

INFLUENCE OF TIME AND METHOD OF APPLICATION OF PHOSPHORUS AND POTASH ON UPTAKE OF NUTRIENTS BY DIFFERENT PLANT COMPONENTS AND SEED COTTON YIELD

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A study was conducted to investigate the influence of time and method of application of P and K on uptake of nutrients by different plant components and seed cotton yield at Tamil Nadu Agricultural University during 1975—76. The results of the study indicated that basal application of 30 kg/ha each of P_2O_5 and K_2O along with 60 kg N/ha favoured in increased uptake of nutrients and seed cotton yield.

Investigation on the uptake of nutrients by different plant parts of cotton crop on the time and method of application, especially, P_2O_5 and K_2O are few and far between. Hence, the study was undertaken to elicit information on the uptake pattern of N, P and K by different parts of the cotton crop at different periods of growth which in turn resulted in higher production of seed cotton.

MATERIAL AND METHODS

Field experiments were conducted to study the influence of time and method of application of P_2O_5 and K_2O on growth, uptake pattern, yield and quality of MCU 5 cotton at TNAU farm, Coimbatore during the winter season of 1975.

The experimental field soil was clay loam with low in available N (188 kg/ha) medium in available P_2O_5 (15 kg/ha) and medium available K_2O

(226 ka/ha). The pH and EC of the soil were 7.4 (normal) and 0.3 (harmless respectively). Randomized block design was adopted with 3 replications. The treatment details are furnished below.

<i>Notation</i>	<i>Treatment particulars</i>
T ₁ =	Control.
T ₂ =	40 kg/ P_2O_5 /ha as basal application (s).
T ₃ =	40 kg K_2O /ha as basal application.
T ₄ =	40 kg each of P_2O_5 and K_2O /ha as basal application (S).
T ₅ =	40 kg P_2O_5 and K_2O as basal application (S) and 20 kg K_2O as top dressing on 40th day (Q) square initiation stage.

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- T₄ = 20 kg P₂O₅ and 40 kg K₂O as basal application (S) and 20 kg P₂O₅ top dressing on 40th day (Q).
- T₇ = 20 kg each of P₂O₅ and K₂O as basal application (S) and 20kg each of P₂O₅ and K₂O as top dressing on 40th day (Q).
- T₈ = 40 kg P₂O₅ and 20 kg K₂O as basal application (S) 10 kg K₂O as top dressing at 40th day (Q) and 10 kg K₂O as foliar application (F).
- T₉ = 20 kg P₂O₅ and 40 kg K₂O as basal application (S), 10 kg P₂O₅ as top dressing on 40th day (Q) and 10 kg P₂O₅ as foliar application (F).
- T₁₀ = 20 kg each of P₂O₅ and K₂O as basal application (S), 10 kg each of P₂O₅ and K₂O as top dressing on 40th day (Q) and 10 kg each of P₂O₅ and K₂O as foliar application.

A uniform dose of 60 kg N/ha in the form of urea was applied to all the plots. For foliar application, 1st spraying was done at 40th day (square initiation stage) and subsequent sprayings at 20 days intervals. Totally three sprayings were given.

Five plants from each plot were cut at cotyledonary node at 30 days intervals and separated into different parts such as stem, leaves, petioles,

and floral parts and oven dried. Plant samples were analysed for N, P and K content. Total nitrogen was estimated by Microkjeldahl method after Humphris (1956) and expressed on percentage of dry matter. Total phosphorus was estimated by triple acid digestion method as detailed by Jackson (1967).

RESULTS AND DISCUSSION

Nutrients uptake on 30, 60, and 120 days after sowing was estimated and it was evident that peak uptake by stem, leaves and petioles was on 90 days and by reproductive parts on 120th day and hence the results are discussed with the data of nutrients uptake on 90 and 120 days.

Uptake of N different plant components

Peak accumulation of N in stem noticed only at 90 days of crop growth. At 120 days there was however marked reduction. Because the growth senescence occur at 120 days.

Peak uptake of N in leaves occurred at 90 days with a subsequent decline due to translocation.

The data indicated that the accumulation of N in petioles increased progressively with the ageing of the plant. At 90 days, T₄ recorded the maximum uptake of 4.40 kg/ha.

The uptake of N progressively increased from 60 days and the maximum peak of uptake of N in reproductive parts was recorded under T₄ on 120 days.

Uptake of P_2O_5 by different plant components

On 90th day the treatment with complete basal application of P_2O_5 and K_2O (T4) registered maximum uptake of P_2O_5 (9.14 kg/ha) occurred in stem. Treatments with no P_2O_5 (T1 and T3) and also that with foliar application of P_2O_5 recorded lower uptake indicating that these treatments failed to influence the uptake of P_2O_5 . The data clearly indicated that peak P_2O_5 accumulation in stem occurred at 90 days of crop growth with a subsequent decline at 120 days which may be due to translocation of nutrients to reproductive parts.

Peak uptake of P_2O_5 by leaves was noticed on 90 days and subsequently the uptake declined which may be due to the translocation of nutrient from source to sink.

At 90 days, maximum uptake of 0.69 kg/ha was registered by petioles. Though the increase in uptake by petioles from 60 to 90 days was considerable that from 90 to 120 days was negligible.

At 90 days, uptake of 6.93 kg/ha was recorded by reproductive parts. At 120 days maximum uptake of 8.70 kg/ha was noticed.

From the foregoing data it is evident that peak accumulation of P_2O_5 in stem and leaves occurred at 90 days and that in reproductive parts at 120 days.

Uptake of K_2O by different plant components

At 90th day the treatment T4 registered maximum uptake of K_2O in

stem which was distinctly superior to the rest of the treatments. As that of N and P_2O_5 , peak uptake of K_2O in stem occurred at 90 days and there after a decline was noticed. This may be due to the translocation of nutrients to other parts.

At 90 days, the uptake was around 37 kg/ha in leaves. Treatments lacking K_2O (T1 and T3) exhibited least uptake.

At 90 days the uptake ranged from 11.6 to 16.5 kg/ha in petioles. Treatments which did not receive K_2O recorded lower uptake.

At 120 days, T4 registered the maximum uptake of 40.3 kg/ha in reproductive parts. The data revealed a linear trend with age in the accumulation of K_2O in the reproductive parts.

Yield of seed cotton

The increase seed cotton yield of 20.04 q/ha in the Year 1975-76 under the combined influence of N, P and K in the treatment T4 may be ascribed to the higher uptake of nutrients especially by reproductive parts. In the year 1975-76 the T4 possess combined application of N, P and K registered 33% increased seed cotton yield. Macha Do dasilva (1972) and Dzhumankulov and Shanetski (1976) stressed the need for combination of N, P, K for increased yield confirmed this result.

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Table 1 Influence of Time and Method of Application of P₂O₅ and K₂O on uptake of N, P₂O₅ and K₂O by stem, leaves, petioles and reproductive parts.

Stem	Uptake of Nitrogen Kg/ha.				Uptake of P ₂ O ₅ /ha				Uptake of K ₂ O/ha			
	Leaves (.....90th day.....)	Petioles (.....90th day.....)	Reproduc- parts (120th day)	Stem (.....90th day.....)	Leaves (.....90th day.....)	Petioles (.....90th day.....)	Reproduc- parts (120th day)	Stem (.....90th day.....)	Leaves (.....90th day.....)	Petioles (.....90th day.....)	Reproduc- parts (120th day)	Stem (.....90th day.....)
35.0	55.5	3.2	32.0	6.23	7.94	0.50	7.36	33.3	23.7	11.6	33.4	33.4
39.1	60.6	4.0	32.7	8.32	10.86	0.60	8.66	38.2	32.9	13.7	33.4	33.4
27.0	66.2	3.4	33.0	7.64	9.65	0.53	7.43	46.3	36.4	16.4	40.0	40.0
41.0	67.0	4.4	34.0	9.14	11.34	0.61	8.70	49.0	37.4	16.5	40.3	40.3
33.9	58.4	4.1	32.3	8.96	11.00	0.60	8.20	39.7	33.4	14.4	34.5	34.5
39.2	62.0	3.5	32.1	8.0	9.28	0.54	8.19	42.8	37.5	15.9	37.3	37.3
37.6	63.9	3.3	33.3	6.55	10.08	0.53	8.30	42.8	37.3	14.7	37.7	37.7
39.5	62.9	3.8	33.2	8.86	10.47	0.69	8.45	40.4	32.3	12.5	35.8	35.8
36.6	60.5	3.8	33.1	6.14	9.06	0.53	8.01	46.3	35.6	15.4	38.2	38.2
39.8	66.1	3.6	34.7	8.00	9.49	0.53	8.25	40.8	32.9	13.3	35.7	35.7
0.97	4.74	0.30	0.47	0.29	0.33	0.02	0.20	0.45	0.13	0.34	1.21	1.21
NS	NS	0.90	NS	0.85	1.03	0.06	0.59	1.33	0.36	1.01	3.62	3.62

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Table 2

Influence of Time and Method of Application of P₂O₅ and K₂O on Yield.

Tr. No.	Yield	Q/ha
T ₁	15.10	17.5
T ₂	12.72	17.8
T ₃	13.93	17.9
T ₄	20.04	21.8
T ₅	19.36	21.3
T ₆	17.86	17.1
T ₇	18.83	20.3
T ₈	17.45	17.6
T ₉	15.95	18.0
T ₁₀	17.79	21.2
SE	1.36	0.3
CD (P = 0.05)	4.05	1.0
NS : Non significant.		