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Manasa Reddy Rikkala
 Department of Genetics and
 Plant Breeding, College of
 Agriculture, Dr. BSKKV,
 Dapoli, Ratnagiri,
 Maharashtra, India

Dr. SS Desai
 Sr. Scientist, AICRP on
 Agroforestry, College of
 Forestry, Dapoli, Ratnagiri,
 Maharashtra, India

Dr. UB Pethe
 Associate Professor (CAS),
 Department of Agricultural
 Botany, College of Agriculture,
 Dapoli, Ratnagiri,
 Maharashtra, India

Dr. AV Mane
 Deputy Director of Research,
 Dr. BSKKV, Dapoli,
 Ratnagiri, Maharashtra, India

Dr. TN Thorat
 Associate Professor,
 Department of Agronomy,
 College of Agriculture, Dapoli,
 Ratnagiri, Maharashtra, India

Corresponding Author:
Manasa Reddy Rikkala
 Department of Genetics and
 Plant Breeding, College of
 Agriculture, Dr. BSKKV,
 Dapoli, Ratnagiri,
 Maharashtra, India

Genetic variability in sunflower (*Helianthus annuus* L.)

Manasa Reddy Rikkala, Dr. SS Desai, Dr. UB Pethe, Dr. AV Mane and Dr. TN Thorat

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Abstract

A field experiment was conducted at Department of Agricultural Botany, College of Agriculture, Dapoli, Ratnagiri during *Rabi* 2022-23. Forty sunflower genotypes were cultivated in Randomized block design with two replications. The aim of the experiment was to determine the genetic variability for seed yield and oil content. The results of the study recorded a broad range of variability for all the characters under study. The traits head diameter (cm), plant height at harvest (cm) and seed yield per plant (g) recorded high phenotypic and genotypic coefficients of variation. High heritability was observed for all the traits except 100 seed weight and seed filling percentage, the characters plant height at harvest (cm), head diameter (cm) and seed yield per plant (g) showed maximum genetic advance as a percent of mean. Hence these traits should be used in future sunflower improvement programmes.

Keywords: Sunflower, variability, heritability, genetic advance

Introduction

Sunflower (*Helianthus annuus* L.) is an important edible oilseed crop grown all over the world because of its short crop duration. It exhibits heliotropism (plant turns towards the direction of sun). In India it is commonly known as 'Suryamukhi'. The oil content of sunflower is about 38-42%. Sunflower oil also contains 25% proteins, 30% carbohydrates and 4% ash, 20-25% essential vitamins like A, D, E and K. Seed yield is a dependent character which is influenced by the environment. The variation present among different sunflower genotypes is useful for further crop improvement. Heritability describes the amount of heritable portion present in the variation. Heritability along with genetic advance helps in determining the genetic gain. Phenotypic and genotypic variance, heritability, genetic advance are essential factors to evaluate magnitude of variability, thus helps in the selection of elite genotypes in sunflower crossing programmes. Therefore, the present experiment was conducted to study the genetic variability among forty sunflower genotypes.

Material and Methods

The Germplasm of forty sunflower genotypes was collected from oilseeds research station, Lathur. During *Rabi* 2022-23 the experiment was conducted at Education and Research farm, Department of Agricultural Botany, College of Agriculture, Dapoli in randomized block design with two replications. Plants were grown with a spacing of 60 cm between the rows and 30 cm between the plants and all the general cultivation practices were followed in irrigated condition. Data was recorded for eight characters like days to 50 percent flowering, days to maturity, plant height at harvest (cm), head diameter (cm), seed filling percentage (%), 100 seed weight, seed yield per plant (gm) and oil content (%). Estimation of genetic parameters viz., phenotypic coefficient of variation (PCV), genotypic coefficient of variation (GCV), heritability and genetic advance was done by Johnson *et al.* (1955)^[1]

Table 1: List of the genotypes

Sr. No	Genotype	Sr. No	Genotype
1.	IB-11	21.	GMU-1000
2.	GMU-934	22.	CSFI-1527
3.	IB-3	23.	GMU-477
4.	NDLP-01	24.	EC-625779
5.	MRHA-2	25.	IL-77
6.	GMU-101	26.	EC-279309-2
7.	NO-30	27.	EC-444424
8.	CSFI-1515	28.	EC-625730-1
9.	CSFI-99	29.	IR-1-1
10.	PB-153	30.	IC-594897
11.	SCG-87	31.	EC-75268
12.	NDI-1	32.	NDSI-3
13.	IC-594897-1	33.	GMU-1060
14.	EC-601924	34.	CSFI-1509
15.	EC-402644	35.	DRSF-106
16.	GMU-520	36.	SCG-107
17.	IC-502017	37.	ID-19
18.	GMU-500	38.	AKSFI-22
19.	GMU-498	39.	Morden (C)
20.	IB-240	40.	P Bhaskar (C)

Result and Discussion

The results of the present experiment were depicted in the Tables 2 and 3. Table 2 represents the data related to analysis of variance showing significant difference among the genotypes for all the eight traits.

Phenotypic and genotypic coefficient of variation

Data of the genetic parameters was provided in the Table 3 highest values for phenotypic coefficient of variation were noticed in traits like head diameter (16.79), seed yield per

plant (15.67), plant height at harvest (14.54), 100 seed weight (8.98), oil content (8.66), days to 50 percent flowering (8.57), whereas lower values were noticed in seed filling percentage (8.01) and days to maturity (6.01).

Genotypic coefficient of variation was higher in head diameter (14.24) followed by plant height at harvest (13.53), seed yield per plant (12.81), oil content (8.22), days to 50 percent flowering (7.67) whereas lower values were noticed in 100 seed weight (6.63), seed filling percentage (6.00) and days to maturity (5.23). The results of both phenotypic and genotypic coefficients of variation were similar with Mamta *et al.* (2017) [3], Reena *et al.* (2019) [5] and Sandhya sree *et al.* (2022) [6].

Heritability and genetic advance

The traits like oil content (90.05%), plant height at harvest (86.69%) and days to 50 percent flowering (80.18%) recorded higher heritability whereas days to maturity (75.57%), head diameter (71.92%) and seed yield per plant (66.89%) recorded moderate heritability. Lowest heritability was recorded in seed filling percentage (56.15%) and 100 seed weight (54.46%).

Genetic advance as a percentage of mean ranged from 9.27% (seed filling percentage) to 25.96% (plant height at harvest). Genetic advance as a percent of mean was maximum for plant height at harvest (25.96%) followed by head diameter (24.88%), seed yield per plant (21.59%), oil content (16.06%) and days to 50 percent flowering (14.15%) while minimum for 100 seed weight (10.08%), days to maturity (9.36%) and seed filling percentage (9.27%). Neelima *et al.* (2016) [4], Mamta *et al.* (2017) [3] and Mallik *et al.* (2020) [2].

Table 2: Analysis of variance for various characters

Sr. No.	Characters	Mean Sum of Squares		
		Replication (1)	Treatment (39)	Error (39)
1.	Days to 50 percent flowering	6.612	45.21**	4.971
2.	Days to maturity	0.45	49.86**	6.937
3.	Plant height at harvest (cm)	0.713	540.812**	38.543
4.	Head diameter (cm)	0.834	7.464**	1.219
5.	Seed filling percentage (%)	28.776	62.743**	17.616
6.	Seed yield per plant (g)	13.866	29.929**	5.936
7.	100 Seed weight (g)	0.014	0.354**	0.104
8.	Oil content (%)	0.10	17.69**	0.93

Table 3: Genetic parameters of various characters

Sr. No.	Characters	PCV (%)	GCV (%)	ECV (%)	h ² b	GA	GAM
1.	Days to 50% flowering	8.57	7.67	3.81	80.18	8.27	14.15
2.	Days to maturity	6.01	5.23	2.97	75.57	8.29	9.36
3.	Plant height at harvest (cm)	14.54	13.53	5.30	86.69	30.39	25.96
4.	Head diameter (cm)	16.79	14.24	8.89	71.92	3.08	24.88
5.	Seed filling percentage (%)	8.01	6.00	5.30	56.15	7.33	9.27
6.	Seed yield per plant (g)	15.67	12.81	9.01	66.89	5.83	21.59
7.	100 Seed weight (g)	8.98	6.63	6.06	54.46	0.53	10.08
8.	Oil content (%)	8.66	8.22	2.73	90.05	5.66	16.06

Conclusion

From the results it can be concluded that the broad range of variation was exhibited for both GCV and PCV values for all the characters. Out of which the traits like head diameter, plant height at harvest and seed yield per plant recorded high phenotypic and genotypic coefficients of variation. Heritability was recorded maximum for oil content, plant

height at harvest, days to 50 percent flowering and genetic advance as a percent of mean was higher in plant height at harvest, head diameter and seed yield per plant. Thus indicating the presence of maximum variability among the genotypes and considering these characters during the selection of elite genotypes in future sunflower crossing programmes will be helpful.

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