

Studies on the Effect of Nitrogen and Phosphorus on the Growth, Development and Flowering of Chrysanthemum CV. Yellow (*Chrysanthemum Indicum* Linn). III Nutrient Uptake*

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Investigations were undertaken to study the pattern of uptake of N, P and K by *Chrysanthemum indicum* CV. Yellow in the field as influenced by their application at different levels. The trend of uptake of N, P and K was similar. There was high uptake at pre-bloom stage and a gradual but slight increase there after. The major nutrients were stored in pre-bloom stage at a high level to be utilised for the subsequent development and production of chrysanthemum flowers. The uptake of Ca and Mg was higher at the flowering and post-bloom stages.

Uniform rooted cuttings having four nodes of chrysanthemum cv. Yellow were planted in the main field. The experimental plot was sandy loam with the PH 8.1, EC 0.3, N 203 kg, P 3.7 kg and K 383 kg/ha of available nutrients. Thirty days after planting, N and P were applied at four levels while K was kept constant.

N : 0, 50, 75, 100 kg/ha
P : 0, 75, 100, 125 kg/ha
K : 100 kg/ha.

Farm Yard Manure having 1.48% N, 0.96% P, and 2.32% K was applied at 3 kg/M² as basal dressing with half of the total quantity of N. The remaining half of N was applied 50 days after planting. Full doses of P and K were applied at the time of planting. The experiment was laid out in a factorial randomised block design with four replications. The pattern of nutrient uptake

was studied during four stages of growth viz., vegetative (60 days after planting), pre-bloom (100 day after planting), flowering (140 days after planting) and post-bloom (180 days after planting) and the data were statically scrutinised.

RESULTS AND DISCUSSION

The pattern of nutrient uptake at four different stages in respect of N, P, K Ca and Mg due to the application of N and P at various combinations is presented (Table I).

Nitrogen : In general, there was considerable increase in the uptake of N with increase in the substrate levels of N in most of the stages. The uptake increased with various developmental stages of growth but perceptible increase noticed after the vegetative phase, is in accordance with the works of Serra *et al* (1976).

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TABLE. Nutrient uptake of N, P, K, Ca and Mg due to the application of N and P at various levels in field grown with Chrysanthemum (Kg/ha)

Treat- ment	Vegetative stage	Pre- bloom	Flowering	Post bloom	Treatment	Vegeta- tive	Pre- bloom	Flowering	Post- bloom
Nitrogen									
N ₀	11.10	40.96	41.89	47.26	P ₀	11.46	38.82	43.77	39.28
N ₁	11.55	38.97	44.19	49.63	P ₁	12.41	40.96	41.69	49.63
N ₂	11.88	39.90	42.31	35.96	P ₂	12.05	41.73	43.77	35.13
N ₃	12.21	41.43	45.23	39.12	P ₃	11.63	39.74	43.77	47.53
Phosphorus									
N ₀	0.50	5.52	7.09	8.14	P ₀	0.24	5.79	7.71	9.45
N ₁	0.57	5.52	7.30	7.88	P ₁	0.69	5.06	6.88	8.14
N ₂	0.78	5.83	7.71	8.40	P ₂	0.50	5.52	7.71	9.45
N ₃	0.78	5.68	8.13	9.19	P ₃	1.19	6.28	6.25	7.61
Potassium									
N ₀	10.23	72.74	92.34	97.93	P ₀	10.14	65.68	89.84	92.95
N ₁	12.76	67.52	87.13	88.22	P ₁	13.65	78.11	87.75	96.36
N ₂	12.32	75.50	82.75	99.25	P ₂	13.03	74.73	87.34	96.10
N ₃	16.06	75.95	88.80	96.12	P ₃	14.72	73.20	86.09	95.58
Calcium									
N ₀	2.58	17.25	24.49	40.02	P ₀	2.47	20.56	27.98	40.04
N ₁	3.45	21.47	28.31	32.79	P ₁	2.94	16.86	22.41	38.99
N ₂	3.30	22.25	18.22	40.67	P ₂	3.61	23.69	23.72	37.42
N ₃	4.12	21.41	29.98	38.70	P ₃	4.43	21.28	27.37	35.76
Magnesium									
N ₀	0.93	12.09	10.96	23.32	P ₀	1.86	14.58	19.51	21.01
N ₁	1.96	10.56	14.30	20.35	P ₁	1.96	10.56	16.15	16.38
N ₂	3.92	9.97	9.65	30.54	P ₂	1.50	7.32	9.13	27.44
N ₃	2.21	12.86	23.99	34.11	P ₃	3.72	13.03	14.07	33.48

The uptake of N due to different P levels showed that the uptake increased with the growth of plant, but the intensity of such increase was more clearly observed when the plant passed the vegetative stage. The total uptake progressively increased upto P_1 level (75 kg/ha) and followed the same trend of N between vegetative and pre-bloom stage.

Phosphorus : The uptake of P increased with increase in the P levels. This trend was maintained in all the stages of plant growth. Striking increase in the uptake of P was observed at pre-bloom compared to vegetative stage and the rate of increase was more perceptible. The total uptake showed gradual increase with increase in the application of P. This is in accordance with the results of Joiner (1967) who stated that increased P in the substrate increased P uptake. It is obvious that there was a pronounced P required during pre-bloom flowering and at post-bloom stages.

Potassium : The total uptake of K in general was remarkable as compared to N and P. There was a sudden spur in the uptake of K from vegetative stage to pre-bloom stage (5-7 fold increase) and this upward trend continued throughout, confirming the results of Lunt and Kofranek (1958).

Calcium : The total uptake of Ca due to application of N and P was not influenced by the levels of NP and K. However, the variation in the uptake of Ca at different stages was striking. Ca uptake showed a sharp rise from vegetative stage to other subsequent stages. It was highest at post-bloom period.

The highest uptake of Ca was found with N_2 and P_{10} .

Magnesium : The total uptake of Mg increased with increase in N levels. At N_2 the plants recorded maximum uptake of Mg (34.11 kg/ha) compared to control (23.32 kg/ha). There was a definite increase in the Mg uptake particularly at pre-bloom stages due to various levels of N.

Owing to the different levels of P, the Mg uptake showed fluctuations. The maximum Mg uptake was registered by plants under treatment P_2 (37.44 kg/ha) compared to other levels of P. It is interesting to note that though there were variations in the total uptake of Mg due to application of P, a trend of increased uptake of Mg was clear from vegetative to other developmental stages. From the foregoing, it is evident that the trend of uptake in N, P and K is similar i.e., the uptake was higher at pre-bloom stage. It may be due to the major nutrients stored at pre-bloom stage at a higher level to be utilised for subsequent development and production of flowers as reported by Boodley and Meyer (1965).

The trend of uptake of secondary elements Ca and Mg is at later phases of development (Vijayakumar, 1977). High accumulation was observed only at the flowering and post-bloom stage which may be attributed to the immobile nature of Ca and mutual antagonistic effect of K, Ca and Mg resulting in the early phase of growth. But subsequently these elements were utilised in greater amounts at later phases of growth for cell thickening and photosynthetic activity.

REFERENCES

- BOODEY, J. W. and M. MEYER. 1965. The nutrient content of Bonnaffon Deluxe chrysanthemum from juvenile to mature growth. *Proc. Amer. Soc. Hort. Sci.* 87 : 472-78.
- JOINER, J.N. 1967. Effect of P,K and Mg levels on growth yield and chemical composition of *Chrysanthemum morifolium* Indianapolis white. *Proc. Amer. Soc. Hort. Sci.* 90 : 389-96.
- LUNT, O.R. and A.M. KOFRANEK 1958. Nitrogen and Potassium nutrition of chrysanthemum. *Proc. Amer. Soc. Hort. Sci.* 72 :487-97.
- SERRA, G., S. LEONI and M. G. CARLETTI 1976. Aspects of chrysanthemum nutrition. Centre Regionale pubblicazione, Afrario sperimentale Cagliari (1975) *Hort. Abst.* 46 : 7804.
- VIJAYAKUMAR, M. 1977. Studies on the effect of nitrogen and phosphorus on the growth development and flowering of chrysanthemum CV. Yellow unpub. M.Sc. (Ag) Dissertation. submitted to the Tamil Nadu Agricultural University.
- VIJAYAKUMAR, M. and K.G. SHUNMUGAVELU, 1978. Studies on the effect of nitrogen and phosphorus on the growth, development and flowering of Chrysanthemum CV. Yellow (*Chrysanthemum indicum* L.) II Nutrient uptake (Pot-culture) (In press).