

Effect of Phosphorus Fertilization on Translocation Index of Total Carbohydrates and Plant Attributes in Rice (*Oryza Sativa* L.)

By

V. THANDAPANI¹ and J. SAKHARAM RAO²

ABSTRACT

The study on the influence of different levels of phosphorus on the Translocation Index at harvesting stage and economic attributes of ADT 27 rice showed that T_2 (30 kg. P_2O_5 /ha) gave the maximum value. Regarding tiller production T_3 (45 kg. P_2O_5 /ha) was most effective. All the treatments in general increased the shoot height and T_3 was observed to be more effective at tillering and flowering stages. The same trend was seen with regard to root length in respect of flowering the harvesting stages. However T_2 influenced the root length better than higher concentration at tillering stages. The medium dosage of 45 kg P_2O_5 /ha was favourable in influencing the length of panicle, number of fertile spikelets and yield.

INTRODUCTION

Adequate work has been undertaken on tiller production as influenced by phosphorus supply. Similarly, the relationship of phosphorus nutrition to that of the height of the plant, length of root, tiller production, formation of fertile and sterile spikelets has been worked out. But, information is scarce with regard to the effect of different levels of phosphorus on the Translocation Index at harvesting stage and economic attributes in the various stages of the crop growth. With a view of studying the phosphorus nutrition this study was initiated in ADT 27 rice crop.

MATERIALS AND METHODS

Investigations were carried out during 1968—'69 in wet lands, Agricultural College and Research Institute,

Coimbatore, with ADT 27 rice. The soil type was heavy clayey. The design adopted was randomised block design with four replications and six treatments viz., 0 (C); 15 (T_1); 30 (T_2); 45 (T_3); 60 kg (T_4) and 75 (T_5) kg P_2O_5 /ha as basal dressing. N and K were given at 60 and 45 kg/ha respectively along with 5000 kg of green leaf manure /ha. The Translocation Index of total carbohydrate (reducing and non-reducing sugars) was calculated at harvesting stage by the method given by McNeal *et al.* (1972). The economic characters such as number of tillers, height of the shoot and length of root were studied at tillering, flowering and harvesting stages of the crop which corresponded with 30, 60 and 90 days after transplanting. The length of panicle, number of spikelets, yield of grain and straw were recorded at harvesting stage.

1. Instructor, 2. Associate Professor of Plant Physiology, Tamil Nadu Agricultural University, Coimbatore - 641003.

RESULTS AND DISCUSSION

(i) **Translocation Index of total carbohydrates (reducing and non-reducing sugars):** The treatment T_2 (30 kg P_2O_5 /ha) gave

higher Translocation Index value, revealing that the translocation of carbohydrates was maximum from the straw to the grain at harvesting stage (Table 1).

TABLE 1. Influence of phosphorus levels on Translocation Index of total carbohydrates (reducing and non-reducing sugars) at harvesting stage (percentage)

Treatments	Total carbohydrates at harvesting stage (%)			Yield of straw in (kg/ha)	Yield of grain in (kg/ha)	Translocation Index (%)
	Root	Straw	Grain			
C	7.5	10.0	19.0	5838	3702	54
T_1	8.0	11.9	19.4	5929	4039	52
T_2	10.0	9.6	19.8	6305	4151	57
T_3	11.0	13.8	19.0	6386	4320	48
T_4	10.1	13.0	19.0	5868	3977	49
T_5	9.1	13.7	21.0	5849	3815	51

(ii) **Tiller production:** The medium dosages of T_2 (30 kg P_2O_5 /ha) were favourable in influencing the tillering as well as number of productive tillers (Table 2), T_3 being most effective. The number of non-productive tillers was minimum in T_3 . An increase in

the number of tillers due to phosphorus level has been recorded by Enyi (1964) and Rami Reddy (1967). The present data indicated the advantageous effect of phosphorus in obtaining maximum number of productive tillers and subsequently the yield.

TABLE 2. Effect of 'P' levels on number of tillers, productive and non-productive tillers

Treatments	Number of tillers		Harvesting stage	
	Tillering stage	Flowering stage	Productive tillers	Non-productive tillers
C	14	14	11	3
T_1	15	15	12	3
T_2	16	15*	13	2
T_3	16	15*	14	1
T_4	15	14*	12	2
T_5	15	15	12	3
P =		0.01	0.05	0.05
C. D. =		1.14	1.62	1.14

* One tiller dried up at flowering stage.

(iii) **Shoot height and root length:** Shoot height was increased by all the treatments (Table 3). The treatments T_3 (45 kg P_2O_5 /ha) was most effective among the treatments at tillering and flowering stages while T_4 (60 kg P_2O_5 /ha) was more effective than other treatments at harvesting stage. Regarding the length of root, the treatment T_2 (30 kg P_2O_5 /ha) was better than higher levels at tillering stage. T_3 was more favourable than

other treatments at flowering and harvesting stages. The phosphorus level had better influence on the length of roots than height of shoot. Similar observations were made in rice and cholam by Tanka *et al.* (1960) and Kamalam (1964) respectively.

(iv) **Length of panicle:** The length of panicle (Table 4) was increased slightly by all the treatments. Among these, T_3 (45 kg P_2O_5 /ha) registered the highest value.

TABLE 3 Effect of 'P' levels on shoot height and root length

Treatments	Shoot height (cm)			Root length (cm)		
	Tillering stage	Flowering stage	Harvesting stage	Tillering stage	Flowering stage	Harvesting stage
C	46.75	110.8	106.1	17.05	17.75	12.25
T_1	52.00	111.8	109.3	19.25	18.62	13.75
T_2	53.75	113.1	110.8	21.75	20.25	14.88
T_3	54.50	118.0	111.0	21.25	21.50	16.88
T_4	53.00	115.6	114.3	20.50	18.88	15.75
T_5	52.72	115.0	112.6	19.87	19.62	14.12
	N. S.	N. S.	P = 0.01 C. D. = 2.57	N. S.	N. S.	N. S.

(v) **Number of spikelets:** All the treatments increased the production of fertile spikelets (Table 4) as compared to the control. Among the treatments, T_3 (45 kg P_2O_5 /ha) recorded the highest fertile spikelets and at the same time reducing the number of sterile spikelets to the minimum (Table 4). Even though phosphorus levels increased the fertile spikelets and decreased the sterile spikelets no significant results were obtained. This view is in conformity with the work of Rami Reddy (1967) in rice.

TABLE 4. Effect of 'P' levels on length of panicle, fertile and sterile spikelets in relation to treatments

Treatments	Length of panicle (cm)	Number of Fertile spikelets	Number of sterile spikelets
C	17.73	105	30
T_1	19.83	106	31
T_2	19.91	122	27
T_3	20.77	137	21
T_4	20.05	112	25
T_5	19.16	111	26
P	= 0.05	N. S.	N. S.
C. D.	= 1.21		

(vi) Yield of grain and straw:

The phosphorus levels had very little effect on grain and straw yield (Table 5). The T_3 (45 kg P_2O_5 /ha) level recorded the maximum yield of 4320 kg of grain and 6386 kg of straw/ha, but no significant variation was observed due to the treatments. The present results agreed with the work and Enyi (1964) in rice.

TABLE 5. Effect of 'P' levels on yield-grain and straw in relation to treatments

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)
C	3702	5838
T_1	4039	5929
T_2	4151	6305
T_3	4320	6386
T_4	3977	5868
T_5	3815	5849
N. S.	N. S.	

REFERENCES

- ENYI, B. A. C. 1964. Effect of varying phosphorus and water supply on growth, yield of upland rice varieties. *Trop. Agric.* **41**: 147-53.
- KAMALAM, N. 1964. Influence of phosphate on the growth, yield and composition of cholam crop. *Madras. agric. J.* **51**: 197-206.
- MCNEAL, F. H., M. A. BERG, C. F. MCGUIRE V. R. STEWANT and D. E. BALDRIDGE, 1972. Grain and plant nitrogen relationship in eight spring wheat crosses, *Triticum aestivum* L. *Crop. Sci.* **12**: 599-602.
- RAMI REDDY, S. 1967. Influence of N, P and plant population on the yield and the growth character of culture No. 2410 (CO 33) rice. M. Sc. (Ag.) Dissertation, University of Madras.
- TANAKA, A., S. PETNAIK and C. T. ABI-CHANDANI. 1960. Influence of increasing levels of phosphorus and potash on the yield and other nutrients uptake by rice plants. *Proc. Ind. Acad. Sci.* **49 B**: 158-68.