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Flower Yield and NPK Content in Leaf of Spray Chrysanthemum under Different Nitrogen Sources

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Abstract

In the investigation, the spray chrysanthemum plants received with 75% of recommended dose of nitrogen (RDN) through equal part of neem cake, mustard cake and CAN and remaining 25% as top dressing of urea were outstanding in flower yield and nitrogen content in leaf. The total N, P and K content in leaf tissues decreased gradually from vegetative to full bloom phases. The yield of flowers increased when leaf nitrogen increased.

Key words : Chrysanthemum, Oil cakes, Leaf nitrogen, Nutrition.

In modernizing agriculture, neither chemical fertilizer alone nor the organic sources exclusively can achieve the production sustainability of a remunerative ornamental crop like chrysanthemum. The interactive advantages of combining organic and inorganic sources of nitrogen in integrated nutrient management system are superior to inorganic fertilizer application alone. Lower productivity and inferior flower quality of chrysanthemum is mainly due to inefficient and frequent use of quick release inorganic nitrogenous fertilizers. Organic sources of nitrogen particularly oil cakes have some role in crop growth and yield comparing the inorganic sources. The level of leaf nitrogen, phosphorus and potassium during different stages of crop growth has direct relation with crop yield. In view of these, an investigation was undertaken to study the flower yield and NPK content in leaf at different phenophases of crop growth in response to crop nutrition with different sources of organic and inorganic nitrogenous fertilizer.

Methods

The experiment was conducted at Horticultural Research Station, Mondouri (23° N, 83° E and 9.75 m altitude), Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, India by planting the cultivar Amal in a factorial randomized block design with 16 treatments and three replications during the two winter seasons of 2003-05. The plantings were done on 30 July and standard package of practices for sustainable production were followed in crop cultivation. The soil texture of the experimental field was clay loam having pH 6.8, organic carbon 0.58, total N 156.8 kg/ha, available P_2O_5 50.4 kg/ha and available K_2O 208.5 kg/ha. All plots of the experiment were received with the recommended dose of fertilizer of N:P:K at 20 :10 : 10 g/sqm in both years of experiment. Full dose of P_2O_5 and K_2O was applied through single super phosphate (SSP) and muriate of potash (MOP), respectively as basal application. The treatments considered of different levels (100, 75, 50 or 25%) from four sources of nitrogen viz., urea (UR), calcium ammonium nitrate (CAN), mustard cake (MC) and neem cake (NC) alone or in combination of two or more of them. The treatment combinations are as follows : T_1 100% N of RDN through UR (50% basal + 50% in two top dress), T_2 100% N of RDN through NC (50% basal + 50% top dressing), T_3 100% N of RDN through MC (50 % basal + 50% top dressing), T_4 100% N of RDN through CAN (50% basal + 50% top dressing), T_5 50% N through NC (basal) + 50% N through UR (25% basal + 25% in two top dress), T_6 50% N through MC (basal + 50% N through UR (25% basal +25% in two top dress), T_7 50% N through MC (basal) + 50% N through CAN (basal), T_8 50% N through NC (basal) +

Table 1. Number of flower head and flower weight in g per plant of chrysanthemum cv. Amal under different sources of nitrogen.

Treatments	Number of flower/plant			Flower weight (g) in g/plant		
	1st yr	2nd yr	Pool	1st yr	2nd yr	Pool
T_1	324.36	261.45	292.91	384.50	341.30	362.90
T_2	246.50	206.25	226.38	361.30	309.40	335.35
T_3	279.35	223.30	251.33	372.30	326.50	349.40
T_4	358.40	283.30	320.85	392.50	355.55	374.03
T_5	381.30	312.30	346.80	403.30	364.30	383.80
T_6	422.70	359.20	390.95	421.55	379.70	400.63
T_7	501.20	451.35	476.28	465.40	422.60	444.00
T_8	480.20	428.40	454.30	451.55	409.65	430.60
T_9	441.40	381.50	411.45	430.55	389.55	410.05
T_{10}	552.35	509.40	530.88	495.70	456.55	476.13
T_{11}	536.45	488.15	512.30	482.55	444.30	463.43
T_{12}	675.40	632.45	653.93	571.50	529.30	550.40
T_{13}	649.55	602.30	625.93	559.45	512.30	535.88
T_{14}	599.40	571.40	585.40	534.35	466.85	500.60
T_{15}	578.25	578.45	578.35	516.65	477.65	497.15
T_{16}	756.30	681.45	718.88	596.40	549.50	572.95
SE ±	24.175	24.348	19.443	15.946	19.192	13.878
CD at 5 %	69.62	70.85	57.34	47.52	57.76	43.16

50% N through CAN (basal), T_9 50% N through NC (basal) + 50% N through MC (basal), T_{10} 75% N through MC (basal) + 25% N through CAN (basal), T_{11} 75% N through MC (basal) + 25% N through CAN (basal), T_{12} 50% N through MC (basal) + 25% N through CAN (basal) + 25% N through UR (two top dress), T_{13} 50 % N through NC (basal) + 25% N through CAN (basal) + 25% N through UR (two top dress), T_{14} 50% N through MC (basal) + 25% N through NC (basal) + 25 % N through UR (two top dress), T_{15} 50% N through NC (basal) + 25% N through MC (basal) + 25% N through UR (two top dress), T_{16} 25% N through NC (basal) + 25% N through MC (basal) + 25% N through CAN (basal) + 25% N through UR (two top dress), Where, N=Nitrogen, RDN = Recommended dose of nitrogen, basal= Basal application.

Observations on yield parameters were recorded and subjected to statistical analysis following Panse and Sukhatme (1). For estimation of N, P and K content of leaves at vegetative,flower bud and flowering stages separately, Kjeldahl method, Colorimetric method and flame-photometer method as described by Jackson (2) were followed, respectively.

Results and Discussion

The number of flower head and flower weight (g) /plant was found to vary significantly in the plants raised under sole application of inorganic and organic fertilizer and their different combinations (Table 1). The maximum number of flower head (718.88) and flower weight (g)/plant (572.95 g) in pooled data were recorded in the plants raised with total RDN through 25% of each of neem cake, mustard cake, CAN and urea in combination (T_{16}) those were closer to the recorded yield of the plants both in number of flower and flower weight/plant raised under T_{12} treatments (50% N as MC + 25% N as CAN + 25% N as UR) and T_{13} treatments (50% N as NC + 25% N as CAN + 25% N as UR). The minimum number of flower head (226.38) and flower weight (g)/plant (335.35 g) was found in the plants received with 100% N supplied solely through neem cake (T_2). The plants under T_{16} treatment produced 57.88% of more yield in respect of pooled data of flower weight (g) over the plants grown under total RDN supplied solely through urea (T_1). Kononkov and Kiran (3) reported that the use of organic fertilizers does not exclude the subsequent addition of mineral fertilizers, which are better assimilated by plants in comparison with organic ones. Olsen et al. (4) reported oil cakes contain some percentage of oil, which prevent rapid conversion of organic nitrogen into available form. As nitrogen present in the oilcake is slow releasing, the nitrogen supply to the plant continued throughout the grow-

Table 2. NPK content in leaves at vegetative (V), flower bud initiation (B) and flowering (F) stages under the different sources of nitrogen (expressed as % dry weight).

Treatments	Nitrogen content			Phosphorus content			Potassium content		
	V	B	F	V	B	F	V	B	F
T_1	2.62	2.29	2.20	0.16	0.11	0.06	3.49	2.31	1.82
T_2	2.32	2.09	1.98	0.15	0.10	0.06	3.22	2.13	1.73
T_3	2.40	2.16	2.06	0.16	0.12	0.06	3.31	2.19	1.76
T_4	2.93	2.42	2.36	0.18	0.13	0.07	3.65	2.43	1.89
T_5	3.01	2.48	2.41	0.18	0.13	0.07	3.72	2.47	1.93
T_6	3.12	2.60	2.55	0.19	0.13	0.09	3.86	2.58	1.99
T_7	3.39	2.89	2.80	0.21	0.15	0.10	4.14	2.74	2.14
T_8	3.31	2.81	2.74	0.21	0.14	0.10	4.06	2.69	2.10
T_9	3.16	2.65	2.62	0.19	0.14	0.09	3.91	2.61	2.02
T_{10}	3.63	3.12	2.96	0.25	0.15	0.10	4.32	2.89	2.24
T_{11}	3.54	3.06	2.91	0.24	0.15	0.10	4.25	2.83	2.20
T_{12}	4.58	3.71	3.33	0.27	0.17	0.13	4.79	3.22	2.49
T_{13}	4.49	3.66	3.24	0.26	0.17	0.13	4.74	3.16	2.44
T_{14}	4.20	3.45	3.19	0.24	0.16	0.12	4.54	3.06	2.37
T_{15}	3.96	3.30	3.07	0.25	0.15	0.11	4.42	2.98	2.31
T_{16}	4.89	3.98	3.54	0.29	0.18	0.13	4.99	3.36	2.58
SE ±	0.149	0.121	0.103						
CD at 5%	0.44	0.36	0.32	NS	NS	NS	NS	NS	NS

ing period. In general, oilcake increased organic carbon, total and inorganic nitrogen and available phosphorus exchangeable potassium, calcium and magnesium contents of the soil. In accordance to the records of flower yield it was found that the plants raised with total RDN through 25% N as NC + 25% N as MC + 25% N as CAN + 25% N as urea as top dress (T_{16}) showed maximum N, P and K content in leaf (Table 2) at the different phenophases of crop growth as compared to other treatments. Where, the nitrogen (N) content in leaf tissues of the plants differed significantly in regardless of treatment combinations but the records on phosphorus (P) and potassium (K) content in leaves failed to differ significantly. In all stages of crop growth i. e. vegetative, flower bud and flowering stages the total nitrogen content in leaf tissues in the plants raised under T_{16} treatment 4.89, 3.98 and 3.54% on dry weight basis, respectively, that was closer to the records in the plants under T_{12} and T_{13} treatment.Whereas, the lowest nitrogen content in leaves was noticed in T_2 treatment i. e. sole application of neem cake in all stages of crop growth. The trend of total nitrogen content in leaf tissues in all phenophases of crop growth was found to be similar with the change in findings of flower yield under different treatments in the experiment. Comparatively it was observed that the treatments comprised of mostly oil cakes of total RDN noticed more nitrogen content in leaf that coincide the records of flower yield. The total N, P and K content in leaf of chrysanthemum, in general decreased gradually from vegetative to full bloom stages, irrespective of the sorces of nitrogen and their combinations. The results also indicate that the flower yield of chrysanthemum increased when leaf nitrogen increased. Application of total RDN through neem cake (T_2) showed poor yield of flowers/plant followed by application of total RDN through mustard cake (T_3) as compared to other treatments. This might be due to low level of leaf-N in all the stages of sampling. Das and Mukherjee (5) noted the adverse effects of neem cake on beneficial organisms present in the soil. Lunt et al. (6) reported that leaf- N levels should be maintained within 4.6—6.0 on dry weight basis for maximum production with quality flowers.

In the investigation, the plants received with 75% of total RDN through equal part of neem cake, mustard cake and CAN and remaining 25% as top dressing of urea, were outstanding in flower yield and nitrogen content in leaf. In general, the total N, P and K content in leaf of chrysanthemum decreased gradually from vegetative to full bloom stages. The yield of flowers increased when leaf nitrogen increased.

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