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Association pattern among the yield attributes in varieties and hybrids of sunflower *(Helianthus annuus* L.)

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Abstract: Three varieties namely CO 4, Morden, COSFV 5 and two hybrids TCSH 1 and KBSH 44 were selected for the study. Simple correlation coefficients were estimated among characters for each variety and hybrids separately. Two traits *viz.*, seed yield and 100-seed weight are important selection indices for the improvement of oil yield improvement in respect of both varieties and hybrids. Thalamus weight can be considered as a selection index for the improvement of seed yield and oil yield in respect of hybrids only. Like wise, the oil content is an important selection index for the oil yield improvement in respect of varieties only. It can also be inferred that the results obtained from the association analysis of data on varieties and hybrids together will give ambiguous results and have an adverse impact on the yield improvement programme. Hence computing separate association analysis for each variety and hybrid is always desirable to identify selection indices for the improvement of sunflower.

Key words: Sunflower, correlation, varieties and hybrids, selection index

Introduction

Yield is a complex character and influenced by several other yield component characters. The knowledge on the association of several characters with yield and inter relationship among themselves will be very essential for planning a successful plant breeding programme. The nature of association may vary depending upon the genetic architecture of the population. Hybrids are differing from the varieties of sunflower due to their heterotic potential. Hence the association may vary for varieties and hybrids. However required importance is not given for this aspect. Hence in the present study, an attempt was made to study the association between oil yield and its component characters in three varieties and two hybrids.

Materials and methods

Three varieties namely CO 4, Morden, COSFV 5 and two hybrids TCSH 1 and KBSH 44 were selected for the study. All the genotypes were evaluated at Oilseeds Farm, Tamil Nadu Agricultural University, Coimbatore during Dec 2004 - March 2005. A total of 50 plants per genotype were subjected to nine biometrical observations namely plant height (cm), head diameter (cm), stem girth (cm), thalamus weight (g)/ plant, 100-seed weight (g), volume weight (g/100 ml), oil content (%), seed yield (g/plant) and oil yield (g/plant). Simple correlation coefficients were estimated among characters for each variety and hybrids separately.

Results and Discussion

Simple correlation coefficients were presented in Table 1. The results are discussed characters wise here under.

Oil yield vs other characters:

Oil yield had significant positive correlation with seed yield and 100-seed weight in both

varieties and hybrids. This indicated that seed yield and 100-seed weight is highly influencing the oil yield in both varieties and hybrids invariably. Hence these two characters are important for the improvement of oil yield. D'Jakov (1966), Skori (1975), and Ghanavathi and Nahavandi (1981). Vannozzi *et al.* (1986) and Mogali (1993) also reported significant association of oil yield with seed yield. Abdel *et al.* (1987) reported both seed yield and 100-seed weight had significant and positive association with oil yield.

Oil content had significant and positive association with oil yield only in varieties. Similarly thalamus weight had significantly positive association with oil yield in respect of hybrids only. This type of association might be due to the presence of higher source and sink in hybrids and hybrid vigour when compared to varieties. The influence of oil content might have been overlooked by another component character namely the seed yield in respect of hybrids. Like wise the hybrid vigour might have expressed for thalamus weight and in turn had the influence on oil yield in hybrids. D'Jakov (1966), Skoric (1975) and Ghanavathi and Nahavandi (1981) reported positive association between oil yield and oil content. Though the characters head weight, stem girth and volume weight had significance in some varieties or hybrids; any specific association trend for hybrids or varieties was not observable. However Ghanavathi and Nahavandi (1981) and Vannozzi *et al.* (1986) for head diameter; Vannozzi *et al.* (1986) and Abdel *et al.* (1987) for plant height reported positive association of these characters with oil yield.

Seed yield vs other characters:

Significant and positive association was recorded between seed yield and 100-seed weight in both hybrids and varieties. It indicated that the character 100-seed weight was influencing the seed yield irrespective of hybrids and varieties and hence more important for the seed yield improvement. Several authors namely Pathak (1975), Shabana (1975), Singh *et al.* (1977), Lakshmanaiah (1978) Anand and Chandra (1979), Giriraj *et al.* (1979), Omran *et al.* (1979), Rao (1983), Shinde *et al.* (1983), Caylak and Emiroglu (1984), Dhaduk *et al.* (1985), Mishra *et al* (1985), Singh *et al.* (1985), Diaz *et al.* (1986), Abdel *et al.* (1987), Vanisree *et al.* (1988), Niranjanamurthy and Shambulingappa (1989), Visic (1989 and 1991), Singh and Labana (1990), Pathak and Dixit (1990), Khan and Islam (1991) and Chaudhary and Anand (1985) also reported positive association between seed yield and 100-seed weight. However, Shrinivasa (1982) and Tariq *et al.* (1992) reported negative association between seed yield and 100-seed weight. Non significant association between these characters was also reported by Vidhyavathi *et al.* (2005).

The character thalamus weight had significant and positive correlation with seed yield in hybrids only and not in varieties. Hence for the yield improvement of varieties this character is not much important. Head diameter, stem girth and volume weight had significant and positive association in some varieties and hybrids only. Hence generalized association for hybrids or varieties was not observed. However, Singh and Labana (1990), Khan and Islam (1991), Chaudhary and Anand (1993), Mogali (1993) and Vidhyavathi *et al.* (2005) reported positive association between head diameter and seed yield.

Like wise, positive association between stem girth and seed yield was reported by several authors namely Pathak and Dixit (1990) and Gangappa and Virupakshappa (1994) and Lakshmanaiah (1978) reported positive

Table 1. Simple correlation coefficients among various characters in hybrids and varieties

		Plant height (cm)	Head diameter (cm)	Stem girth (cm)	Thalamus weight (g)	100-seed weight (g)	Volume weight /100 ml (g)	Oil content (%)	Seed yield/ plant (g)
Head diameter (cm)	CO 4	0.03							
	Morden	0.58**							
	COSFV 5	0.16							
	TCSH 1	-0.15							
	KBSH 44	-0.13							
Stem girth (cm)	CO 4	0.00	-0.02						
	Morden	-0.11	-0.23						
	COSFV 5	0.05	-0.12						
	TCSH 1	-0.29*	0.21						
	KBSH 44	0.19	-0.26						
Thalamus weight (g)	CO 4	0.12	0.05	-0.26					
	Morden	0.11	0.25	-0.02					
	COSFV 5	-0.09	-0.26	0.07					
	TCSH 1	-0.16	0.22	0.28*					
	KBSH 44	-0.10	-0.27*	0.19					
100-seed weight (g)	CO 4	0.01	0.00	-0.12	0.25				
	Morden	0.19	0.28*	0.14	0.27*				
	COSFV 5	-0.16	0.05	-0.14	0.03				
	TCSH 1	0.12	-0.11	0.16	0.14				
	KBSH 44	-0.01	-0.06	0.02	0.44				
Volume weight / 100ml(g)	CO 4	0.00	0.11	0.26	0.14	0.50**			
	Morden	0.12	0.23	-0.09	0.08	0.23			
	COSFV 5	-0.01	0.14	-0.30*	-0.10	0.13			
	TCSH 1	-0.09	-0.08	0.25	0.24	0.33*			
	KBSH 44	0.05	-0.18	-0.02	0.07	0.43**			
Oil content (%)	CO 4	-0.17	-0.26	-0.10	0.24	0.20	-0.02		
	Morden	0.09	0.39**	-0.07	0.27*	0.14	0.42**		
	COSFV 5	-0.09	-0.01	-0.07	0.04	0.24	0.18		
	TCSH 1	-0.18	0.32*	-0.05	-0.18	-0.16	-0.13		
	KBSH 44	0.18	0.17	0.04	-0.31*	0.01	0.28*		
Seed yield/ plant (g)	CO 4	-0.16	-0.03	0.05	0.17	0.62**	0.65**	0.21	
	Vlorden	0.21	0.32*	0.03	0.19	0.51**	0.16	0.22	
	COSFV 5	-0.13	0.04	0.00	-0.03	0.86**	0.09	0.19	
	TCSH 1	-0.07	0.04	0.32*	0.41**	0.35**	0.41**	-0.22	
	KBSH 44	-0.16	-0.18	0.13	0.70**	0.58**	0.16	-0.20	
Oil yield/ plant(g)	CO 4	-0.17	-0.09	0.04	0.21	0.59**	0.58**	0.48**	0.95**
	Morden	0.22	0.36**	0.03	0.22	0.50**	0.22	0.34*	0.99**
	COSFV 5	-0.15	0.03	-0.03	-0.01	0.85**	0.12	0.35**	0.98**
	TCSH 1	-0.16	0.15	0.32*	0.35**	0.29*	0.37**	0.14	0.93**
	KBSH 44	-0.11	-0.17	0.14	0.67**	0.59**	0.19	-0.09	0.99**

*, ** significant at 5 and 1 per cent respectively

association. However, Vidhyavathi (2005) reported no association between seed yield and volume weight.

Volume weight vs other characters

Volume weight had significant and positive association with 100- seed weight in hybrids and CO 4. It indicated that 100-seed weight is important in deciding the volume weight in hybrids than varieties. This might also be due to the heterotic vigour of the hybrids expressed for 100-seed weight than varieties.

Association among other characters:

The association of other characters was observed in some varieties or hybrids.

But generalized trend was not observed for hybrids or varieties. Hence these characters are less dependable.

From the foregoing discussion, it may be concluded that the characters, seed yield and 100-seed weight are important selection indices for the oil yield improvement programme in respect of both varieties and hybrids. Thalamus weight can be considered as selection index for the improvement of seed yield and oil yield in respect of hybrids only. Like wise, the oil content is important for the oil yield improvement programme in varieties only. It may also be concluded that the results obtained from the association analysis of data on varieties and hybrids together will give ambiguous results. This will have an adverse impact on the yield improvement programme. Hence separate association analysis computed for varieties and hybrids separately is always desirable to identify suitable selection indices for the improvement of sunflower.

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