https://doi.org/10.29321/MAJ.10.A01902

Madras agric. J.78 (9-12) Sep-Dec-1991

YIELD AND UPTAKE OF MAJOR NUTRIENTS BY MAHSURI RICE IN THE ONATTUKARA TRACT OF KERALA

S. SOBHANA and P. CHANDRASEKHARAN
Agronomic Reserch Station, Chalakudy, Trichur, Kerala.

ABSTRACT

A field experiment was conducted in the sandy loam soils of the Onattukara tract of kerala with rice variety Mahsuri to determine the effect of different levles of fertilisers on the yield and uptake of major nutrients at different stages of crop growth. The results revealed that the uptake of N, P and K increased with increased levels of fertilisers at all the growth stages. The uptake of N and P increased from tillering to flowering and thereafter declined. The uptake of K was at its highest at harvest. The grain and straw yields were also significantly increased by increasing the fertiliser levels, and were found to be siginificantly and positively correlated with the uptake of N, P and K.

KEY WORDS : Yield, Uptake, Rice, Kerala.

The open texture and the heavy leaching nature of the the sandy loam soils of the Onattukara tract of kerala contribute to their low nutrient status. Under such poor soil conditions, better crop responses can be elicited by higher levels of fertilisation. It has been proven by earilier research that a linear relationship exists between the levels of the applied nutrient and its uptake by the crop (Sadanandan *et.al* 1969) though studies on the pattern of uptake as related to the stages of crop growth have resulted in contradictory findings. The content of NP and K shoot dry matter and their uptake at the various growth stages of the crop as influenced by the levels of applied fertiliser was investigated. Using the rice variety Mahsuri, which is photoinsensitive, has a long duration and, though tall, can respond better to higher levels of fertilisers without fear of lodging compared to other tall varieties.

MATERIALS AND METHODS

A field experiment was conducted during *rabi* season at the Rice Research Station, Kayamkulam, which represents Onattukara tract. The fertiliser levels tried were 50:25:25 (F_1), 60:30:30 (F_2), 70:35:35: (F_3), and 80:40:40: (F_4) kg.ha^{-1} NPK. The experiment was laid out in a factorial RBD with three replications. For the uptake studies, six hills were uprooted from the destructive rows of each plot during tillering, panicle initiation, flowering and harvest stages. From the dry weight of these samples, nutrient content and uptake of major plant nutrients were calculated. The grain and straw yields were recorded.

The initial soil analysis of the experimental site had a 0.045 per cent of total N 0.0024 per cent available P and 0.0037 per cent available K with a pH of 5.3.

RESULTS AND DISCUSSION

N uptake

The data on the uptake of N, P and K at tillering, panicle initiation, flowering and harvest stages are presented in Table 1. Increase in the levels of fertilisers were observed to influence the plant N uptake significantly at all stages of growth, the uptake being highest with 80:40:40 kg.ha^{-1} NPK. This could be attributed to the fact that increasing the supply of N alone increased

its availability to plants and this together with the higher levels of P and K could ensure increased root growth and consequently facilitate better absorption. A study of the pattern of uptake as related to crop age showed that the uptake was at its lowest at tillering, thereafter increased and reached a maximum at flowering (89.29 kg.ha^{-1}) with 80:40:40 kg.ha^{-1} NPK) and declined towards harvest. The increase in the dry matter production (DMP) with increasing age of crop helped to mould this trend of uptake.

However, the low uptake noticed at harvest could be due to the lowest plant N content at that stage when compared to the earlier stages of growth. Again, there was no significant increase in DMP after flowering which could otherwise have increased the uptake even with a low N content. The above finding is in conformity with the results of Patnaik and Nanda (1969) according to them N uptake was highest up to flowering, after which most of the absorbed N was translocated to the grain.

P uptake

Phosphorus uptake by the rice plant also increased with increasing level of appplied fertilisers. The highest uptake was obtained with the highest fertiliser level of 80:40:40 kg.ha^{-1} NPK. As in the case of N, this could be a direct result of the increased supply of the nutrient which enabled the plants to absorb and accumulate more of it in the plant parts. Further, it could be explained by the accompanying increase in N levels which may have an influence on the unit root absorbing surfact to absorb P. The increased root growth and consequently better absorption of the nutrient followed by rapid translocation could also have increased the uptake. The uptake of P was at its lowest during tillering and thereafter increased to give the highest values during the flowering stage. The uptake was low at harvest. The low P uptake values obtained at harvest could be related to the low plant content of P at that stage. The uptake pattern observed here was similar to that reported by Muthuswamy *et al.* (1973) That more than half of the total requirements of P was absorbed between the stages of panicle initiation and flowering.

K uptake

There was a progressive and significant increase in plant K uptake with each successive increment of fertiliser from 50:25:25 kg.ha^{-1} NPK to 80:40:40: kg.ha^{-1} NPK as evident from Table 1. The results also indicated that rice plants absorbed more K than N and P and that the absorption of K occured even at the later stages of growth. The uptake was lowest at tillering and gradually increased to reach a maximum at harvest. Here again, the increase in DMP together with increased plant content of K with advancing age of crop resulted in the increased uptake as crop age advanced. The pattern of uptake obtained here is similar tothat reported by Mohamed Ali and Morachan (1973) that the uptake of K was at its highest at harvest.

During tillering and panicle initiation stages, uptake of N was higher than that of P and K but as the age advanced, N uptake diminished and K uptake increased. At the later stages of growth, uptake of K was higher than that of N and P. Phosphorus uptake by plants remained lower than N and K uptake at all growth stages.

Grain and Straw yield

The data presented in Table 1 showed that grain yields increased significantly with increasing levels of fertilisers, the highest yield being given by 80:40:40 kg.ha^{-1} NPK. The combined favorable influence of N, P, K facilitated better nutrient absorption and translocation and consequently higher starch synthesis and yield. Straw yields were also found to increase with increased fertiliser levels. The increase in straw yields with increasing levels of fertilisers is indicative of the increased vegetative growth induced by higher levels of N. The influence of N was complimented by the increased levels of P and K.

Table 1. Uptake of NPK at different growth stages and grain and straw yields as influenced by different fertiliser levels.

Treatments	Nitrogen uptake ($kg.ha^{-1}$)				Phosphours uptake ($kg.ha^{-1}$)				Potash uptake ($kg.ha^{-1}$)				Grain yield ($t.ha^{-1}$)	Straw yield (t.ha-1)
	Tiller-ing	Panicle initia-tion	Flower-ing	Harvest	Tiller-ing	Panicle intia-tion	Flower-ing	Harvest	Tiller-ing	Panicle initia-tion	Flower-ing	Harvest	-	-
F_1	10.62	30.59	61.72	52.51	1.72	10.86	17.36	14.37	8.34	32.35	90.34	93.22	2.196	5.223
F_2	12.25	35.06	72.33	57.26	1.94	12.55	20.17	16.76	9.18	34.78	101.75	104.40	2.504	5.419
F_3	12.95	41.41	85.15	61.03	2.15	13.43	21.81	19.09	9.87	36.98	109.73	111.87	2.567	5.521
F_4	15.02	43.47	89.29	65.51	2.52	14.03	24.37	19.83	11.03	38.36	119.27	119.74	2.634	5.634
CD (5)	0.711	6.18	7.01	2.78	0.068	0.183	0.48	0.588	0.205	0.572	0.805	0.734	0.021	0.024

The values of simple correlation coefficients were worked out and it was found that the uptake of N, P and K by the crop at harvest were significantly and positively correlated with grain yield and the correlation coefficients were 0.706, 0.729 and 0.826 respectively. Correlations of N, P and K uptake with DMP at harvest showed that they were significant and positive, the correlation coefficients being 0.832, 0.361 and 0.940 respectively.

From the above results it was concluded that increasing the level of applied fertilisers from 50:25:25 kg.ha^{-1} NPK to 80:40:40 kg.ha^{-1} could increase the nutrient uptake significantly and consequently the grain and straw yields in the case of Mahsuri rice grown in the Onattukara tract of Kerala.

REFERENCES

MOHAMED ALI, A. and MORACHAN Y.B 1973. UPTAKE and quality studies in rice. *Madras agric. J. 60*:755-759.

MUTHNSWAMY, P., RAJ D and KRISHNA MOORTHY K.K.1973. Mineral nutrition of high yielding rice (*Oryza sativa L.*) varieties. *Madras agrie. J.* 60 : 764-767.

PATNAIK, S. and NANDA BB. 1969. Uptake of nutrients in relation to growth of high yielding rice varieties under tropical conditions. *Indian J. Agric. Sci.* 39 (3) : 341-352.

SADANANDAN, A.K., GURUSWAMY M and SIVAPPAH A.N. 1969. Studies on the nitrogen, phosphorus and potash uptake by ADT 27 rice. *Madras agric. J. 56* (2) : 188-194.

Madras agric. J.78 (9-12) Sep-Dec-1991

RESPONSE OF GREENGRAM (CO 4) TO SOIL AND FOLIAR NUTRITION

R. RAJENDRAN
Dept. of Agronomy, Tamil Nadu Agricultural University, Coimbatore.3.

ABSTRACT

The effect of foliar spray of urea and di-ammonium phosphate (DAP) with and without basal dressing of fertilizer was studied on greengram Co4 at Tamil Nadu Agricultural University farm, Coimbatore during 1983-1984. Uptake of N and P was higher when basal application of 50 kg.ha^{-1} was combined with foliar spraying of urea or DAP twice. The rate of nutrient uptake increased with age of the crop, and reached the peak at 40 and 60 days after sowing (DAS) for P and N respectively. No significant difference was observed in grain yield between urea and DAP foliar spray on equal N basis. The highest income and return rupee^{-1} invested were recorded by foliar application of urea twice.

KEY WORDS : Greengram, Urea, Diammonium phosphate Foiar Application. Fertilizers.