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Effect of nitrogen and phosphorus on seed yield and uptake of nutrients in musk mallow (*Abelmoschus moschatus* Medic.)

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Abstract

A field experiment conducted at Akola (Maharashtra) to study the effect of nitrogen and phosphorus on seed yield and uptake of nutrients in musk mallow (*Abelmoschus moschatus*) indicated that application of 75 kg N ha^{-1} and 50 kg P_2O_5 ha^{-1} recorded significantly higher seed yield and nutrient (NPK) uptake. The maximum uptake of nitrogen was registered at 135 days after sowing and phosphorus and potassium uptake at 180 days after sowing.

Key words: *Abelmoschus moschatus*, musk mallow, nutrient uptake, yield.

Musk mallow (*Abelmoschus moschatus* Medic.) seeds are valued for their volatile oil, which has various applications in medicines and cosmetics. In spite of its wide application and utility, not much work has been done on agro-techniques to enhance the productivity of the crop. Hence, the present study was undertaken to evaluate the effect of nitrogen and phosphorus on seed yield and uptake of nutrients in musk mallow.

The field experiment was conducted for three years during *kharif* 2000–01, 2001–02 and 2002–03 at Nagarjun Medicinal Plants Garden, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra). The treatments consisted of four levels of nitrogen namely, 0, 25, 50 and 75 kg ha^{-1} and three levels of phosphorus namely, 0, 25 and 50 kg ha^{-1} in a factorial randomised block design with three replications. A basal dose of potassium @ 25 kg ha^{-1} was applied to all plots.

The experimental site lies in semi-arid area of Deccan Plateau of Maharashtra (22.42^0 N and 77.02^0 E), at an altitude of 307.42 m above MSL. The climate is sub-tropical monsoonic semi-arid type and the period March to May is hot and dry followed by rains during June to September (south west monsoon). The distribution of rainfall is erratic with an average of 810 mm per year. Irrigation was provided to the crop as and when required. The soil was alkaline in reaction (pH 7.8), low in organic carbon (0.33%), available nitrogen (147.8 kg ha^{-1}), phosphorus (14.8 kg ha^{-1}) and rich in potassium (276.0 kg ha^{-1}).

The plant samples were collected at 45, 90, 135 and 180 days after sowing (DAS) for estimation of periodic uptake of nutrients. The seed yield through 3–4 pickings was recorded. Chemical analysis of soil and plants was performed by standard procedures (Piper 1966; Jackson 1967).

The seed yield increased with each increment of nitrogen and the application of 75 kg N ha^{-1} yielded significantly higher yield which

was 37% more compared to control (Table 1). Similarly, the application of each level of phosphorus increased the seed yield and significantly higher yield was obtained due to application of 50 kg P_2O_5 ha^{-1} which was 23% more compared to control. These results are in agreement with the findings reported by Tiwari *et al.* (2000) at Jabalpur region. Dahatonde (1988) recorded significant increase in seed yield of musk mallow due to application of 50 kg N ha^{-1} and 50 kg P_2O_5 ha^{-1}. The response to the higher levels of nitrogen in the present study might be due to low content of available nitrogen of the experimental soil.

The uptake of nitrogen and potassium at all the growth stages increased with each increment of nitrogen, the highest being

Table 1. Seed yield of musk mallow as influenced by nitrogen and phosphorus application (pooled means)

Treatment	Seed yield (kg ha^{-1})			
	2000–01	2001–02	2002–03	Pooled mean
Nitrogen (kg ha^{-1})				
0	485.0	329.0	268.0	361.0
25	559.0	520.0	380.0	486.0
50	578.0	553.0	429.0	520.0
75	620.0	626.0	478.0	575.0
SE±m	5.4	14.0	16.7	8.7
CD (P=0.05)	15.8	41.0	48.9	24.4
Phosphorus (kg ha^{-1})				
0	518.0	442.0	335.0	432.0
25	560.0	522.0	397.0	493.0
50	604.0	558.0	433.0	531.0
SE±m	4.7	12.2	14.4	7.5
CD (P=0.05)	13.7	35.7	42.4	21.2
Interaction (N x P)				
SE±m	9.3	24.3	28.9	15.0
CD (P=0.05)	NS	NS	NS	NS

Table 2. Periodic uptake of NPK (kg ha^{-1}) by musk mallow as influenced by nitrogen and phosphorus application (pooled means)

Treatment	45 DAS			90 DAS			135 DAS			180 DAS		
	N	P	K	N	P	K	N	P	K	N	P	K
Nitrogen (kg ha^{-1})												
0	3.50	0.93	4.20	8.30	2.00	9.09	11.47	2.67	11.70	7.96	2.41	11.28
25	6.78	1.97	7.99	12.67	3.17	13.59	17.74	4.15	17.75	13.10	4.15	17.40
50	10.10	2.53	11.35	16.93	4.92	18.07	21.12	4.94	19.93	16.52	5.18	21.01
75	9.89	2.53	11.56	22.22	5.77	23.31	22.99	5.39	22.11	19.27	5.93	24.29
SE±m	0.24	0.10	0.52	0.46	0.28	0.58	0.41	0.19	0.54	0.37	0.34	0.62
CD (P=0.05)	0.69	0.30	1.54	1.34	0.82	1.71	1.20	0.56	1.57	1.09	1.01	1.81
Phosphorus (kg ha^{-1})												
0	6.08	1.43	7.19	12.12	2.80	12.68	14.90	3.17	14.64	12.00	3.37	15.84
25	8.09	2.20	9.43	15.54	4.14	16.63	19.55	4.67	19.12	14.80	4.60	19.50
50	8.54	2.33	9.71	17.23	4.96	18.74	20.70	5.03	19.87	15.84	5.27	20.14
SE±m	0.17	0.05	0.26	0.38	0.02	0.42	0.39	0.10	0.34	0.30	0.10	0.34
CD (P=0.05)	0.50	0.15	0.78	1.12	0.07	1.22	1.15	0.28	1.01	0.89	0.30	1.00
Interaction (N x P)												
SE±m	0.33	0.10	0.53	0.77	0.64	0.84	0.73	0.19	0.69	0.61	0.21	0.68
CD (P=0.05)	6.99	0.30	NS	2.24	0.14	2.45	NS	NS	NS	1.78	0.62	NS

DAS = Days after sowing

with 75 kg N ha^{-1}. Although phosphorus uptake recorded with 75 kg N ha^{-1} was the highest, it was at par with 50 kg N ha^{-1} at all the stages of growth (Table 2). However, maximum uptake of nitrogen was registered at 135 DAS and phosphorus and potassium uptake at 180 DAS.

The uptake of nutrients (NPK) was also significantly influenced with phosphorus levels and significantly highest values were noticed with 50 kg P_2O_5 ha^{-1}. The uptake of nutrients at the growth stage of 45 DAS were at par at the levels of 50 kg P_2O_5 and 25 kg P_2O_5 ha^{-1}. Potassium uptake in general was more or less similar with different P_2O_5 levels at all stages except at 90 DAS. The 50 kg P_2O_5 ha^{-1} level was significantly higher over lower levels. The interaction effect was non-significant.

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