Journal of Tropical Agriculture 63(4): 268-272, 2025
ISSN 0971-636X (Print), ISSN 0973-5399 (Online)

DOI No.: 10.63599/JTA.2025.1644

Short Communication

Identification and characterization of high yielding sunflower genotypes suitable for North Eastern Region of Tamil Nadu

Y. Poorna Chandra Rao[1], C. Kalaiyarasan[1]*, S. Kandasamy[1],
P. Sudhakar[1] and K. Dhanasekaran[2]

[1]*Department of Agronomy, Annamalai University, Annamalai Nagar – 608002, Tamil Nadu, India*
[2]*Department of Soil Science and Agriculture chemistry, Faculty of Agriculture, Annamalai University, Annamalai Nagar – 608 002, Tamil Nadu, India*

Received on 24 September 2025; received in revised form 29 October2025, accepted 10 November2025.

Abstract

Field experiment was conducted at the Experimental Farm, Department of Agronomy, Annamalai University, between February and May 2023, to evaluate sunflower genotypes in terms of growth and yield characters of the crop within the northeastern zone of Tamil Nadu.The field experiment comprised seven treatments laid out in randomised block design (RBD), with three replications.The treatments wereseven genotypes *viz.,* two varieties and five hybrids (T_1 - CO 4, T_2 - DRSF 108, T_3 - COSFH 4, T_4 - KBSH 44, T_5 - KBSH 53, T_6 - Sunbred and T_7 - Jaya).The results demonstrated that the evaluated sunflower genotypes varied significantly in growth and yield parameters. Among the genotypes, COSFH 4 (T_3) outperformed all other genotypes tested, recording superior values for growth attributes *viz.,* plant height (140.32cm), leaf area index (3.52), dry matter production (3206.49 kg ha^{-1}), and chlorophyll content index (13.42 CCI), and yield attributes *viz.,* capitulum diameter (22.45 cm), total seed set $capitulum^{-1}$(850.58), number of filled seeds$capitulum^{-1}$(690.56), test weight (5.94g), seed yield (1850.37kg ha^{-1}) and stalk yield (3248.71kg ha^{-1}). The minimum values for growth and yield attributes were observed for the genotype CO 4.

Key word: Genotypes, Growth, **S**unflower, Yield

Introduction

Sunflower (*Helianthus annuus L.*) is a major annual oilseed crop which ranks fourth after groundnut, rapeseed-mustard and soybean, playing a crucial role in reducing the lack of edible oil in the Indian diet.Sunflower seeds provide abundant amount of oil and protein, contains 21% protein, 55% fat and 19% carbohydrates. Sunflower oil is valued for its substantial levels of unsaturated fatty acids, chiefly oleic and linoleic acids, which together constitute about 91% of the total fatty acid profile (FSSAI,2022).

At present, the country is experiencing a significant shortage of oilseeds. Factors such as low domestic production, heavy reliance on imports, and a widening demand–supply gap have collectively made oilseeds a costly market commodity. In this context, enhancing the productivity of major oilseed crops such as sunflower emerges as a difficulty faced by both scientists and farmers (Sharma et al., 2016). To address the current supply-demand imbalance, the oilseed production has to be increased and dependence on imports of oil could be reduced. Among the major oilseeds, sunflower is an important oilseed crop with several advantages such as photo thermo-insensitive, a fast-maturing, deep-rooted and highly adaptable crop that reliably enhances oilseed production (Langhi et al., 2021). Sunflower is recognized as a high-potential oilseed crop, possessing both superior yield capacity and greater oil content compared to conventional crops such as mustard and rapeseed (Babu et al.*,* 2015).

India contributes approximately 4 per cent (around one million tons) of the global sunflower output, with a cultivation area of nearly 2.34 million hectares which is 10% of the world sunflower area. Tamil Nadu ranks as one of the major contributors to sunflower with 0.07 lakh hectares in area, production of 0.06 lakh tonnes with an average productivity of 866 kg ha^{-1} (DA and FW, 2025). In India, domestic production satisfies only ten percent of sunflower demand, while the remaining ninety per cent is met through imports. In view of the growing economic and nutritional demand for edible oils, it has become essential to strengthen domestic oilseed cultivation either through the adoption of improved production technologies or by introducing genotypes with enhanced yield potential and stability under

* Author for Correspondences: Phone :; Email: kalai77.agri@gmail.com: ORCID: https://orcid.org/0000-0002-1580-1172

diverse agro-climatic conditions (Meena et al., 2022).

The adoption of improved sunflower genotypes is critical for expanding cultivation areas and enhancing production to meet the growing demand for edible oils. Genotype selection plays a pivotal role in ensuring uniform crop establishment, efficient performance under low input conditions, and improved yield. Sunflower genotypes inherently vary in their genetic constitution, and the superior performance of hybrids can be attributed to their enhanced genetic potential to efficiently utilize available resources, resulting in greater dry matter accumulation and higher seed yield. The genetic findings suggest that hybridization can generate heterotic effects, which may be effectively exploited for developing sunflower hybrids with enhanced yield potential. (Zaman et al., 2023; Hussain et al., 2025).

Based on the above, the experiment was conducted with the objective to identify suitable genotype to optimize sunflower yield in North Eastern Region of Tamil Nadu.

Materials and methods

Field experiment was carried out in experimental farm, Department of Agronomy, Faculty of Agriculture, Annamalai University, Tamil Nadu, India, duringFebruary to May 2023 to evaluate the growth and yield performance of various sunflower genotypes. The site is geographically situated at the spatial coordinates 11°23’ N and 79°43’ E”. The experimental soil was classified as clay loam, with a nutrient profile characterized by low available nitrogen (265.4 kg ha^{-1}), medium available phosphorus (19.3 kg ha^{-1}), high available potassium (302.6 kg ha^{-1}) and low available sulphur (9.1 kg ha^{-1}). The experiment was laid out in randomized block design (RBD) with three replications and the treatmentscomprisedseven sunflower genotypes *viz.,* two varieties and five hybrids (T_1 - CO 4, T_2 - DRSF 108, T_3 - COSFH 4, T_4 - KBSH 44, T_5 - KBSH 53, T_6 - Sunbred and T_7 - Jaya). The genotypes were sown at 45 cm ×30 cm spacing for varieties and at 60 cm ×30 cm spacing for hybrids. The varietal characters of genotypes are given in (Table1). Fertilizers were applied as per the recommended dosage for varieties (60:30:30kg NPK ha^{-1}) and hybrids (60:90:60kg NPK ha^{-1}) with 45 kg S ha^{-1} in all treatments (TNAU, 2025). Half the dose of recommended nitrogen and the entire dose of phosphorus and potassium were applied as basal through urea, DAP and MOP respectively. The remaining half ofnitrogen was applied at 25 DAS. Sulphur was incorporated as basal dose through gypsum. Hand pollination was done at 48 days to enhance seed setting and yield. Observations on growth and yield attributes were recorded on five randomly tagged plants within each net plot, at 30 DAS and 60 DAS and at harvest. The experimental data were statistically analysed following the procedures outlined by Gomez and Gomez (2010). The critical variation for significant results was calculated at 5 per cent degree of probability.

Results and discussion

Growth attributes

Sunflower genotypes exhibited significant variation in growth and yield attributes, particularly in width of the capitulum, number of seeds per capitulum, and total plant dry matter.

The growth attributes of sunflower (Table 2) varied significantly with the genotypes.The genotype COSFH 4(T_3) resulted in highest values for plant height 71.32 cm, 131 cm and 140 cm, leaf area index 2.35,4.29 and 3.52, dry matter production 740 kg ha^{-1}, 2901 kg ha^{-1} and 3206 kg ha^{-1} at 30, 60 DAS and at harvest correspondingly, and chlorophyll content index13.42 CCI at 60 DAS, this was followed by KBSH 44 (T_4) recorded a plant height 69.30 cm, 128 cm and 136 cm, leaf area index 2.19, 4.13 and 3.40, dry matter production 702 kg ha^{-1}, 2794 kg ha^{-1} and 3077 kg ha^{-1} at 30, 60 DAS and at harvest and chlorophyll content index 12.95 CCI at 60 DAS respectively. The superior performance of the genotype COSFH 4 may be attributed to its genetic constitution and higher adaptability, particularly traits such as enhanced leaf area development and chlorophyll content which govern key physiological processes like photosynthesis, nutrient assimilation, and hormonal regulation, thereby contributing to improved growth and yield

Table 1. Varietal description of Sunflower genotypes

Genotypes	Duration (days)	Plant height (cm)	Head diameter (cm)	100 - seed weight (g)	Average yield (kg ha^{-1})
			Varieties		
CO 4	85	120 - 150	13 - 16	5.6	1250 - 1300
DRSF 108	90 - 95	120 - 150	16 - 18	5.6 - 6.0	1400
			Hybrids		
COSFH 4	90 - 100	180 - 200	26 - 30	5.5 - 5.8	2200 - 2600
KBSH44	95 - 100	178 - 186	23 - 26	5.4	2200 - 2300
KBSH 53	95 - 100	180	16 - 19	5.1 - 5.3	1700 - 2700
SUNBRED	95 - 100	140 - 160	17 - 19	6.0	1600 - 2500
JAYA	90 - 95	140 - 160	17 - 19	5.0 - 6.0	1500 - 2500

Table 2. Performance of sunflower genotypes on growth attributes of sunflower grown in North Eastern Region of Tamil Nadu

Treatments	Plant height (cm)			LAI DMP (kg ha^{-1})			Chlorophyll content			Index (CCI)
	30 DAS	60 DAS	At Harvest	30 DAS	60 DAS	At Harvest	30 DAS	60 DAS	At Harvest	60 DAS
T_1 – CO4	64.65	113	120	1.23	3.13	2.81	504	2117	2248	9.62
T_2 – DRSF 108	65.34	115	123	1.55	3.49	2.92	567	2264	2427	10.21
T_3 - COSFH 4	71.32	131	140	2.35	4.29	3.52	740	2901	3206	13.42
T_4 – KBSH 44	69.30	128	137	2.19	4.13	3.40	702	2794	3077	12.95
T_5 – KBSH 53	68.02	123	133	2.02	3.97	3.28	688	2683	2924	12.21
T_6 - SUNBRED	67.17	120	130	1.88	3.81	3.16	650	2542	2723	11.46
T_7 – JAYA	66.11	118	127	1.70	3.64	3.02	603	2435	2560	10.83
SE. d	0.315	1.15	1.55	0.063	0.072	0.031	6.92	51.43	59.21	0.24
CD(p=0.05)	0.65	2.16	3.15	0.13	0.15	0.10	14.02	104.89	120.43	0.44

performance. COSFH 4 tend to show greater vegetative vigour, characterized by taller plants, larger leaf areas, as depicted in Table 2. all of which contribute to higher photosynthetic capacity and resource use efficiency. These traits enable such genotypes to accumulate more dry matter and sustain growth longer during the critical stages of development. This is in accordance with the reports of Yousif and Hussain. (2019) and (Kalaiyarasan et al., 2024).

The genotype CO 4 (T_1) recorded the lowest values for plant height 64.65 cm, 113 cm, 120 cm, leaf area index 1.23, 3.13, 2.81, and dry matter production 504 kg ha^{-1}, 2117 kg ha^{-1}, 2248 kg ha^{-1} at 30 DAS, 60 DAS, and at harvest, respectively, with a chlorophyll content index 9.62 CCI at 60 DAS.The less favourable growth attributes observed in CO 4 may be attributed to less responsive and poorly adapted to the prevailing environmental conditions. Similar trend in genotypes was reported by (Gawale et al., 2022).

Yield attributes

Yield-contributing traits and seed yield of sunflower also differed significantly among the genotypes, Table 3. The genotype COSFH 4 (T_3) significantly registered maximum head diameter 22.45 cm, total number of the highest seeds capitulum^{-1} 850, number of filled seeds capitulum^{-1} 690 and hundred seed weight 5.94 g. The higher seed yield1850kg ha^{-1}and stalk yield 3428 kg ha^{-1}were observed in T_3.This was closely followed by the genotype KBSH 44 (T_4) which registered significant values for yield attributes such ashead diameter 21.41cm, total number of seeds head^{-1} 830, number of filled seeds head^{-1} 649, hundred seed weight 5.73 g, seed yield 1770 kg ha^{-1} and stalk yield 3258 kg ha^{-1}. The reasons attributed for maximum values in COSFH 4 might be due to vigorous vegetative development, enhanced dry matter accumulation, and improved efficiency of nutrient utilization and adaptability to the given agro-climatic conditions, which are governed by traits such as greater leaf area indexand higher chlorophyll concentration. These characteristics likely enhanced resource allocation during the critical reproductive stage, thereby enabling COSFH 4 to achieve higher yields (Ravikumar et al., 2021; Biswas et al., 2024).

The genotype CO 4 exhibited minimum values for head diameter 16.17 cm, total number of seeds capitulum^{-1} 573, number of filled seeds capitulum^{-1} 451, and hundred seed weight 4.46 g. Furthermore, CO 4 resulted in lower seed yield 1052 kg ha^{-1} and stalk yield 1789 kg ha^{-1}.This low yield could be attributed to the combined effect of small capitulum, minimum number of filled seeds, reduced seed weight, and its limited adaptation to the prevailing agro-climatic conditions. The similar trend for genotypes aligns with the findings of Nath et al. (2017) and Reddy et al. (2017). Seed yield exhibited a direct positive linear relationship with genotype, leaf area index, hundred-seed weight, and head diameter, confirming the influence of genotypic variation on yield (Fig. 1). The present results follow a similar trend with different sunflower genotypes adoption and performance in a particular localitywasearlier reported by (Kalaiyarasan et al., 2020; Dharanidharan et al., 2025).

Table 3. Performance of sunflower genotypes on yield attributes and yield of sunflower grown in North Eastern Region of Tamil Nadu

Treatments	Head diameter (cm)	Total number of seeds capitulum^{-1}	Number of filled seeds capitulum^{-1}	Hundred seed weight(g)	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})
T_1 - CO4	16.17	573	451	4.46	1052	1789
T_2 - DRSF 108	17.09	626	489	4.60	1264	2046
T_3 - COSFH 4	22.45	850	690	5.94	1850	3428
T_4 - KBSH 44	21.41	830	649	5.73	1770	3258
T_5 - KBSH 53	20.35	771	612	5.39	1703	2739
T_6 - SUNBRED	19.32	721	575	5.02	1613	2471
T_7– JAYA	18.07	682	531	4.87	1449	2295
SE. d	0.41	9.87	14.98	0.076	30.16	72.56
CD(p=0.05)	0.88	18.76	30.14	0.151	62.34	159.85

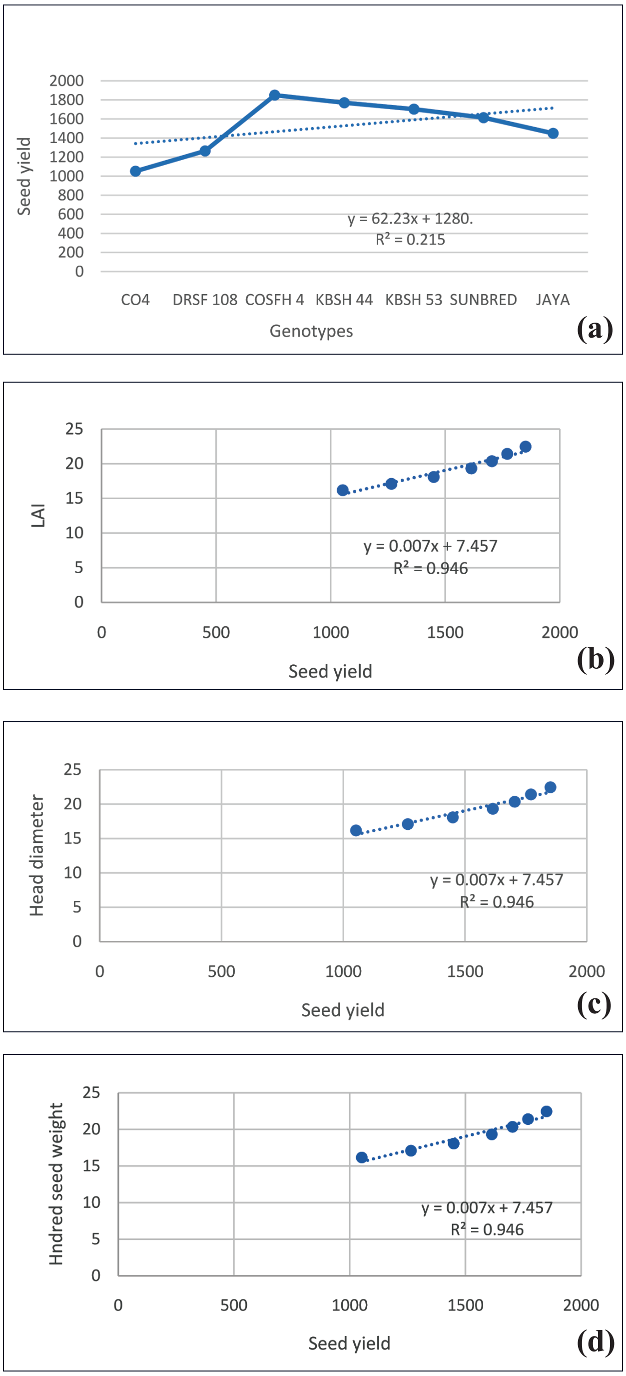

Figure 1. Linear Relationship between seed yield with a) Genotypes, b) LAI, c) Hundred seed weight, d) Head diameter

Table 4. Economics of sunflower genotype grown in North Eastern Region of Tamil Nadu

Treatments	Total Cost of cultivation(₹)	Gross return(₹)	Net return(₹)	Benefit cost ratio
T_1 - CO4	56916	75771	18854	1.33
T_2 - DRSF 108	56916	91068	34151	1.60
T_3 - COSFH 4	59845	133226	73381	2.22
T_4 - KBSH 44	59844	128913	69068	2.15
T_5 - KBSH 53	59844	125537	65692	2.09
T_6 - SUNBRED	59844	116200	56355	1.94
T_7 – JAYA	59844	104433	44588	1.74

Economics

The gross return, net return and benefit cost ratio of different sunflower genotypes are outlined in the Table 4. The fundamental goal of any agricultural innovation is to optimize returns on each invested unit. Assessing this helps in determining the ideal input levels required to maximize net profit. For farmers to adopt a technology, it must demonstrate economic viability through increased net gains or a favourable benefitcost ratio. In this study, COSFH 4 (T_3) yielded the highest gross return of ₹1,33,226ha^{-1}and a net return of ₹73,381 ha^{-1} followed by KBSH 44 (T_4) with gross return of ₹1,28,913 ha^{-1}and net returns of ₹ 69,068 ha^{-1}. In contrast, CO 4 (T_1) produced the lowest gross return of ₹75,771 ha^{-1} and net return of ₹18,854 ha^{-1}.

The benefit cost analysis revealed that the genotype COSFH 4 (T_3) achieved the highest benefit cost ratio (2.22), followed by KBSH 44 (T_4) with a BCR of 2.15, whereas the lowest value of 1.33 was obtained in CO 4 (T_1). The superior economic performance of COSFH 4 and KBSH 44 could be attributed to their greater biomass accumulation and more efficient translocation of assimilates toward the reproductive sink, resulting in improved yield components and higher economic returns. Similar genotypic differences in yield potential and profitability were also observed by Gul and Coban (2020) and Mahapatra et al. (2024).

Conclusion

The results revealed significant variation in plant growth, yield, and overall economic performance among the sunflower genotypes evaluated. Differences in morphological and physiological traits notably influenced yield and its contributing parameters. Among the genotypes studied, COSFH 4 exhibited superior growth and yield performance, whereas CO 4 recorded the lowest values.

Acknowledgement

The authors gratefully acknowledge the research associate committee for their invaluable guidance, constructive suggestions and consistent support rendered during the course of this investigation. Special thanks are extended to Dr. C. Kalaiyarasan, Research Supervisor, for his valuable guidance and encouragement. The constructive suggestions and continuous support from Dr. S. Kandasamy, Dr. P. Sudhakar, and Dr. K. Dhanasekaran are sincerely appreciated.

References

Babu, S., Singh, R., Avasthe, R.K., Yadav, G.S. and Chettri, T.K. 2015. Sunflower (*Helianthus annuus*L) – a promising oil seed crop for mid hill ecosystems of Sikkim Himalayas. *Pop. Kheti*, 3(4): 30–34.

Biswas, S., Nwe, L.L., Das, R., Mahato, M. and Dutta, D. 2024. Productivity of soybean (*Glycine max*) varieties under different levels of integrated nutrient management. *Indian J. Agric. Sci.*, 94: 713–718. doi: 10.56093/ijas.v94i7.120900

Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare, Government of India Home. https://agriwelfare.gov.in/ (Accessed: 27 July 2025).

Dharanidharan, V., Kalaiyarasan, C., Kandasamy, S., Venkatakrishnan, D., Madhavan, S., and Ramesh, S. (2025). Impact of Organics and Inorganics on Growth and Yield of Sunflower Based Intercropping System. *Ecology, Environment & Conservation* (0971765X), *31*. doi: 10.37446/jinagri/rsa/11.4.2024.1-7

Food Safety and Standards Authority of India. 2022. *Food Safety and Standards (Advertising and Claims) Regulations: Sunflower oil health claims*. Government of India.

Gawale, A.V., Bhalerao, A. S., Bende, T. S. and Pawar, G. S. 2022. Study of soybean genotypes to examine the genotypic variation in physiological growth parameters. *The Pharm. Innov. J.*, 12(1): 845–852. www.thepharmajournal.com/archives/2023/vol12issue1/PartI/12-1-131-812.pdf

Gomez, K. A. and Gomez, A. A. 2010. *Statistical procedures for agricultural research*, 2nd edn. New York: Wiley.

Gul, V. and Coban, F. 2020. Determination of yield and quality parameters of oil sunflower genotypes grown in Turkey. *Turk. J. Field Crops*, 25(1): 9–17. doi: 10.17557/tjfc.609749

Hussain, S., Khalili, A., Qayyum, A. 2025. Optimizing sunflower (*Helianthus annuus* L.) hybrids growth, achene and oil yield through soil applied sulphur and zinc. *Sci. Rep.*, 15: 13829. doi: 10.1038/s41598-025-96800-2

Kalaiyarasan, C., Gandhi, G. 2024. Response of sunflower genotypes to sulphur nutrition grown under Veeranamayacut regions. *Current Res. Progress in Agric. Sci*, 4: 21–28. doi.org/10.9734/bpi/crpas/v4/2165

Kalaiyarasan, C., Tamizhselvan, D., Jawahar, S., Ezhilkumar, S., Suseendran, K., Madhavan, S., & Ramesh, S. (2020). Effect of sulphur and boron on growth and yield of hybrid sunflower. *Plant Archives (09725210)*, *20*(1).

Langhi, A. M., Patel, S. R., Narwade, A. V., Patel, R. K., Chaudhari, K. N. and Chhatrola, H. N. 2021. Studies on genotype × environment interactions of sunflower hybrids (*Helianthus annuus* L.). *J. Oilseeds Res.*, 38(2): 211–221.

Mahapatra, K. S., Banerjee, H., Pahari, A., Banik, A., Nayak, J. and Pal, S. 2024. Variation in growth, yield and quality traits of spring sunflower (*Helianthus annuus* L.) due to sowing method and nitrogen level under coastal agroecosystem. *Indian J. Agric. Sci.*, 94(7): 1234–1242. doi: 10.56739/bkc68670

Meena, N., Mohamed, Y. M. and Mohamed, A. M. 2022. Response to spacing and weed management on sunflower (*Helianthus annuus* L.) productivity. *J. Oilseeds Res.*, 39(1): 21–25.

Nath, A., Karunakar, A. P., Kumar, A. and Nagar, R. K. 2017. Effect of sowing dates and varieties on soybean performance in Vidarbha region of Maharashtra, India. *J. Appl. Nat. Sci.*, 9(1): 544–550.

Ravikumar, C., Karthikeyan, A., Senthilvalavan, P. and Manivannan, R. 2021. Effect of sulphur, zinc and boron on the growth and yield enhancement of sunflower (*Helianthus annuus* L.). *J. Appl. Nat. Sci.*, 13(1): 295–300. doi: 10.31018/jans.v13i1.2569

Reddy, Y. R., Kumar, S., Singh, R. P. and Rao, K. S. 2017. Factors influencing seed yield in sunflower under varying agronomic practices. *Crop Sci. J.*, 57(3): 1231–1239.

Sharma, P., Dupare, B. U. and Patel, R. M. 2016. Soybean improvement through research in India and socio-economic changes. *Legume Research – An International Journal*, 39: 935–945. doi: 10.18805/lrv0iOF.11190

Tamil Nadu Agricultural University (TNAU). 2025. *Sunflower crop production guide.* Coimbatore: Directorate of Crop Management, Tamil Nadu Agricultural University. https://agritech.tnau.ac.in (Accessed: 26 October 2025).

Yousif, D. P. and Hussain, A. 2019. Effect of genotype and plant density on growth characteristics and yield of peanut (*Arachishypogaea* L.) in central region of Iraq. *Agric. Res. Technol: Open Access J.*, 19(3): 101–106. doi: 10.19080/ARTOAJ.2018.19.556092

Zaman, R. Q. U., Rana, H. S., Rana, A. and Anwar, A. M. 2023. Genetic variability analysis for achene yield and its related traits in sunflower. *Int. J. of Agri. Biosci.*, 12(3): 143–152. doi: 10.47278/journal.ijab/2023.057