Characterization of Sunflower (*Helianthus annus* L.) Genotypes for Some   Qualitative Traits at Central Highlands of Ethiopia

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Abstract

Twenty five sunflower genotypes were characterized for their qualitative morphological traits to detect phenotypic differences present among different sunflower genotypes. the study was conducted during 2017/18 across two location namely, Holetta and Adadi. The trial was laid out using simple lattice design. Eleven qualitative traits data were collected using morphological descriptor. No environmental effect was observed for all traits. Shannon diversity index was used for analysis of variation among genotypes for qualitative traits. All qualitative traits shows variation among genotypes except pollen color, ray floret color and leaf shape. Majority of the genotypes showed elongated ray floret shape (84%), medium leaf serration (48%), medium hairiness at top of stem (68%), erect to semi erect leaf petiole (44%), dropping leaf blade (66%), elongated bract shape (80%) and Concave head shape (72). Half branch was observed in 16% of genotypes while majority of them (84%) have no branches.

Key words: *Characterization; Qualitative traits, Sunflower*

Introduction

Sunflower (*Helianthus annus* L.) belongs to compositae (Asteraceae) family wich is the largest plant family on earth (Stevens 2010). It belongs to compositae because what looks like a single large flower is a composite of many tiny flowers. It is across pollinated crop with 2n=34. Today sunflower is grown for many purposes, as oil crop (oil type), for beauty (Ornamental type) and for direct seed consumption (Confectionary sunflower). It is oil is taken as premium oil because of its high unsaturated fatty acids and low content of linoleic acid. It is agood source of proteins, minerals, vitamin-E, Folic acid, and B-complex vitamins. It is used to provide high energy, reduce blood sugar levels, Anxiety and Necrosis.

Sunflower is one of the main oil crops being cultivated in the world. It is mainly grown in Russian federation, Ukraine, India and Argentina (Browers, *et al*., 2012). Having high adaptation capability sunflower is adapted from lowland to highland areas of Ethiopia. However, the crop has high potential to be grown in various climatic conditions, it is not being grown in large areas and could not grown with more profitable crops like, Wheat, barley, teff etc. to increase sunflower growing areas, varieties having high yield potential should be developed through breeding program. To develop varieties with high yield potential, improved oil content and resistant to biotic and a biotic stresses, characterization of the genetic materials for different traits is important. Hence, this study was undertaken to characterize sunflower genotypes for different qualitative traits and detect differences among them.

Objective: to detect the differences among different sunflower genotypes using different qualitative traits

Methodology

The study was conducted at Holetta and Adadi during the main season of 2017/18 using simple lattice design (5x5).Twenty five sunflower genotypes were characterized for their qualitative traits. The following data were collected and analyzed following biometricians.

Data collected

The following qualitative data were collected on plot bases by using Descriptors of international Board for Plant Genetic Resources (IBPGR, 1985) for Sunflower.

Leaf shape: data was recorded by visual observation at flowering stage and grouped as oblong, lanceolate, triangular, cordate and rounded.
Ray floret shape: It was observed at flowering stage as elongated, ovate and rounded.
Ray floret color: Was visually recorded at flowering stage as ivory, pale yellow, yellow, orange, purple, red and multi-color.

Pollen color: Was visually observed at flowering stage as white, pale yellow, yellow and orange.
Head shape: Was visually observed at maturity stage as concave, flat, convex and irregular.
Leaf serration: Leaf serration was recorded at flowering stage as fine, medium and coarse.

Stem hairiness: Was observed visually at flowering stage as absent, medium and strong.
Orientation of leaf blade: Was visually observed at flowering stage as erect and drooping.
Leaf habit of petiole: Petiole leaves were observed on plot basis and grouped as erect, semi-erect, erect to semi-erect, semi-erect to horizontal and horizontal.
Plant *branching:* Was visually observed at maturity stage as absent, basal branching, top branching, fully branched with central head and fully branched without central head.

Bract *shape:* Was visually recorded on plot basis as elongated and rounded

Data Analysis

All qualitative traits observed in this study were analyzed by using Shannon-information index and final results were presented in percentage.

Results and Discussion

The results of this study indicated that sunflower genotypes showed considerable differences for the observed qualitative characters**.** All studied qualitative traits showed differences among genotypes except ray floret, leaf shape and pollen color (Table 1). This finding in line with the findings of Tan and Tan (2011), which stated a large variation for all qualitative traits except pollen fertility. The studied genotypes showed a wide variation for head shape, bract shape, orientation of leaf blade, leaf habit of petiole, hairiness at top of stem, leaf blistering and ray floret shape(Table 1). This finding is similar to the finding of Makane (2011), which indicated a large variation for all qualitative traits among accessions of sunflower germplasm. The result of this study is also in conformity of the findings of khoufi *et al*. (2013) which reported wide differences of qualitative traits among different sunflower hybrids and inbreeds lines. Estimates of diversity for each traits using Shannon-diversity index were presented in Table.1 Diversity was observed for all traits except pollen color, color of ray floret and leaf shape. Shannon diversity index values ranged from Zero (0) for these traits to 0.33 for leaf habit of petiole. Leaf habit of petiole showed the highest diversity followed by leaf serration (0.323), hairiness at top of stem (0.26), head shape (0.244),

orientation of leaf blade (0.197) and bract shape (0.156). Shape of ray floret (0.12) and branching habit of plants (0.137) shows low diversity.

Table *1: Some Qualitative traits of 25 sunflower genotypes studied at Holetta and Adadi*

No	Trait	State	Code	Frequency of genotypes	Percentage (%)	H'
	ray floret color	Ivory	1	0		
		pale yellow	2	0		
		yellow	3	25	100	0
		orange	4	0		
1		purple	5	0		
	ray floret shape	elongate	1	21	84	
		ovate(ovoid)	2	0	0	
2		rounded	3	4	16	0.12
	pollen color	pale yellow	1	0		
		orange	2	0		0
3		yellow	3	25	100	
	leaf shape	oblong	1	0		
		lanceolate	2	0		
		cordate	3	0		0
		rounded	4	0		
4		triangular	5	25	100	
	leaf serration	fine	1	8	32	
		medium	2	12	48	
5		course	3	5	20	0.323
	hairiness at top of stem	low	1	3	12	
		medium	2	17	68	0.26
		high	3	5	20	
6		extremely high	4	0	0	
	leaf habit of petiole	erect	1	0	0	
		erect to semi erect	2	11	44	
		semi erect	3	9	36	0.33
		semi erect to horizontal	4	5	20	
7		horizontal	5	0	0	
	orientation of leaf blade	Erect to semi erect	1	11	44	0.197
8		dropping	2	14	66	
	bract shape	elongated	1	20	80	0.156
9		rounded	2	5	20	
	head shape	convex	1	3	12	
		flat	2	4	16	0.244
10		concave	3	18	72	
	Branching habit	not present	1	21	84	0.137
11		half branch	2	4	16	

Summary and Conclusion

Different values recorded by Shannon-diversity index indicate that, there are substantial differences among genotypes. Large differences were observed among genotypes in ray floret shape, head shape, orientation of leaf blade and leaf habit of petiole. The different values observed in frequency of genotypes and percentage shows the possibility of using these lines as parental materials for further improvement of genotypes in future breeding work

References

[1] Bowers JE, Nambeesan S, Corbi J, Barker MS, Rieseberg LH, Knapp SJ, et al., Development of an Ultra-Dense Genetic Map of the Sunflower Genome Based on Single-Feature Polymorphisms.Wu S-B, editor. PLoS ONE. 2012;7(12):e51360.from: http://dx.plos.org/10.1371/journal.pone.0051360

[2] IBPGR, 1985.Discriptors for cultivated and wild sunflower, Rome.

[3] Khoufi S, Khamassi K, da Silva JAT, Aoun N, Rezgui S, Jeddi FB. 2013. Assessment of diversity of phonologically and morphologically related traits among adapted populations of sunflower (*Helianthus annuus* L.). Helia 36 (58): 29-40.

[4] Makane, V.G., Shinde, C.A., Mohrir, M.N. and Shaikh Md ShoyabAkhil Md Ab. Majid. 2011. Genetic variability studies in new versions of sunflower (*Helianthus annuus L.*). BIOINFOLET, 8(1): 44-51.

[5] Stevens P. Angiosperm phylogeny Website. Available from http://www.Mobot.Org/mobot/ research/apweb/. 2010.

[6] Tan, A.S. & Tan, A.. (2011). Genetic resources of sunflower (*Helianthus annuus* L.) in Turkey. Helia. 34. 39-46. 10.2298/HEL1155039T.