Madras Agric. J., 87(10-12): 609 - 612 October - December 2000
https://doi.org/10.29321/MAJ.10.A00519

Effect of NPK levels and seed setting treatments on the quality of oil, nutrient uptake and seed yield of sunflower

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Abstract : Field experiment was carried out during summer and South West Monsoon seasons of 1997 at Tamil Nadu Agricultural University Farm, Coimbatore to study the effect of NPK levels and seed setting treatments on nutrient uptake and quality of sunflower var. Co4. Among NPK levels, N:P:K at 80:40:40 kg ha^{-1} recorded higher seed yield and nutrient uptake. With respect to seed setting treatments, 0.2 per cent borax +2 per cent DAP spraying at ray floret opening stage improved the seed setting percentage. NPK levels significantly influenced the quality parameter, crude protein content. Among NPK levels, N:P:K at 80:40:40 kg ha^{-1} recorded higher crude protein contents in both the seasons. The seed setting treatment failed to exert any significant influence on crude protein and oil content. (***Key Words*** : *Sunflower, Nitrogen, Phosphorus, Potassium, Crude protein, Oil content, Seed setting, Nutrient uptake).*

Sunflower is becoming popular among the farmers because of its commercial value. Sunflower oil is preferred for its high quality and nutrition than other edible oils. Moreover its oil is reported to be helpful for maintaining the health of man, especially those with heart diseases. Sunflower, apart from source of edible oil, is a source of lecithin, tocopherols, furfurol and nutritious meal used mainly as bird and animal feed. Higher yields and quality of oil in sunflower can be realized only when all the three major nutrients are supplied in sufficient quantities and in a balanced way. Apart from nutrition, poor seed setting is often considered to be a major reason for low yields in sunflower. Some of the reasons for poor seed setting are self-incompatibility, absence of pollen vectors, insufficient nutrition, moisture stress and lack of growth regulators during seed formation and competition among developing seed themselves (Sindagi, 1979). It is reported that high levels of N increased N and P content and concentration of all plant components (Loubser and Human, 1993). Protein content in sunflower seed increased by the application of N but decreased by P fertilization, but the oil content evinced reverse response (Blamey and Chapman, 1981). Hence an attempt was made to study the effect of NPK levels and seed setting treatments on the nutrient uptake, quality of oil and seed yield of sunflower.

Materials and Methods

Field experiments were conducted at Tamil Nadu Agricultural University, Coimbatore during summer (March-May) and South West Monsoon (SWM) (June-September) seasons of 1997 to study the effect of NPK levels and seed setting treatments on the seed yield and oil quality of sunflower variety CO4. The experiment was laid out in a split plot design. Five levels of fertilizer (NPK) *viz.*, 40:20:20 kg ha^{-1} (N_1), 50:25:25 kg ha^{-1} (N_2), 60:30:30 kg ha^{-1} (N_3), 70:35:35 kg ha^{-1} (N_4) and 80:40:40 kg ha^{-1} (N_5) were applied in the main plots. In the sub plots, four different seed setting treatments *viz.*, control (S_1), hand pollination (S_2), spraying of 0.2 per cent borax +2 per cent diammoniumphosphate (DAP) (S_3) and 1 ppm brassinolide (S_4) at ray floret opening stage were tried in three replications during both the seasons. The soil was sandy clay loam and low in available phosphorus and high in available potassium with pH of 8.1. The N, P and K were supplied in the form of Urea (46%N), single super phoshpate (16%P) and muriate of potash (60%K_2O), respectively. Fifty per cent of N and full dose of P_2O_5 and K_2O were applied at the time of sowing and the remaining 50 per cent N was top dressed on 25 DAS. Hand pollination was done on 58 DAS by hand covered with soft cloth. At ray floret opening stage, one round of spraying was given with borax at 0.2 per cent combined with DAP at 2 per cent and brassinolide at 1 ppm as per the treatment schedule. The N, P and K uptake were estimated and calculated by using standard procedures.

The nitrogen content of the seed was multiplied by the factor 6.25 to get the crude protein content of seed and expressed in per cent. Oil yield was worked out by multiplying the oil content with seed yield and expressed in kg ha^{-1}.

Results and Discussion

The data on the effect of NPK levels and seed setting treatments on nutrient uptake, seed yield and

Table 1. N, P and K levels and seed setting treatments on seed yield, crude protein, oil content and oil yield

Treatment	Seed yield (kg ha^{-1})		Crude protein (%)		Oil content (%)		Oil yield (kg ha^{-1})	
	Summer 97	SWM *97*	Summer 97	SWM *97*	Summer 97	SWM *97*	Summer 97	SWM *97*
N_1	1227	1010	18.16	16.98	38.3	38.1	471	385
N_2	1353	1118	18.57	17.31	38.1	37.8	515	423
N_3	1434	1207	18.79	17.48	37.8	37.6	543	455
N_4	1508	1284	18.86	17.51	37.6	37.5	568	475
N_5	1540	1313	18.91	17.52	37.5	37.5	578	481
SE_d	5.35	4.63	0.07	0.06	0.29	0.23	4.1	2.81
CD (p=0.05)	12.3	10.6	0.16	0.13	NS	NS	9.3	6.49
S_1	1074	914	18.65	17.38	37.7	37.6	406	344
S_2	1458	1224	18.68	17.38	37.8	37.6	552	461
S_3	1593	1329	18.74	17.41	37.9	37.8	604	502
S_4	1525	1279	18.70	17.39	37.8	37.6	577	481
SE_d	8.8	7.5	0.13	0.11	0.34	0.26	5.6	4.2
CD (p=0.05)	18.1	15.2	NS	NS	NS	NS	11.4	8.5
N at S								
SE_d	17.9	15.2	0.25	0.22	0.59	0.50	11.6	8.61
CD (p=0.05)	37.1	31.3	NS	NS	NS	NS	NS	NS
S at N								
SE_d	19.8	16.6	0.27	0.24	0.62	0.53	12.5	9.39
CD (p=0.05)	40.3	34.1	NS	NS	NS	NS	NS	NS

oil quality of sunflower under two different seasons are presented in the table 1 and 2. The NPK level and seed setting treatments in both the seasons significantly influenced the N, P and K uptake at harvest. The highest nutrient uptake was observed with a NPK level of 80:40:40 kg ha^{-1} (N_5). The highest dry matter production (DMP) evinced in this treatment might be the reason for the increased uptake of N, P and K. The result confirms with the findings of Mishra *et al.* (1995). Among the seed setting treatments, spraying 0.2 per cent borax +2 per cent DAP (S_3) at ray floret opening stage recorded higher NPK uptake in both the seasons. The results confirms with the findings of Susheela (1996).

The crude protein content varied with NPK levels. In both the seasons, application of NPK at 80:40:40 kg ha^{-1} (N_5) recorded higher N content in the seed resulted in higher crude protein content (18.91 and 17.52%, respectively). The increased N content in the seed may be due to the application of sufficient quantity of N (80 kg ha^{-1}). The result confirms with the findings of Uppar and Kulkarni (1989). The NPK levels and seed setting treatments did not influence the oil content as this parameter, being a genetic and normally and agronomic manipulations will not have any influence on oil content (Sathiyavelu *et al.* 1994).

The oil yield is an important factor, decided upon the oil content and grain yield of sunflower. Among the NPK levels, N:P:K at 80:40:40 kg ha^{-1} during summer and SWM '97 was the best treatment in recording higher oil yields. This increase might be evidenced by the increased seed yield in the corresponding treatment. The result confirms with

Table 2. N, P and K levels and seed setting treatments on dry matter production and N, P and K uptake at harvest (kg ha^{-1})

Treatment	Summer 1997				SWM 1997			
	DMP at Harvest (kg ha^{-1})	N uptake (kg ha^{-1})	P uptake (kg ha^{-1})	K uptake (kg ha^{-1})	DMP at Harvest (kg ha^{-1})	N uptake (kg ha^{-1})	P uptake (kg ha^{-1})	K uptake (kg ha^{-1})
N_1	5022	61.4	21.3	45.9	4298	50.6	18.4	43.9
N_2	5333	67.3	23.7	47.2	4581	60.9	20.4	44.9
N_3	5574	72.1	25.1	48.3	4801	64.6	21.5	45.7
N_4	5781	75.8	26.2	49.3	5029	67.7	22.2	46.3
N_5	5832	76.2	26.5	50.1	5067	67.9	22.4	46.7
SE_d	29.7	0.22	0.08	0.16	17.5	0.17	0.06	0.15
CD (p=0.05)	68.7	0.50	0.18	0.36	40.6	0.40	0.14	0.34
S_1	5147	62.8	22.7	46.3	4523	58.5	19.9	44.4
S_2	5536	70.1	24.3	48.9	4858	63.6	21.1	46.5
S_3	5716	74.3	25.6	50.4	1997	67.5	21.9	47.8
S_4	5639	72.1	25.1	49.5	4932	65.5	21.7	47.2
SE_d	36.4	0.45	0.16	0.30	30.1	0.40	0.14	0.29
CD (p=0.05)	74.5	0.91	0.33	0.62	61.3	0.81	0.29	0.59
N at S								
SE_d	76.4	0.88	0.32	0.61	60.8	0.79	0.28	0.57
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
S at N								
SE_d	81.5	0.98	0.36	0.68	67.2	0.88	0.32	0.64
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS

the findings of Sonue and Chaskar (1991). Seed setting treatments had no impact on the oil content of seeds. Spraying 0.2 per cent borax +2 per cent DAP (S_3) at ray floret opening stage recorded higher oil yield. This was wholly due to increased seed yield obtained with the seed setting treatment (Sakthivel, 1995).

Study clearly indicates that there are possibilities to increase the seed setting by spraying combination of borax and DAP at ray floret opening stage. Double the time of recommended dose of fertilizer application found to increase the yield by margin 25.5 per cent indicating the response of sunflower to the increased dose of fertilizer.

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(Received : November 1999 ; Revised : April 2001)

Madras Agric. J., 87(10-12): 612 - 614 October - December 2000

Analysis of nutritional and anti-nutritional factors in certain *Cenchrus* grass species

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Abstract : Six cultures of *Cenchrus* grass were compared with the variety Co-1 based on nutritional and antinutritional factors. The culture CAZRI 75 recorded highest crude protein content. Crude fibre was highest in CAZRI 1263. Dry matter production was highest in the culture CAZRI 1128. Analysis of mineral content has revealed culture CAZRI 75 to have highest inorganic phosphorus and potassium contents. CAZRI 1263 and CAZRI 1128 recorded highest calcium and magnesium contents respectively. The check variety Co-1 had the lowest oxalate content. Co-1, CAZRI 1106 and CAZRI 75 recorded highest thiamine, riboflavin and carotene contents respectively. Micronutrients iron, zinc and manganese were highest in Co-1, while CAZRI 1263 recorded highest copper content. (***Key Words*** : *Cenchrus, Nutritional and Antinutritional Factors)*.

The nutritive value of forages is often estimated on the basis of the content of chemical constituents i.e. their potential to meet the energy, protein and mineral requirements of the animal. Crude protein and crude fibre have long been used for this purpose. With increased animal production, more emphasis is put on the supply of specific nutrients required for the synthesis of macromolecules such as (milk) protein, (milk) fat, lactose and immunoglobulins. Therefore in addition to energy, the potential to supply specific compounds for the synthesis of animal tissues and products should be considered more precisely. In addition to this, antinutritional factors present in forages influence the availability of vital nutrients to the animals and hence play a major role in determining the quality of forages.

Materials and Methods

Seven *Cenchrus* grass Spp. *viz.*, CAZRI 358, CAZRI 75, IGFRI 3813, CAZRI 1128, CAZRI 1106, CAZRI 1263 and the variety Co-1 grown in the specimen plot of Department of Agricultural Botany, Agricultural College, Killikulam, were analysed for certain nutritional and antinutritional factors to assess their forage value. The first cutting was done 60 days after planting and subsequent cuttings after 40-45 days interval. A total of eight cuttings were done per year.

The crude protein, crude fibre content and dry matter production of the seven cultures of *Cenchrus* grass spp. were estimated. The dry matter content was estimated for the total yield of eight cuttings. The mineral content in terms of inorganic phosphorus, calcium, potassium and magnesium were estimated. The antinutritional factor oxalate content was estimated in all the seven spp. of *Cenchrus* grass. The vitamins such as thiamine, riboflavin and carotenoids of the *Cenchrus* grass spp. were analysed. The seven *Cenchrus* grass spp. were estimated for