combination with azolla in the ratio of 25:75 may be recommended for Co.43 rice for enhancing growth and yield than application of 100 kg N as PU.

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