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Effect of N, P and K levels and seed setting treatments on yield attributing characters and yield of sunflower

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Abstract : Field experiment was carried out at Tamil Nadu Agricultural University, Coimbatore during summer and South West Monsoon seasons of 1997 to study the effect of NPK levels and seed setting treatments on the yield attributing characters of sunflower var. CO4. The yield attributing characters viz., head diameter, number of seeds head^{-1}, seed filling percentage and 100 seed weight were significantly influenced by NPK levels. Whereas the seed setting percentage was influenced both by NPK levels and seed setting treatments. Application of N: P: K at 80:40:40 kg ha^{-1} was found to be superior in enhancing the yield and yield attributing characters in both the seasons. Among the seed setting treatments, application of 0.2 per cent borax with 2 per cent diammoniumphosphat (DAP) spray at ray floret opening stage was found to be superior in influencing the seed filling percentage in both the seasons. (*Key Words : Sunflower, nitrogen, phosphorus, potassium, borax, diammoniumphosphate and seed setting).*

Sunflower is a promising oilseed crop becoming popular among the farmers due to its adaptable nature to any situation. However the yield of sunflower is based upon several external and internal factors. Poor seed setting and filling has been one of the most commonly encountered problems in sunflower. Even under favourable conditions, the average percentage of seed setting in India is around 60 per cent and it may be reduced to 20 per cent in certain seasons and locations (Seetharam, 1976). Poor seed filling is reflected in terms of higher per cent of hallow seeds and lower test weight. This problem demands greater attention due to its adverse effect on seed yield. Not much work has been done to find out the combined effect of fertilizer levels and seed setting treatments on yield and yield attributing characters of sunflower. Hence a study was carried out to find out the effect of NPK levels and seed setting treatments on yield and yield attributing characters of sunflowers.

Materials and Methods

The experiments was carried out at Tamil Nadu Agricultural University, Coimbatore during summer and South West Monsoon (SWM) seasons of 1997 to study the effect of NPK levels and seed setting treatments on the yield and yield attributing characters of sunflower. The experiments were 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 1ppm brassinolide (S_4) at ray floret opening stage were tried in three replications in both the seasons. The soil was sandy clay loam and low in available nitrogen medium in available phosphorus and high in available potassium with a 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 days after sowing (DAS). Hand pollination was done by rubbing with soft cloth at 58 DAS. At ray floret opening stage, one round of spraying was given with borax at 0.2 per cent along with DAP at 2 per cent and brassinolide at 1 ppm as per there treatment schedule. Observation on yield attributing characters viz., head diameter, number of seed head^{-1}, seed filling percentage, 100 seed weight and seed yield was recorded at harvest.

Results and Discussion

The data on the effect of NPK levels and seed setting treatments on head diameter, number of seeds head^{-1}, seed filling percentage, 100 seed weight and yield under different seasons are given in the Table 1 and 2. Head diameter was higher in summer than in SWM season. In both the seasons, N_5 (N:P:K: at 80:40:40 kg ha^{-1}) recorded higher head diameter and it was on par with N_4 (N:P:K: at 70:35:35 kg ha^{-1}). Increased availability and uptake of nutrients at higher levels of NPK

promote the formation of larger head size (Uijinaiah et al., 1995). The seed setting treatments did not influence the head diameter significantly in both the seasons. Interaction between NPK levels and seed setting treatments was not observed in both the seasons. Application of N: P: K at 80:40:40 kg ha^{-1} (N_5) registered the higher number of seeds $head^{-1}$ in both the seasons and it was comparable with N_4 (N:P:K: at 70:35:35 kg ha^{-1}), but were superior to N_3, N_2 and N_1. This increase was also due to increased head diameter, NPK availability and uptake. Similar view has been expressed by Shivakumar et al., (1994). Ther was no significant difference in total number of seed $head^{-1}$ due to seed setting treatments in both the seasons. However S_3 (0.2 per cent borax + 2 per cent DAP at ray floret opening stage) recorded numerically higher number of seed $head^{-1}$ in both the seasons. In respect of interaction effects, it was found to be non-significant in both the seasons.

There was significant difference in percentage of filled seeds due to NPK levels and seed setting treatments. N_5 (N: P: K: at 80:40:40 kg ha^{-1}) recorded significantly higher filled seeds percentage of 88.6 and 88.5 in summer and SWM respectively. This is significantly higher than the filled seed percentage observed at lower levels of NPK (N_4, N_3, N_2 and N_1). Similar view has been expressed by Narwal and Malik (1985). Similarly seed setting treatments had a significant influence on percentage of filled seeds in both the seasons. Combined spraying of borax and DAP (S_3) recorded highest filled seeds percentage (91.3 in summer and 90.7 in SWM) and was superior to S_4, S_2 and S_1. The increased seed filling percentage might be due to better pollen germination, increased viability and fertilizing capacity of the pollen. The result confirms the findings of Susheela (1996). In respect of interaction effects, it was found to be significant in both the seasons. N_5S_3 (N: P: K at 80:40:40 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spray) recorded the highest filled seed percentage of 94.4 in summer and 94.2 in SWM and was superior to all other treatment combinations.

Hundred seed weight was significantly affected by NPK levels in both the seasons. During summer, N_5 (N: P: K at 80:40:40 kg ha^{-1}) recorded highest hundred seed weight and was superior to lower levels of NPK. Whereas in SWM, N_5 was comparable with N_4, but was superior to lower levels of NPK. This increase was due to increased NPK availability and uptake at higher levels of NPK application. Similar view has been expressed by Uijinaiah et al., (1995). Among the seed setting treatments S_3 (0.2 per cent borax + 2 per cent DAP spray) recorded higher hundred seed weight. Treatments S_1, S_2 and S_4 did not affect the hundred seed weight significantly in both the seasons. The interaction effect was found to be non-significant in both the seasons.

The highest seed yield of 1540 kg ha^{-1} and 1313 kg ha^{-1} were observed with the NPK level 80:40:40kg ha^{-1} (N_5) during summer and SWM respectively which is 30 and 25.5 per cent higher compared to NPK applied at 40:20:20 kg ha^{-1} (N_1) in both seasons, respectively. Several researchers reported similar findings on the effect of different levels of NPK on seed yield of sunflower. Sirbu and Ailincai, (1992) reported that 80 kg N ha^{-1} recorded the highest seed yield. The result also confirms the findings of Sarmah *et al.*, (1995).

Higher seed setting percentage (91.8 and 91.4 per cent) by combined spraying of borax (0.2%) and DAP (2.0%) at ray floret opening stage (S_3) recorded higher grain yield compared which is significantly different from the other seed setting treatments. The increased seed filling percentage might be due to the higher P content in plants during the reproductive phase with DAP spray which in turn resulted in proper seed development and filling and thus increased the seed yield. This corroborated the findings of Kene *et al.*, (1990) that foliar application of P at flowering stage increased the seed yield of sunflower. The higher seed set with borax spray might be due to better pollen germination, increased pollen viability and the fertilizing capacity of the pollen as reported by Shatilov and Ikonnikov (1970). Increase in seed yield of sunflower with borax dusting at ray floret opening stage was reported by Tufail Ahmedkhan *et al.*, (1990). The result confirms the findings of Susheela (1996) that combined spraying of borax 0.2 per cent and DAP 2 per cent at ray floret opening stage increased the yield of sunflower.

The present study revealed that the combined application of N: P: K at 80:40:40 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spraying at ray floret opening stage was found to be more effective in increasing the seed yield by improving the yield attributing characters of sunflower.

References

Kene, H.K., Wankhade, S.T. and Sagare,B.N. 1990. Influence of nutrient spray on yield and oil content of sunflower. *Ann. Plant Physiol.*,4: 246-248.

Table 1. Effect of N, P and K levels and seed setting treatments on seed filling percentage.

Treat.	Summer 97						Treat.	SWM 97					
	N_1	N_2	N_3	N_4	N_5	S Mean		N_1	N_2	N_3	N_4	N_5	S Mean
S_1	74.3	76.4	78.2	79.8	80.5	77.8	S_1	73.5	75.8	77.7	79.4	80.2	77.3
S_2	81.7	83.8	85.8	87.7	88.6	85.5	S_2	81.1	83.3	85.4	87.4	88.5	85.2
S_3	86.3	89.9	91.8	93.9	94.4	91.3	S_3	85.6	95.3	91.3	93.5	94.2	90.7
S_4	84.8	86.3	88.6	90.4	90.8	87.9	S_4	83.2	85.8	88.2	90.1	90.7	87.6
N Mean	81.5	84.1	86.1	87.9	88.6		N Mean	80.8	83.5	85.7	87.6	88.5	

	SE_d	CD
N Mean	0.17	0.40
S Mean	0.18	0.37
N at S	0.40	0.83
S at N	0.41	0.84

	SE_d	CD
N Mean	0.04	0.08
S Mean	0.07	0.14
N at S	0.15	0.30
S at N	0.16	0.33

Table 2. Effect of N, P and K levels and seed setting treatments on yield attributing characters and yield of sunflower during summer and SWM 1997.

Treat.	Head diameter (cm)		Number of seed $head^{-1}$		Hundred seed wt (g)		Seed yield (kg ha^{-1})	
	Summer	SWM	Summer	SWM	Summer	SWM	Summer	SWM
N1	12.9	11.8	474	433	4.27	4.23	1227	1010
N2	14.1	12.8	536	488	4.48	4.45	1353	1118
N3	14.8	13.2	592	538	4.80	4.76	1434	1207
N4	15.2	13.5	642	579	5.22	5.19	15.08	1284
N5	15.3	13.6	655	585	5.24	5.20	1540	1313
SE_d	0.06	0.05	3.6	3.3	0.02	0.01	5.35	4.63
CD	0.14	0.12	8.4	7.7	0.05	0.03	12.3	10.6
S1	14.3	12.8	576	521	4.76	4.74	10.74	914
S2	14.4	12.9	579	523	4.77	4.74	1458	1224
S3	14.6	13.2	583	526	4.86	4.82	1593	1329
S4	14.5	13.1	581	525	4.80	4.76	1525	1279
SE_d	0.09	0.08	5.9	5.4	0.03	0.02	8.8	7.5
CD	NS	NS	NS	NS	0.06	0.04	18.1	15.2
N at S								
SE_d	0.18	0.16	12.1	11.0	0.07	0.05	17.9	15.2
CD	NS	NS	NS	NS	NS	NS	37.1	31.3
S at N								
SE_d	0.20	0.18	13.2	12.1	0.09	0.07	19.8	16.6
CD	NS	NS	NS	NS	NS	NS	40.3	34.1

Narwal.S.S. and Malik, S.D. 1985. Influence of intercropping on the yield and food value of rainfed sunflower and companion legumes. *Exptl. Agric.*, **21**: 395-401.

Sarmah, P.C., Katyal, S.K. and Bhola, A.L. 1995. Nutrient uptake and quality of spring sunflower as influenced by fertility levels and plant population. *Haryana Agrl. University J. of Research.* **25**(1/2): 21-28.

Seetharam, A., 1976. Performance of sunflower varieties and the role of various factors affecting seed yield. Paper presented at subject matter seminar on sunflower production technology, University of Agricultural Sciences, Banaglore.

Shatilov, F.V. and Ikonnikov, P.A. 1970. Effect of soil drought on reproductive capacity of sunflower top dressed with phosphorus and boron. *Soil Fert.*,**33**(3): 302.

Shivakumar, Patel, A.L., Tomer, R.P.S. and Dahiya, B.S. 1994. Influence on N and 2,3,5 TIBA on hybrid seed yield and its components in sunflower. *Crop. Res. (Hisar).***8**(3): 457-460.

Sirbu, M. and Ailincai, D. 1992. The effect of long term fertilizer applications including NPK on the grain yields and quality of sunflowers. *Cercetari Agronomic in Moldova.* **25** (3) : 181-187.

Susheela, N. 1996. Studies on the influence of phosphors and boron on seed set and quality of sunflower. M.Sc. Thesis. Tamil Nadu Agrl. Univ., Coimbatore.

Tufail Ahmedkhan, Venugopal, K., Chikka Devaiah and Seenappa, K. 1990. Effects of secondary nutrients and boron on some growth characters and yield in sunflower. *J. Oilseeds Res.*, 7: 136-139.

Uijianiah, U.S., Shambulingappa, K.G. and Seenappa, K. 1995. Effect of different levels of nitrogen and spacing on production and quality of BSH-1 hybrid sunflower. *Mysore J. of Agrl. Sci.*, **29**(1): 9-13.

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CoC 99061-A new sugarcane variety for Tamil Nadu

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Abstract : CoC 99061 is an intervarietal hybrid of Co 6806 x Co 740. It is a mid late sugarcane variety with a duration of 330 - 360 days. It is an erect, medium thick cane with high yield potential. It is non lodging and non flowering. CoC 99061 recorded an average cane yield of 130.33 t/ha, CCS % of 11.94 (commercial cane sugar) and yield of 15.59 t/ha. It is moderately resistant to red rot disease and tolerant to borers. (*Key Words : Sugarcane, CoC 99061, Variety).*

Tamil Nadu ranks first in the world average yield of sugarcane with 99.3 t/ha. High yielding and high quality varieties have played a major role in the increase of the cane as well as sugar yield in Tamil Nadu over years. Mid late planting mostly suffers by the incidence of the Early shoot borer and none of the variety is resistant to early shoot borer. High temperature during maturity causes inversion of sucrose resulting in the deterioration of quality of canes. CoG 93076, Co 85019, Co 8021 and Co 6304 are the ruling varieties available under mid late season in which CoG 93076 is a medium quality cane and Co 6304, and Co 8021 are reported to be susceptible to red rot disease.

Hence attempt were made at Sugarcane Research Station, Cuddalore to find out superior varieties for high yeild and quality. As a result, Coc 99061, a high yield and high quality variety over CoG 93076 was released during 1999 for cultivation in Tamil Nadu and Pondicherry.

Materials and Methods

The new sugarcane cultivar is an intervarietal of Co 6806 x Co 740. Hybridization was made at National Hybridization Garden, Sugarcane Breeding Institute, Coimbatore during 1989-90 and seedlings were raised from the fluff at Sugarcane Research Station, Cuddalore. In subsequent studies, the clone was identified and clonal number assigned as C 90025. Further yiedl trials conducted with this clone during 1990-95 in comparison with Co 6304 and CoG 93076, proved it as an alternative to CoG 93076. The clone was tested in 59 locations for two years during 1996-