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Combining ability analysis in sweet corn (*Zea mays* L. Ssp. *saccharata*) hybrids

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Abstract
The present investigation was carried out using eighteen elite diverse parents and crossing them in line x tester pattern, using fifteen inbreds as females and three as testers during Kharif 2018. The developed 45 single cross sweet corn hybrids were evaluated at Udaipur during Kharif 2019 in RBD with three replications for various growth, yield attributing and yield and quality parameters to estimate general and specific combining ability effects. Cross L5 x T2 possessed significant and positive sca effects for green cob weight/ plant, green cob yield, green fodder yield and TSS content of green grain. Hybrid L6 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and green fodder yield. L10 x T1 and L15 x T3 possessed significant and positive sca effects for green cob weight/ plant and green cob yield while hybrid L1 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and TSS content.

Keywords: Combining, ability, sweet corn, hybrids

Introduction
Sweet corn (*Zea mays* var. *saccharata*), is a specialty corn which is characterized by translucent, horny appearance of kernel when matures and wrinkled when it dries. The mutant mutant genes *su*, *su1* and *se* prevent the conversion of sugar into starch and thus such corn tastes sweet. Total sugar content in sweet corn at milky stage ranges from 25-30% as compared to 2-5% of normal corn (Sadaiah *et al*., 2013) [10]. Popularity of sweet corn is increasing in the national and international market due to the sweetness and tenderness of its kernels and its appetizing taste, which has in turn resulted in its increased cultivation in the country. Use of sweet corn at immature stage as well as in a variety of cuisines has increased its market value and export potential ensuring good returns to the farmers. Further, the left over plant after the harvest of cobs can be used as fresh or dry fodder for the animals.

Sweet corn breeding aims to improve quality and appearance as well as cob yield. The genetic base of sweet corn breeding programme is relatively narrow and related inbreds often are crossed to make hybrids that meet the strict market requirements on quality and appearance (Tracy, 1994) [14]. The quality parameters are relatively more important especially because of direct consumption of sweet corn as vegetable and the preference of the consumers. In the present study, attempts were made to identify superior hybrid combinations using line x tester method. Combining ability analysis helps to screen out superior cross combinations as well as selection of suitable parents for hybrid development by evaluating the available inbreds in term of their genetic value. In breeding of high yielding hybrids/varieties, the breeder often faces the problem of selecting the desirable parents. Information on combining ability provides guidelines to the plant breeder in selecting the elite parents and desirable cross combinations to be used in the formulation of systematic breeding programme and at the same time reveals the nature of gene action involved in the inheritance of various traits, combining ability analysis also provide the requisite information on the magnitude of gab and sac variances and effects, to formulate an efficient breeding methodology.

Material and Methods
Eighteen diverse sweet corn inbred lines were used as parents (fifteen females and three testers). The crosses were made at Instructional Farm, RCA, Udaipur during *kharif* 2018.

Total 66 genotypes comprising of 45 sweet corn hybrids, 18 parental lines and 3 standard checks (Priya, Madhuri and Sugar-75) were evaluated in RBD in at Instructional Farm, RCA, Udaipur during Kharif-2019 in RBD with three replications.

Recommended agronomic practices were used to raise a healthy crop. Observations were recorded for 20 characters *viz.*, days to 50 per cent tasseling, days to 50 per cent silking, plant height, ear height, number of leaves/ plant, length of leaf, breadth of leaf, days to green cob harvest, number of ear/ plant, ear length, ear girth, number of grain rows/ ear, number of grains/ row, 100 fresh seed weight, green cob weight/ plant, moisture per cent of green grain, green cob yield, green fodder yield, TSS content of green grain and protein content.Ten plants were taken from each row for recording observations from each replication. TSS content was recorded using hand refrectrometer. The analysis of variance for general and specific combining ability effects over the environments and in three individual environments was done for different characters under the study using line x tester mating design provided by Kempthorne (1957) [6].

Results and Discussion

The results for analysis of variance for combining ability are presented in the table, which revealed that the mean sum of squares due to lines were found significant for the characters ear height, number of leaves/ plant, breadth of leaf, ear length, ear girth, number of grains/ row, 100 fresh seed weight, moisture per cent of green grain and green cob yield while the mean sum of squares due to testers was reported to be significant for the characters days to 50 per cent tasseling and silking, plant height, ear height, breadth of leaf, days to green cob harvest, number of grains/ row, green cob yield, green fodder yield, TSS content of green grain and protein content. Variance due to line x tester interaction was found significant for all the characters except for characters days to green cob harvest, 100 fresh seed weight and protein content. This indicated that the experimental material possessed considerable variability and that both gca and sca were involve in the genetic control of various characters.

For days to green cob harvest, none of the lines exhibited significant general combining ability effects in negative direction. Eight lines were reported to exhibit significant and positive general combining ability effects for green cob weight/ plant, maximal and positively perceptible effects were shown by the line L7 (0.08) which was followed up by L2 (0.04), L13 (0.03), L3 and L8 (0.02 each) and L9, L11 and L12 (0.01 each). Analysis for green cob yield revealed that seven lines exhibited significant and positive general combining ability effects, where maximal positively significant effects was shown by the line L7 (4686.30) succeeded by L2 (3105.19), L13 (1701.85), L8 (1410.74), L3 (1374.07), L9 (1112.96) and L12 (732.96). Eight lines exhibited positive and significant general combining ability effects for green fodder yield, highest magnitude was exhibited by the line L3 (4976.22) succeeded by L13 (4491.78), L2 (4181.78), L4 (4156.22), L7 (4105.11), L1 (3936.22), L14 (1326.22) and L12 (1864.00). For TSS content, positive and significant general combining ability effects were revealed by four lines, where maximal effects were observed for the line L11 (1.17) succeeded by L7 (1.09), L5 (0.76) and L14 (0.60).

For days to green cob harvest, one tester T2 showed significant and negative general combining ability effect. For green cob weight/ plant, tester T1 (0.02) had perceptible and positive general combining ability effects. Tester T1 (1347.41) showed positively perceptible general combining ability effects for green cob yield. Maximum effects were exhibited by the tester T1 (2991.33) succeeded by T2 (1840.44) for green fodder yield. Tester T1 (1.03) showed significantly positive general combining ability effects for TSS content.

None of the sweet corn hybrids in possessed significantly negative specific combining ability effects for days to green cob harvest. Fourteen sweet corn hybrids exhibited significantly positive specific combining ability effects for green cob weight/ plant and maximum effects was shown by L5 x T2 (0.09) succeeded by L10 x T1 (0.06), L6 x T3 (0.05), L15 x T3 (0.05), L1 x T3 (0.04), L4 x T3 (0.04), L7 x T1 (0.03), L14 x T1 (0.03), L3 x T2 (0.03), L8 x T2 (0.03), L6 x T1 (0.02), L2 x T2 (0.02), L15 x T2 (0.02) and L14 x T3 (0.02).Fifteen sweet corn hybrids had significant specific combining ability effects in positive direction for green cob yield, with highest positively perceptible specific combining ability effect being observed for the hybrid L5 x T2 (5112.59) succeeded by L10 x T1 (3812.59), L15 x T3 (3142.59), L6 x T3 (3007.04), L1 x T3 (2362.59), L4 x T3 (2273.70), L14 x T1 (2001.48), L3 x T2 (1961.48), L8 x T2 (1961.48), L7 x T1 (1770.37), L2 x T3 (1361.48), L15 x T2 (1231.48), L9 x T1 (1230.37), L6 x T1 (1213.70) and L13 x T3 (1101.48). For green fodder yield, eighteen sweet corn hybrids showed positively perceptible specific combining ability effects, where maximum specific combining ability effect was shown by the hybrid L4 x T2 (15677.33) succeeded by L5 x T2 (9675.11), L6 x T3 (8395.11), L3 x T1 (8266.44), L8 x T2 (6877.33), L8 x T3 (5889.56), L15 x T3 (5565.11), L7 x T1 (5267.56), L13 x T1 (4777.56), L1 x T3 (4249.56), L12 x T2 (3066.22), L9 x T3 (2968.44), L10 x T2 (2937.33), L12 x T1 (2705.33), L14 x T2 (2390.67), L1 x T1 (2363.11), L2 x T1 (2287.56) and L10 x T1 (2249.78). Seven sweet corn hybrids were reported to show significant specific combining ability effects in positive direction for TSS content where highest effect was shown by the sweet corn hybrid L14 x T2 (2.11) succeeded by L2 x T3 (1.94), L7 x T2 (1.76), L12 x T1 (1.60), L1 x T3 (1.60), L5 x T2 (1.56) and L10 x T3 (1.35).

Cross L5 x T2 possessed significant and positive sca effects for green cob weight/ plant, green cob yield, green fodder yield and TSS content of green grain. Hybrid L6 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and green fodder yield. L10 x T1 and L15 x T3 possessed significant and positive sca effects for green cob weight/ plant and green cob yield while hybrid L1 x T3 possessed significant and positive sca effects for green cob weight/ plant, green cob yield and TSS content.

Singh *et al*. (2017) [12], Elayaraja *et al*. (2018) [4], Ola *et al*. (2018) [9], Al-joboory and Al-gaisi (2019) [2], Chinthiya *et al*. (2019) [3], Hassan *et al*. (2019) [5], Kumar *et al*. (2019) [7], Nanditha *et al*. (2019) [8], Sharma *et al*. (2019) [11], Tesfaye *et al*. (2019) [13] and Al- Hazemawi *et al*. (2020) [1] reported similar results for combining ability analysis on maize.

The study under discussion finally revealed that some of inbred lines and testers used in the present investigation can be selected for the successful development of single cross hybrids since they possessed high to good *per se* performance with good general combining ability for green cob yield and TSS content and other yield contributing traits. Characters inhibited through additive mode of inheritance can be improved by selection method. Some of the selected hybrids under study revealed good economic heterotic response along with good *per se* performance with high significant and positive sca effects for green cob yield and TSS content. Hence, these hybrids may be concluded for commercial exploitation and could be recommended for testing in multi-location trials.

Table 1: List of genotypes used

S. No	Symbol	Pedigree	S. No	Symbol	Pedigree
1.	L_1	SC-7-2-1-2-6-1	10.	L_{10}	BAJ-SC-17-2
2.	L_2	SC-18728	11.	L_{11}	BAJ-SC-17-1
3.	L_3	BAJ-SC-17-6	12.	L_{12}	DMSC-28
4.	L_4	BAJ-SC-17-10	13.	L_{13}	Mas Madu (sh2 sh2)
5.	L_5	BAJ-SC-17-12	14.	L_{14}	MRCSC-12
6.	L_6	BAJ-SC-17-9	15.	L_{15}	SC-33
7.	L_7	BAJ-SC-17-11	16.	T_1	SC-35
8.	L_8	BAJ-SC-17-8	17.	T_2	SC-32
9.	L_9	BAJ-SC-17-4	18.	T_3	DMRSC-1

Table 2: Analysis of variance for combining ability in environment E_1 for different characters in sweet corn

Source	d.f.	Mean sum of squares									
		Days to 50% Tasseling	Day to 50% silking	Plant height (cm)	Ear height (cm)	Number of leave plant^{-1}	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant^{-1}	Ear length (cm)
Crosses	44	15.22**	17.05**	2876.43**	1026.42**	4.3**	256.61**	2.84**	16.55	0.1**	34.21**
Line effe.	14	10.94	10.99	2731.64	1090.82**	6.39*	285.68	3.78**	11.91	0.14	62.31**
Tester effe.	2	111.09**	117.12**	10330.24*	10916.19**	6.92	574.88	22.88**	106.45**	0.16	29.42
Line x Tes. effe.	28	10.51**	12.93**	2416.41**	287.81**	3.08**	219.35**	0.93**	12.44	0.09**	20.5**
Error	124	2.62	3.4	254.13	24.43	0.88	17.2	0.36	12.47	0.0019	1.86

Table 3: Analysis of variance for combining ability in environment E_1 for different characters in sweet corn

Source	d.f.	Mean sum of squares									
		Ear girth (cm)	Grain row ear-1	Grains row^{-1}	100 fresh seed weight (g)	Green cob weight Plant^{-1} (kg)	Moisture of green grain (%)	Green cob yield (kg ha^{-1})	Green fodder yield (kg ha^{-1})	TSS of green grain (%)	Protein content (%)
Crosses	44	4.2**	5.54**	204.41**	4.24**	0.01**	119.89**	36382558.92**	208659141.82**	6.87**	0.01
Line effe.	14	7*	3.93	288.43*	7.3**	0.02	211.2*	60651750.26**	239270675.87	6.67	0.01
Tester effe.	2	6.58	16.56	1023.78**	5.94	0.03	74.59	94986740.74*	802831215.56*	38.36**	0.06**
Line x Tes. effe.	28	2.63**	5.56**	103.87**	2.59	0.01**	77.47**	20061950.26**	150912512.38**	4.72**	0.01
Error	124	0.55	1.2	11.84	1.69	0.0001	24.62	833171.16	2081550.4	0.77	0.04

*.** significant at 5 and 1%, respectively

Table 4: GCA effects in E_1 environment for different characters in sweet corn

S. No.	Lines/ testers	Days to 50% Tasseling	Day to 50% silking	Plant height (cm)	Ear height (cm)	Number of leave plant^{-1}	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant^{-1}	Ear length (cm)
1.	L1	-1.09*	-1.48*	11.87*	11.58**	-0.62*	2.34	0.4*	-1.53	-0.05**	2.35**
2.	L2	0.8	0.41	-9.05	22.92**	1.22**	5.88**	1.07**	0.36	-0.05**	2.28**
3.	L3	0.02	-0.48	7.17	-0.22	0.48	-3.8**	-0.23	-0.53	0.04**	2.71**
4.	L4	0.24	0.07	7.9	-5.92**	0.39	4.66**	1.09**	0.03	-0.05**	-0.7
5.	L5	0.91	0.96	3.96	0.66	0.62*	-0.92	-0.28	0.92	0.28**	-2.77**
6.	L6	1.8**	1.63**	0.46	-5.08**	-0.14	-1.05	-0.6**	1.7	-0.05**	-4.06**
7.	L7	-0.2	-0.7	14.31**	10.66**	-0.28	1.24	0.41*	-0.64	0.31**	2.79**
8.	L8	-0.64	-0.37	11.77*	-2.87	-0.29	4.58**	-0.62**	-0.41	-0.05**	2.7**
9.	L9	-0.87	-0.81	0.6	-12.65**	-0.81*	-3.56*	-0.59**	-0.86	-0.05**	0.44
10.	L10	-1.31*	-0.48	-39.76**	-7.72**	0.26	-6.74**	-0.57**	-0.64	-0.05**	-1.85**
11	L11	-0.42	-1.37*	9.47	-5.72**	0.17	2.9*	0.08	-1.3	-0.05**	-0.43
12	L12	0.24	0.52	14.77**	11.68**	0.14	5.12**	0.08	0.59	-0.04**	1.42**
13	L13	-1.98**	-1.15	-7.13	-7.01**	1.08**	6.54**	0.75**	-1.19	-0.05**	1.6**
14	L14	1.91**	2.19**	11.99*	8.33**	0.06	-3.1*	0.07	2.36*	-0.05**	-1.02*
15	L15	0.58	1.07	-38.33**	-18.62**	-2.28**	-14.1**	-1.05**	1.14	-0.05**	-5.46**
17	T1	1.71**	1.03**	5.29*	-0.16	0.44**	0.4	0.27**	1.01	-0.01	0.85**
18	T2	-1.38**	-1.86**	-17.09**	-15.5**	-0.3*	-3.76**	0.53**	-1.77**	0.06**	-0.09
19	T3	-0.33	0.83**	11.8**	15.65**	-0.15	3.36**	-0.81**	0.76	-0.05**	-0.76**
20	SE										
21	GCA line	0.54	0.61	5.31	1.65	0.31	1.38	0.2	1.18	0.01	0.45
22	GCA tester	0.24	0.27	2.38	0.74	0.14	0.62	0.09	0.53	0.01	0.2
23	gi-gj lines	0.76	0.87	7.51	2.33	0.44	1.96	0.28	1.66	0.02	0.64
24	gi-gj tester	0.34	0.39	3.36	1.04	0.2	0.87	0.13	0.74	0.01	0.29
25	CD (5%)										
26	GCA line	1.07	1.22	10.52	3.26	0.62	2.74	0.4	2.33	0.03	0.9

27	GCA tester	0.48	0.54	4.7	1.46	0.28	1.22	0.18	1.04	0.01	0.4
28	gi-gj lines	1.51	1.72	14.87	4.61	0.88	3.87	0.56	3.29	0.04	1.27
29	gi-gj tester	0.68	0.77	6.65	2.06	0.39	1.73	0.25	1.47	0.02	0.57

Table 5: GCA effects in E_1 environment for different characters in sweet corn (Continued)

S. No.	Lines/ testers	Ear girth (cm)	Grain row ear^{-1}	Grains row^{-1}	100 Fresh seed weight (g)	Green cob weight plant^{-1} (kg)	Moisture of green grain (%)	Green cob yield (kg ha^{-1})	Green fodder yield (kg ha^{-1})	TSS content of green grain (%)	Protein content (%)
1.	L1	-1.4**	1.02**	4.92**	-1.44**	-0.01**	-6.84**	-515.93	3936.22**	0.26	-0.02
2.	L2	1.21**	0.27	3.66**	1.26**	0.04**	-5.72**	3105.19**	4181.78**	-0.09	0.03
3.	L3	0.39	0.69	1.31	0.39	0.02**	6.37**	1374.07**	4976.22**	-0.56	-0.03
4.	L4	0.16	-0.41	0.56	0.19	0	0.17	159.63	4156.22**	-1.72**	0.03
5.	L5	-0.98**	-0.62	-3.35**	-1.04*	-0.02**	0.08	-1177.04**	345.11	0.76*	-0.04
6.	L6	-0.12	0.28	-8.08**	-0.08	-0.05**	1.55	-3170.37**	-5209.33**	-0.44	0.01
7.	L7	1.16**	0.27	7.28**	1.17**	0.08**	1.97	4686.3**	4105.11**	1.09**	-0.01
8.	L8	-0.53*	-0.34	5.95**	-0.54	0.02**	4.47**	1410.74**	-8363.78**	-0.8**	0.01
9.	L9	1.03**	0.98**	-1.36	1.05*	0.01**	4.76**	1112.96**	-869.33	0.55	-0.03
10.	L10	-0.43	-1.04**	-1.12	-0.43	-0.04**	-2.88	-2872.59**	-3317.11**	0.57	0.04
11	L11	0.8**	0.38	1.95	0.77	0.01**	4.58**	376.3	449.56	1.17**	-0.06
12	L12	0.51*	0.35	0.78	0.51	0.01**	1.96	732.96*	1864**	-0.1	0.08
13	L13	-0.07	-0.4	5.68**	-0.09	0.03**	-9.84**	1701.85**	4491.78**	0.16	-0.05
14	L14	-0.16	-1.04**	-4.7**	-0.1	-0.02**	3.51*	-1214.81**	1326.22**	0.6*	0.03
15	L15	-1.57**	-0.37	-13.49**	-1.62**	-0.1**	-4.15*	-5709.26**	-12072.67**	-1.43**	0.01
17	T1	0.39**	-0.55**	5.22**	0.38	0.02**	0.7	1347.41**	2991.33**	1.03**	-0.04
18	T2	-0.38**	-0.1	-4.13**	-0.35	0	-1.49*	191.85	1840.44**	-0.75**	0.03
19	T3	-0.01	0.65**	-1.1*	-0.03	-0.03**	0.78	-1539.26**	-4831.78**	-0.29*	0.01
20	SE										
21	GCA line	0.25	0.37	1.15	0.43	0.0033	1.65	304.26	480.92	0.29	0.07
22	GCA tester	0.11	0.16	0.51	0.19	0.0015	0.74	136.07	215.07	0.13	0.03
23	gi-gj lines	0.35	0.52	1.62	0.61	0.0047	2.34	430.29	680.12	0.41	0.09
24	gi-gj tester	0.16	0.23	0.73	0.27	0.0021	1.05	192.43	304.16	0.18	0.04
25	CD (5%)										
26	GCA line	0.49	0.72	2.27	0.86	0.007	3.27	602.22	951.87	0.58	0.13
27	GCA tester	0.22	0.32	1.02	0.38	0.003	1.46	269.32	425.69	0.26	0.06
28	gi-gj lines	0.69	1.02	3.21	1.21	0.009	4.63	851.66	1346.15	0.82	0.19
29	gi-gj tester	0.31	0.46	1.44	0.54	0.004	2.07	380.88	602.02	0.37	0.08

*.** significant at 5 and 1%, respectively

Table 6 SCA effects in E_1 environment for different characters in sweet corn

S. No.	Lines/ testers	Days to 50% Tasseling	Day to 50% silking	Plant height (cm)	Ear height (cm)	Number of leave plant^{-1}	Length of leaf (cm)	Breadth of leaf (cm)	Day to green Cob harvest	No of ear plant^{-1}	Ear length (cm)
1	L1 X T1	-1.27	-1.59	-11.21	1.07	0.53	0.48	0.06	-1.9	0.01	-0.53
2	L2 X T1	1.51	1.53	44.31**	17.76**	-0.03	9.9**	-0.61	1.21	0.01	-2.79**
3	L3 X T1	-0.04	0.75	-6.84	2.97	1.73**	-1.42	-0.31	0.44	-0.04	2.65**
4	L4 X T1	0.4	0.53	-9.21	2.3	0.26	-2.51	0.44	0.21	0.01	0.23
5	L5 X T1	0.73	1.3	-17.6	-4.95	-0.48	2.34	-0.26	1.33	-0.32**	0.56
6	L6 X T1	-0.82	-0.7	-0.26	-11.21**	1.34*	-8.16**	0.06	-0.45	0.01	2.91**
7	L7 X T1	2.51**	2.97**	-11.95	5.38	0.31	2.58	0.05	3.21	0.24**	0.9
8	L8 X T1	-0.38	-0.36	7.69	-6.42*	-0.84	3.27	0.08	-0.34	0.01	0.89
9	L9 X T1	-0.16	-0.25	0.69	-1.31	-0.98	-1.62	0.05	-0.23	0.01	2.91**
10	L10 X T1	-0.71	-1.59	36.43**	-1.33	-0.94	4.59	0.06	-1.45	0.01	0.6
11	L11 X T1	-0.93	-1.03	4.89	6.4*	-0.27	3.92	0.38	-1.12	0.01	-0.71
12	L12 X T1	0.4	-0.59	-7.11	7.4*	0.16	-6.63**	-0.65	-0.67	0	1.1
13	L13 X T1	-0.04	0.75	6.26	-2.24	-0.03	1.25	-0.23	0.77	0.01	-0.87
14	L14 X T1	-1.27	-1.92	3.54	-4.52	-0.04	3.98	0.39	-1.45	0.01	-0.62
15	L15 X T1	0.07	0.19	-39.64**	-11.3**	-0.72	-11.98**	0.5	0.44	0.01	-7.25**
16	L1 X T2	2.16*	1.97	-7.14	-9.39**	-0.64	-4.03	-1.2**	2.21	-0.06*	-1.52
17	L2 X T2	-0.73	-0.25	12.75	-19.84**	-0.34	-13.88**	0.13	-0.01	-0.06*	1.09
18	L3 X T2	-2.96**	-3.36**	19*	1.84	-0.74	8.77**	0.47	-3.12	0.08**	0.66
19	L4 X T2	-1.18	-1.59	9.03	11.91**	1.35*	-7.69**	0.08	-1.34	-0.06*	-1.36
20	L5 X T2	0.16	-0.47	0.54	-4.65	0.16	4.89*	0.44	-0.56	0.6**	2.24**
21	L6 X T2	2.27*	1.86	-26.73**	1.13	-2.21**	-1.88	-0.2	1.66	-0.06*	-3.67**
22	L7 X T2	-0.73	-0.81	-0.58	-4.65	-0.08	2.77	-0.18	-1.01	0.07**	-1.48
23	L8 X T2	-0.29	-1.14	-2.87	2.95	1.04	-0.58	-0.21	-1.23	-0.06*	0.41
24	L9 X T2	-0.07	-0.7	-9.4	3.76	0.56	-6.8**	-0.15	-0.79	-0.06*	-1.87*
25	L10 X T2	-3.62**	-2.7*	39.96**	3.74	1.61**	11.88**	0.77*	-2.67	-0.06*	1.62*
26	L11 X T2	0.49	0.86	-5.4	2.97	0.82	5.13*	0.12	0.99	-0.06*	0.87

*.** significant at 5 and 1%, respectively (Continued)

Table 7: SCA effects in E_1 environment for different characters in sweet corn

S. No.	Lines/ testers	Days to 50% Tasseling	Day to 50% silking	Plant height (cm)	Ear height (cm)	Number of leave plant^{-1}	Length of leaf (cm)	Breadth of leaf (cm)	Day to green cob harvest	No of ear plant^{-1}	Ear length (cm)
27	L12 X T2	-0.18	0.3	4.33	9.34**	-0.5	5.86*	0.12	0.44	-0.04	0.08
28	L13 X T2	1.04	0.97	-24.14**	-4.8	-0.44	-1.53	0.44	0.88	-0.06*	-0.13
29	L14 X T2	2.16*	2.3*	-5.76	-2.08	-0.41	-1.93	0.13	1.99	-0.06*	0.66
30	L15 X T2	1.49	2.75*	-3.6	7.77**	-0.16	-0.97	-0.76*	2.55	-0.06*	2.39**
31	L1 X T3	-0.89	-0.39	18.34*	8.32**	0.11	3.55	1.14**	-0.32	0.05*	2.05*
32	L2 X T3	-0.78	-1.27	-57.07**	2.08	0.38	3.97	0.48	-1.21	0.05*	1.69*
33	L3 X T3	3**	2.61*	-12.16	-4.81	-0.99	-7.35**	-0.16	2.68	-0.04	-3.31**
34	L4 X T3	0.78	1.06	0.18	-14.21**	-1.6**	10.2**	-0.51	1.13	0.05*	1.13
35	L5 X T3	-0.89	-0.83	17.05	9.6**	0.33	-7.23**	-0.18	-0.76	-0.28**	-2.8**
36	L6 X T3	-1.44	-1.16	26.99**	10.08**	0.87	10.04**	0.14	-1.21	0.05*	0.76
37	L7 X T3	-1.78	-2.16*	12.53	-0.73	-0.23	-5.35*	0.13	-2.21	-0.31**	0.58
38	L8 X T3	0.67	1.5	-4.82	3.47	-0.2	-2.69	0.13	1.57	0.05*	-1.3
39	L9 X T3	0.22	0.95	8.71	-2.45	0.41	8.42**	0.1	1.01	0.05*	-1.04
40	L10 X T3	4.33**	4.28**	-76.39**	-2.41	-0.67	-16.47**	-0.82*	4.13*	0.05*	-2.22**
41	L11 X T3	0.44	0.17	0.51	-9.38**	-0.56	-9.05**	-0.5	0.13	0.05*	-0.17
42	L12 X T3	-0.22	0.28	2.78	-16.74**	0.35	0.77	0.53	0.24	0.04	-1.19
43	L13 X T3	-1	-1.72	17.88	7.05*	0.46	0.28	-0.21	-1.65	0.05*	1
44	L14 X T3	-0.89	-0.39	2.22	6.6*	0.45	-2.05	-0.52	-0.54	0.05*	-0.04
45	L15 X T3	-1.56	-2.94**	43.24**	3.52	0.89	12.95**	0.25	-2.99	0.05*	4.86**
46	SE										
47	SCA	0.93	1.06	9.2	2.85	0.54	2.39	0.35	2.04	0.03	0.79
48	Sij-Skl	1.32	1.51	13.02	4.04	0.77	3.39	0.49	2.88	0.04	1.11
49	CD (5%)										
50	SCA	1.85	2.11	18.22	5.65	1.07	4.74	0.69	4.04	0.05	1.56
51	Sij-Skl	2.62	2.98	25.76	7.99	1.52	6.7	0.97	5.71	0.07	2.2

*.** significant at 5 and 1%, respectively

References

1. Al-Hazemawi AKH, Hassawi DS, Mohammed AA. Combining ability analysis of yield and yield components in maize (*Zea mays* L.) using line x tester method under heat stress. Journal of Education and Scientific Studies 2020;4(15):231-254.
2. Al-Joboory AHA, Al-Gaisi WHMT. Estimate of combining ability in maize (*Zea mays* L.) using (line x tester) method. Tikrit Journal for Agricultural Sciences 2019;17(3):80-95.
3. Chinthiya A, Ganesan KN, Ravikesavan R, Senthil N. Combining ability and association studies on different yield contributing traits for enhanced green cob yield in sweet corn (*Zea mays* Ssp *saccharata*). Electronic Journal of Plant Breeding 2019;10(2):500-511.
4. Elayaraja K, Gadag RN, Kumari J, Mishra U. Combining ability and gene action in experimental hybrids of sweet corn (*Zea mays* Ssp *saccharata*). Indian Journal of Horticulture 2018;75(1):64-69.
5. Hassan AA, Jama AA, Mohamed OH, Biswas BK. Study on combining ability and heterosis in maize (*Zea mays* L.) using partial diallel analysis. International Journal of Plant Breeding and Crop Science 2019;6(2):520-526.
6. Kempthorne O. An introduction to genetic statistics. New York: John Wiley and sons, Inc; London: Chapman & Hall, Ltd 1957.
7. Kumar S, Chandel U, Guleria SK, Devlash R. Combining ability and heterosis for yield contributing and quality traits in medium maturing inbred lines of maize (*Zea mays* L.) using line x tester. International Journal of Chemical Studies 2019;7(1):2027-2034.
8. Nandhitha G, Ganesan KN, Ravikesavan R. Heterosis and combining ability studies in single cross hybrids synthesized with diverse inbred lines of maize (*Zea mays* L.). Electronic Journal of Plant Breeding 2019;9(4):1503-1511.
9. Ola B, Dubey RB, Singh M, Ameta KD. Combining ability analysis in medium maturing yellow seeded maize (*Zea mays* L.) hybrids. Journal of Pharmacognosy and Phytochemistry 2018;7(3):1354-1359.
10. Sadaiah K, Reddy VN, Sudheer Kumar S. Heterosis and combining ability studies for sugar content in sweet corn (*Zea mays saccharata* L.). IJSRP 2013;3:1-5.
11. Sharma P, Kamboj MC, Punia MS. Assessment of combining ability effects using quality protein maize donors as testers for yield and yield traits in maize. Electronic Journal of Plant Breeding 2019;10(4):3365-3368.
12. Singh M, Dubey RB, Ameta KD, Haritwal S, Ola B. Combining ability analysis for yield contributing and quality traits in yellow seeded late maturing maize (*Zea mays* L.) hybrids using line x tester. Journal of Pharmacognosy and Phytochemistry 2017;6(5):112-118.
13. Tesfaye D, Abakemal D, Habte E. Combining ability of highland adapted double haploid maize inbred lines using line x tester mating design. East African Journal of Sciences 2019;13(2):121-134.
14. Tracy WF. Sweet corn, p. 147-187. In: A. R. Haullauer (ed.) Specialty types of maize. CRC Press, Boca Raton, Fla 1994.