



RESEARCH PAPER

Performance of sunflower hybrids in rainfed vertisols situation under southern agro climatic zones of Tamil Nadu

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Abstract : A field study was carried out to evaluate the yield potential of 10 sunflower hybrids under rainfed vertisols condition at Black Soil Farm, Agricultural Research Station, Kovilpatti, Tamil Nadu during *Rabi* Season of 2016 -18. The hybrids such as Krishian, Arathana, Ganga GK 2002, Suvathi, Sun bread 293, Sun bread 275, Arunodhaya, Sunny, Modern were compared with variety CO 2. Among the hybrids significantly higher plant height was recorded in CO 2 (123.7 and 113.0 cm) and the lowest in sunny (91.1 and 71.7 cm). However, maximum capitulum diameter was observed in Sunny (19.4 and 15.9 cm) and minimum in Sun bread 293 (11.3 and 11.1 cm). The early maturing varieties were modern (90 and 75 days). Among the hybrids significantly higher seed yield was observed in Suvathi (1157 and 979 kg/ha), Sun bread 275 (1174 and 1105 kg/ha) and Sunny (1235 and 1236 kg/ha) over variety CO2 (763 and 514 kg/ha). The highest oil content was in Sunny (37.3 and 37.6 %) followed by Krishna (35.6 and 35.4 %) and Ganga GK 2002 (35.5 and 35.4 %). However, the maximum oil yield was recorded in Sunny (461 and 465 kg/ha) over other hybrids.

Key Words : Sunflower, Oil content, Weather parameters, Yield, Rainfed

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INTRODUCTION

Sunflower (*Helianthus annuus* L.) was introduced during seventies as an oilseed crop to India. It gained importance and popularity as a commercial oilseed crop of India under rainfed conditions due to its short growth period coupled with photo insensitivity which enables the cultivation of crop in any season, its wide adaptability to different agro-climatic regions and soil types and its easy cultivation. While the area is on the increase, the productivity has been low (736 kg/ha) owing to poor seed

filling (Singh *et al.*, 2018). Several approaches have been attempted to enhance seed filling and thereby productivity. One such approach is identification of high yielding, more seed filling hybrids to enhance the productivity. The availability of hybrids for cultivations has phenomenally increased during the last decade, which is expected to improve yield and disease control of the crop significantly. Drought and incidences of diseases and insect pests are the major constraints in sustaining the higher productivity of sunflower in India. At present,

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sunflower crop is being grown with coverage of more than 0.49 million hectare and production is 0.43 million tones in India. Wide variation exists in flowering and maturity periods of sunflower across environments. On an average, crop matures in about 95 days in the South to about 100 days in the North. High productivity in North can be attributed to longer duration of the crop and high applied inputs. In coming years, major emphasis is to be placed on increasing productivity and yield stability across environments (Kaya *et al.*, 2012). This necessitates to study the performance evaluation of high seed yield cultivars with inbuilt resistance to biotic and abiotic stresses. Farmers in Southern agroclimatic region are preferring to grow sunflower than any other oilseed crop as an alternate crop if Northeast monsoon delays. But since last threefour years, general yield of sunflower crop is declining in this zone due to non availability of better hybrids which are high yielding with drought tolerance traits. To cater the needs of the above, the present investigation was undertaken to screening of private and public sunflower hybrids suitable for Southern agroclimatic zone of Tamil Nadu.

MATERIAL AND METHODS

The field experiment was conducted during the *Rabi* season of 2016-18 at Agricultural Research Station, Tamil Nadu Agricultural University, Kovilpatti, Tamil Nadu, India. The experiment place is located in Southern Agroclimatic Zone of Tamil Nadu State, which falls between 9°17' N latitude and 77°87' E longitude with an altitude of 106 meters above mean sea level. The soil of the experimental site belongs to deep black soil with clay texture. The soil fertility status revealed that low in available nitrogen (220 kg ha⁻¹), medium in soil available phosphorous (10.1 kg ha⁻¹) and high in available potassium (455 kg ha⁻¹). The experiment was conducted with 9 different sunflower hybrids (Krishian, Arathana, Ganga GK 2002, Suvathi, Sun bread 293, Sun bread 275, Arunodhaya, Sunny and Modern) and one variety (CO 2) as check. The trial was laid out in a Randomized Block Design with four replications. The fertilizers were applied in basal applications as per the rainfed recommended package (40:50:40 kg N:P₂O₅:K₂O/ha). The experimental data was statistically analysed by using SAS programme.

RESULTS AND DISCUSSION

The results obtained from the present investigation

as well as relevant discussion have been summarized under following heads :

Weather parameters during crop periods :

Rainfall between October and January, the most effective rainfall period for sunflower growth was 234.7 mm and 245.4 mm which were received in 16 and 18 rainy days (Fig. 1 and 2), respectively. No single irrigation was given during the cropping period. The average maximum temperature recorded during the cropping season was 33.05°C and 32.43°C while minimum was 20.10° C and 21.78°C which are very congenial for sunflower growth (Kazemini *et al.*, 2009 and Singh *et al.*, 2005). The maximum relative humidity recorded during the crop season was 63.2 and 87.4 per cent and minimum was 52.0 and 49.9 per cent, which favoured the built up of pests like tobacco cut worm, gram pod borer and diseases such as powdery mildew, rust which were controlled by spraying pesticides and fungicides as per the recommendation.

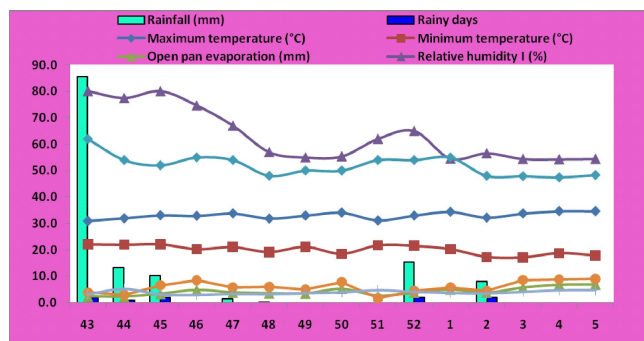


Fig. 1: Weather parameters in cropping season during 2016-17

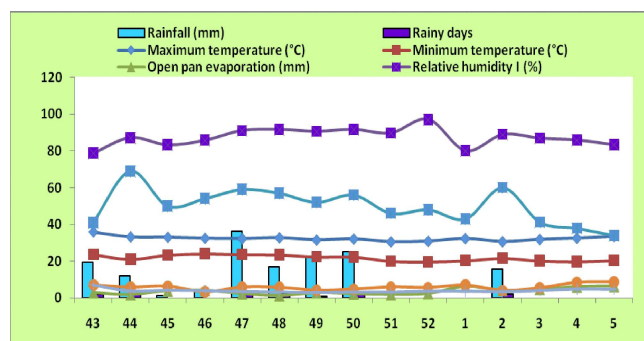


Fig. 2: Weather parameters in cropping season during 2017-18

Soil moisture content during crop periods :

Soil moisture contents were decreasing from 43rd standard meteorological week to 49th standard meteorological week (Fig. 3). Again the soil moisture

contents were increased from 50th standard week to 4th standard week due to rainfall events during the crop period. Soil moisture contents were higher in upper soil layer (0 - 15 cm) upto 48th standard week over lower layer (30 - 45 cm soil depth). From 49th standard week, the lower soil layer (30 - 45 cm) was observed with higher soil moisture content up to harvest (5th standard week) during 2016-17. Soil moisture contents were decreasing from sowing to 46th standard meteorological week during cropping period 2017 - 18 (Fig. 4). Later, the soil moisture contents were increased from 47th and 48th standard weeks because of receipt of rainfall. Soil moisture contents were again decreased from 50th to 52nd standard week and again the soil moisture content increased from 1st to 2nd standard weeks thereafter it decreased upto harvest.

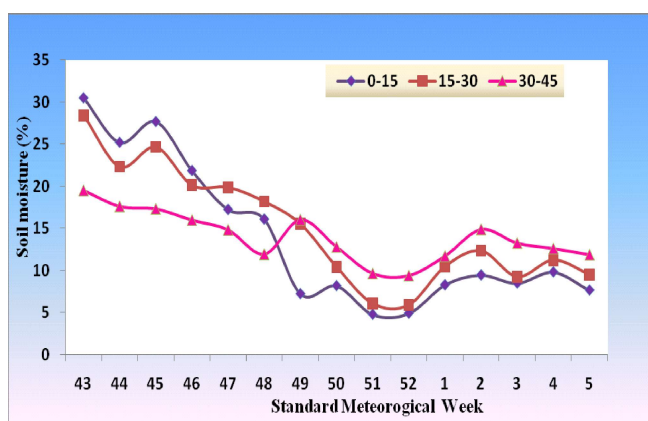


Fig. 3: Soil moisture content (%) in cropping season during 2016 - 17

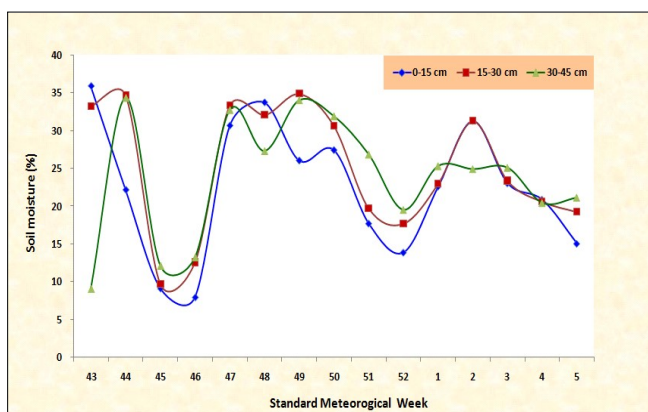


Fig. 4: Soil moisture content (%) in cropping season during 2017-18

Growth and yield attributes :

The analysis of variance for growth parameters viz., plant height, days to 50 % flowering, days to maturity,

head diameter, 100 seed weight, volume weight, seed yield and oil content indicated significant difference among hybrids. The co-efficient of variation (CV) was high (14.8 %) for seed yield and low (2.1 %) for oil content. High CV indicates hybrids are highly variable for seed yield and least variation was observed for seed oil content. Different sunflower hybrids have a significant effect on growth attributes, viz., plant height, days to 50 per cent flowering and days to maturity.

Among the sunflower hybrids, the highest plant height was recorded significantly by CO 2 (123.7 and 113.0 cm) over other hybrids and the shortest hybrid was Arunodhaya (91.1 cm) during 2016 - 17 and Sunny (71.1 cm) during 2017 - 18 (Table 1 and 2). Similar results were reported by Parameswarappa and Lamani (2004). CO 2 and Suvathi (53 days) during 2016 - 17 and Modern (40 days) during 2017 - 18 were earliest to complete days to 50 % flowering while Sun bread 293 (90 days) during 2016 - 17 and Modern (75 days) during 2017 - 18 were early maturing cultivars. The results also revealed that different sunflower hybrids have a significant effect on yield attributes like head diameter, 100-seed weight and volume weight. Among sunflower hybrids, head diameter was significantly high for Sunny (19.4 cm and 15.9 cm) over Sun bread 293 (11.3 and 11.1 cm). Among hybrids, the highest volume weight was recorded by Suvathi (43.2 and 44.5 g/100 ml) differed significantly from check variety (CO 2) and the lowest volume weight was recorded by Arunodhaya (36.5 and 37.1 g/100 ml). The highest 100 seed weight was recorded by Sun bread 275 (5.5 and 5.7 g) and the lowest by CO 2 (4.2 and 4.1 g). Hybrids such as Aradhana, Ganga GK 2002, Sun bread 293, Sun bread 275 and Sunny differed significantly from check variety (CO 2) for 100 seed weight. The yield and yield components of sunflower were differed due to performance of different sunflower hybrids to weather and management practices. Similar type of synergetic effect was also reported by Barmaki *et al.* (2009) and Aravinda Kumar *et al.* (2010).

Seed yield and oil content :

The hybrids have differed for seed yield in comparison to check variety. However, the highest seed yield was recorded by Sunny (1235 and 1236 kg/ha) and the lowest seed yield by CO 2 (763 and 514 kg/ha). Most of the hybrids have differed among themselves for oil content in comparison to check variety (CO 2). The highest oil content was recorded by Sunny (37.3 and 37.6 %). The lowest was observed with Modern (31.3

and 31.1 %) during both years. Hybrids have differed among themselves for oil yield but comparison to check variety (CO 2). However, the highest oil yield was

recorded by Sunny (461 and 465 kg/ha) while the lowest by CO 2 (245 and 162 kg/ha). Similar results were observed in sunflower crop by Kazem *et al.* (2013).

Table 1 : Performance of promising sunflower hybrids for yield contributing characters and yield of sunflower during 2016 - 17

Hybrids	Plant height (cm)	Days to 50 % flowering	Days to maturity	Head diameter (cm)	100 seed weight (g)	Volume weight (g/100 ml)	Seed yield (kg/ ha)	Oil content (%)	Oil yield (kg/ ha)
CO ₂	123.7	53	95	12.7	4.2	39.8	763	32.1	245
Krishian	92.5	58	98	13.1	4.3	40.7	806	35.6	287
Arathana	111.1	59	95	13.0	5.2	39.2	916	32.7	300
Ganga GK 2002	93.7	55	100	11.4	4.8	39.4	960	35.4	340
Suvathi	97.0	53	98	12.3	5.2	43.2	1157	34.6	400
Sun bread 293	95.4	54	98	11.3	4.8	42.7	955	35.3	337
Sun bread 275	105.9	60	95	13.1	5.5	41.2	1174	34.5	405
Arunodhaya	91.1	56	95	12.9	5.1	36.5	812	35.3	287
Sunny	93.1	54	102	19.4	5.1	40.7	1235	37.3	461
Modern	96.3	56	90	12.6	4.8	37.0	937	31.3	293
C.D. (P=0.05)	19.1	5.1	5.2	1.7	0.6	4.1	307	1.1	111
CV (%)	11.2	5.3	10.4	8.3	9.9	5.6	14.5	1.6	5.4

Table 2 : Performance of promising sunflower hybrids for yield contributing characters and yield of sunflower during 2017 - 18

Hybrids	Plant height (cm)	Days to 50 % flowering	Days to maturity	Head diameter (cm)	100 seed weight (g)	Volume weight (g/100 ml)	Seed yield (kg/ ha)	Oil content (%)	Oil yield (kg/ ha)
CO ₂	113.0	50	85	12.5	4.1	40.7	514	31.8	162
Krishian	72.6	55	90	13.0	4.3	41.5	539	35.4	191
Aradhana	94.6	60	95	14.7	5.2	39.9	867	34.6	300
Ganga GK 2002	83.5	55	90	13.0	5.1	40.2	713	35.4	252
Suvathi	76.5	55	90	11.4	4.8	44.5	979	32.7	320
Sun bread 293	97.7	50	85	11.1	5.3	43.9	639	34.5	220
Sun bread 275	80.7	50	85	13.3	5.7	42.5	1105	32.1	355
Arunodhaya	90.1	50	85	13.6	4.8	37.1	521	31.3	163
Sunny	71.7	55	90	15.9	5.2	41.3	1236	37.6	465
Modern	95.9	40	75	12.9	5.1	38.7	847	31.1	263
C.D. (P=0.05)	5.5	5.1	4.6	1.3	0.5	4.4	248	1.4	92
CV (%)	3.7	5.3	8.2	5.9	11.5	7.9	14.8	2.1	6.2

Table 3: Correlation co-efficient of growth parameters, yield attributes and yields of sunflower during 2016 - 17

Properties	Plant height	Days to 50 % flowering	Days to maturity	Head diameter	100 seed weight	Volume weight	Seed yield	Oil content	Oil yield
Plant height		0.039	-0.315	-0.135	-0.203	0.036	-0.244	0.202	-0.633
Days to 50 % flowering	0.039		0.918*	-0.075	0.350	-0.234	-0.027	-0.245	-0.116
Days to maturity	-0.315	0.918*		0.575	0.016	-0.147	0.368	0.332	0.269
Head diameter	-0.135	-0.075	0.575		0.194	0.008	0.501	0.524	0.451
100 seed weight	-0.203	0.350	0.016	0.194		0.087	0.813	0.624	0.203
Volume weight	0.036	-0.234	-0.147	0.008	0.087		0.501	0.540	0.382
Seed yield	-0.244	-0.027	0.368	0.501	0.813	0.501		0.414	0.984**
Oil content	0.202	-0.245	0.332	0.524	0.624	0.540	0.414		0.270
Oil yield	-0.633	-0.116	0.269	0.451	0.203	0.382	0.984**	0.270	

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 4 : Correlation co-efficient of growth parameters, yield attributes and yield of sunflower during 2017 - 18

Properties	Plant height	Days to 50 % flowering	Days to maturity	Head diameter	100 seed weight	Volume weight	Seed yield	Oil content	Oil yield
Plant height		-0.386	-0.386	0.454	-0.246	-0.276	-0.088	-0.373	-0.064
Days to 50 % flowering	-0.386		0.986**	0.114	-0.052	0.265	-0.011	0.645	0.010
Days to maturity	-0.386	0.986**		0.114	-0.052	0.265	-0.011	0.645	0.010
Head diameter	0.454	0.114	0.114		-0.374	-0.544	0.224	-0.377	0.233
100 seed weight	-0.246	-0.052	-0.052	-0.374		0.151	0.820*	-0.014	0.735
Volume weight	-0.276	0.265	0.265	-0.544	0.151		-0.365	0.416	-0.374
Seed yield	-0.088	-0.011	-0.011	0.224	0.820*	-0.365		-0.381	0.872*
Oil content	-0.373	0.645	0.645	-0.377	-0.014	0.416	-0.381		-0.293
Oil yield	-0.064	0.010	0.010	0.233	0.735	-0.374	0.872*	-0.293	

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Correlation co-efficients:

The correlation among different morphological characters with oil content recorded highly significant negative correlation between days to maturity and days to 50 % flowering ($r=0.918$ and 0.986) indicating that selection of hybrids of early maturity types may lead to selection for early flowering types (Table 3 and 4)(Ahmad *et al.*, 1992 and Singh *et al.*, 2005). Seed yield also significantly correlated with oil yield ($r=0.984$ and 0.872). 100 seed weight was significantly correlated with seed yield ($r=0.813$ and 0.820).

Conclusion :

Sunflower being a nutrient exhaustive crop, the hybrids respond to both nutrients and water. Hence, the study recommends the promising hybrids Sunny, Sun Bread 275 and Suvathi to the farmers for higher seed and oilyield in the Southern agroclimatic zone of Tamil Nadu under rainfed condition.

REFERENCES

- Aravinda Kumar, B.N., Bhat, S.N. and Shanwad, U. K. (2010). Effect of micronutrients on growth and yield in sunflower. *Current Adv. Agric. Sci.*, **2** (1) : 51 - 52.
- Aziz Qureshi, A., Singh, R.K., Sen, D., Baishya, L.K., Singh, A.P., Vishnuvardhan Reddy, A., Avasthe, R.K. and Pati, D. (2018). Evaluation of sunflower hybrids for their suitability in north eastern hill regions of India. *J. Oilseeds Res.*, **35**(2): 116 - 120.
- Barmaki, E., Jalili, F., Eyvazi, A. and Rezaei, A. (2009). Fe, Zn and B foliar spray on yield and quality of two sunflower cultivars. *J. Res. Agric. Sci.*, **26** (6) : 2 - 13.
- Devidayal and Agarwal, S.K. (1998). Response of sunflower (*Helianthus annuus* L.) to organic manures and fertilizers. *Indian J. Agronomy*, **43** (3) : 469 - 473.
- Kaya, Y., Jovic, S. and Miladinovic, D. (2012). Sunflower. In S. K. Gupta (Ed.) *Technological innovations in major world oil crops*, **1** : 85-130.
- Kazem, S.N., Nabavi Kalat, S.M. and Sadrabadi Haghghi, R. (2013). The study on effects of bio-fertilizer and foliar spray with complete fertilizer on yield and yield components of sunflower (*Helianthus annuus* L.). *Internat. J. Agron. & Plant Production*, **4**(12) : 3404-3409.
- Kazemini, S.A., Edalat, M. and Shekoofa, A. (2009). Interaction effects of deficit irrigation and row spacing on sunflower growth, seed yield and oil yield. *African J. Agricultural Research*, **4** (11) : 1165 - 1170.
- Parameswarappa, S.G. and Lamani, K.D. (2004). Performance of public and private bred sunflower hybrids in northern transitional zone of Karnataka. *Karnataka J. Agric. Sci.*, **17** (3) : 568 - 570.
- Shanwad, U. K., Shanker Goud, I., Sudhakarbabu, S.N., Vinod Kumar, W., Kanatti, Anand and Kulkarni, Vikas (2016). Performance of sunflower hybrids in black cotton soils of Northern Karnataka, India. In: Proceeding of 19th International sunflower Conference, May 29th - June 3rd, 2016, Edirne, Turkey. pp. 896 - 904.
- Singh, K.N., Raju, N.S., Subba, A.R., Abhishek, R., Sanjay, S., Samanta, R.K. and Maji (2005). Prescribing optimum dose of nutrients for targeted yield through soil fertility map in Andhra Pradesh. *J. Indian Society of Agricultural Statistics*, **59**(2): 131 - 140.
- Singh, Raghavendra, Avasthe, R.K., Babu, Subhash, Sharma, Pusal, Md. Vrushali and Aziz Qureshi, A. (2018). Performance of sunflower (*Helianthus annuus* L.) hybrids under organic management conditions in mid hills of Sikkim. *Indian J. Hill Farming*, **31** (2): 249 - 253.

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