International Journal of Advanced Biochemistry Research

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; SP-9(8): 1027-1031
www.biochemjournal.com
Received: 20-05-2025
Accepted: 24-06-2025

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Heterosis in maize for yield and yield attributing characters

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i8So.5306

Abstract
The present study, titled "Assessment of heterosis and combining ability for seed yield and it's component traits in Maize (*Zea mays* (L)), was conducted to assess the magnitude of heterosis and evaluate the general and specific combining ability effects for yield and its related traits. Four female lines were crossed with five male lines to produce twenty F_1 hybrids. These hybrids, along with their parents and two standard checks, were evaluated in a randomized block design with two replications during *Kharif* 2024 season at the Experimental Farm, Agricultural Reaserch Station Badnapur. Data were collected for eight traits: days to tasseling, days to silking, days to maturity, plant height (cm), cob length (cm), number of cobs per plant, 100-seed weight (g), and seedyield per plant (g).
The extent of heterosis over both the mid-parent and better parent was notably high for most of the traits examined in the present study. Among all the traits, the highest level of heterosis was observed for the cross PFSR 3 x 115VL-1013592 exhibited a seed yield per plant 221.60% over the better parent, followed by the cross CML 451 x ZL155281, which showed a 25.88% increase 100-seed weight compared to its better parent. The analysis of variance for mean values indicated significant differences across all eight traits studied.

Keywords: Maize, heterosis, combining ability, seed yield, hybrids, genetic evaluation

Introduction
Zea mays (L.), or maize, is a major grain crop that plays a significant role in world agriculture. After sorghum, rice and wheat it comes at number four in India. Maize (*Zea mays* (L).; 2n = 20) is the most versatile and widely distributed food crop in the world. Globally, it is known as "Queen of cereals" because of its highest genetic yield potential. Maize is a domesticated grass of tropical Mexican origin, belongs to large and important family of Poaceae and to tribe Maydeae. Maize grain contain 70% carbohydrate, 10% protein, 4% oil, 2.3% crude fibre, 10.4% albuminoids 1.4% ush and some of important Vitamins and Minerals. It also acts as new traditional oilseed crop having about 80% unsaturated fatty acids in oil and is widely used for cooking medium and for manufacturing of hydrogenated oil. However, having so many qualities maize deserves as a "Poor man's nutricerca". (Dwivedi and Godawat, 1994) Several million people mainly in developing countries derive their protein and calorie requirements from maize.
In India, maize is cultivated in a variety of things, indicating its greater versatility. Due to its many uses, including industrial use, human consumption, poultry feed, green fodder, and a variety of value-added products, the crop has taken centre stage in Indian agriculture. Globally, 25% of maize is utilised for human food, 67% is used for livestock feed, and the remaining portion is used for industry. The grass family Poaceae includes the tribe Maydeae, which includes maize. "*Zea*" was taken from an ancient Greek term that means "food grass." Species mays, Order Poales, Family Poaceae (Gramineae), Class Liliopsida, Division Magnoliophyta, and Kingdom Plantae are its members. Human activity helped to select beneficial variants from vast populations of teosinte and concentrate them into distinct evolutionary pools, facilitating the evolutionary processes of mutation, hybridisation, genetic drift, and selection that led to the transformation of maize from teosinte. This caused Maize to differrentiate into a wide variety of races.male sterility became apparent, further research led to the identification of multiple alternative cytoplasmic male sterility sources, including

A1, A2, A3, A4, A5, and others. This study was conducted to estimate the nature and extent of heterosis for yield and related traits.

Materials and Methods

The current study on "Assessment of Heterosis and Combining Ability for Seed Yield and It's Component Traits in Maize (*Zea mays* (L))" was conducted at the Experimental Farm of the Agricultural Research Station, Badnapur, under Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, during the *Summer* 2024 and *Kharif* 2024 seasons. The experimental material consist of four lines (CML 451, PFSR 3, CM 218 and CML 141) and five testers (ZL 155281, 167-SNL-18960, VL-108154 and ZL19598). The detailed information about the parents, including lines, testers, their salient characteristics, and crosses, is presented in Table 1. Four lines and five testers were crossed using the Line x Tester mating design, resulting in twenty crosses during the *Summer* 2024 season. The experimental material consists of a total of thirty one entries, which include the twenty crosses, four lines, five testers, and two check varieties Phule Champion and PDKV Arambh. These entries were evaluated during the *Kharif* 2024 season at the Agricultural Research Station, Badnapur The following important parents are used in the crossing programme and cross produced for the studies in Maize.

Table 1: Source and features of parental lines and check.

Sr. No	Genotype
Females (lines)	
1.	CML 451
2.	PFSR 3
3.	CML 218
4.	CML 141
Males (Testers)	
1.	ZL155281
2.	167-SNL-18960
3.	VL-108154
4.	115VL-10113592
5.	ZL-19598
Checks	
1.	Phule Champion
2.	PDKV Arambh

The crossing programme for obtaining the cross seeds, four lines and five testers were grown at experimental farm of Agricultural Reaserch Station, Badnapur during *Summer* 2024. In the evening of the previous day of pollination, remove the tassel from the female plant. The next day morning at 7 a.m. to 8 a.m. collected pollen from a different male plants and dust it on the silks of the female plants. The standard agronomic practices were followed to raise the material under irrigated conditions. All the F_1 seeds were stored properly in the seed packets for sowing in the *Kharif*, 2024.

Results and Discussion

Estimation of Heterosis

Heterosis is a natural phenomenon which makes hybrid off spring of genetically diverse individual and display improved physical and functional charactistics relative to their parents. The aim of heterosis breeding is to exploit the phenomenon of hybrid vigor for increasing the yield potential and stability of crosses diverse environments.

In the current study, various levels of heterosis were assessed by calculating the percentage increase or decrease of hybrid performance over the better parent (heterobeltosis) and the standard check (standard heterosis) varieties, Phule Champion and PDKV Arambh for different traits

Days to tasseling

The range of heterosis for days to tasseling varied as follows over the mid-parent, it ranged observed between-2.32% in (PFSR 3 x 167-SNL-18960) to 6.56% (CML 218 x ZL-19598). Over the better parent, it ranged from-9.52% in CML 218 x ZL155281 to 3.13% in CML218 x ZL19598. Early tasseling is an important trait for earliness breeding, and similar negative heterotic effects for this trait have been reported by Matin *et al.* (2016) [11].

Days to silking

Early silk emergence is a highly desirable trait. Crosses exhibiting negative heterotic effects for this characteristic are considered beneficial. Heterosis over the Mid-parent for this trait ranged from-5.99% (CML 451 x ZL155281) to 10.92% (CML218 x ZL 155281). Among the crosses evaluated, CML 451 x ZL155281 (-5.99%), CML 451 x ZL-19598 (-5.86%) and CML218 x ZL 155281 (10.92%) exhibited notable negative heterosis over the better parent, while CML218 x ZL 155281 (10.92%) show the higher positive heterosis over the better parent. The range of heterosis over the better parent varied from-12.46% (CML 451 x ZL-19598) to 9.38% (CML 218 x ZL 155281). A total of five crosses showed significant negative heterotic effects over the better parent, with the most prominent being CML 451 x ZL-19598 (-12.46%), followed by CML 451 x ZL155281 (-11.99%), CML 218 X 167-SNL-18960 (-5.69%) and CML451 x VL-108154 (-5.45%). These results are in agreement with Ofori *et al.* (2015) [12], who also found that specific hybrids expressed significant negative heterosis for silking, contributing to early maturity.

Days to Maturity

Out of the twenty crosses evaluated, two crosses showed significant negative heterosis over the mid-parent, better parent, and the both standard checks. Among them, the cross PFSR 3 x VL-108154 recorded the highest significant negative heterosis over the mid-parent (-5.92%), followed by CML 141 x ZL155281 (-5.78%). Regarding the standard check Phule Champion (SC1), the crosses exhibiting the highest significant negative heterosis were CML 141 x ZL155281 (-5.78%), PFSR 3 x VL-108154 (-5.92%). These findings corroborate those of Matin *et al.* (2016) [11], who documented that certain maize hybrids could shorten maturity duration through significant negative heterosis.

Plant height

Dwarfness is considered highly desirable when economic importance is placed solely on grain production. However, for dual-purpose hybrids, tall plant types are preferred, and in such cases, positive heterotic effects are beneficial. In terms of heterosis for plant height, values of mid parent ranged from 13.99% (CML 141 x ZL-19598) to 19.70% (CML451 x VL-108154) over the mid-parent and from 10.55% (CML451 x VL-108154) to 12.62% (CML218 x ZL 155281) over the better parent. Heterosis among the studied twenty hybrids ranged from 13.99% (CML 141 x ZL-19598) to 19.70 (CML451 x VL-108154) over both standard checks. Out of these twenty crosses, four showed significant positive heterosis over the mid-parent, ten showed over the better parent and both checks. The cross 19.70% (CML451 x VL-108154) recorded the highest significant positive heterosis over the mid-parent and better parent and both checks. Positive heterosis for plant height in dual-purpose maize hybrids has similarly been reported by Tafa *et al.* (2020) [13].

Number of cobs per plant

The heterotic estimates for number of cob per plant ranged from-20.00% (CML 141 x 167-SNL-18960) to 62.79% (CML 451 x ZL155281) over the mid-parent and-25.93% (CML 141 x ZL-19598) to 52.17% (PFSR 3 x 115VL-1013592) over the better parent. Among the twenty crosses studied, cross no one, fifth, twelve, & seventeen showed significant higher heterosis over the mid-parent and better parent and standard check 1. While cross no nine and eleven shows positive heterosis over standard check PDKV Arambh (SC2). The cross PFSR 3 x 115VL-1013592 exhibited the highest significant positive heterosis over the mid-parent (62.79%). The same cross (PFSR3 x 115VL-1013592) also showed the highest significant positive heterosis over the better parent (52.17%).

Cob length

The heterosis estimated for cob length in cm is varied between 32.27% (CML 141 x 167-SNL-18960) to 205.67% (PFSR 3 x 115VL-1013592) for mid parent and the crosses 30.53% (PFSR 3 x ZL155281) to 187.24% (PFSR 3 x 115VL-1013592) over the better parents. In contrast, it ranged from-40.33% and-42.58% (CML 141 x ZL-19598) and IC-541033 x GPM-210) to 15.22% and 10.89% (CML 141 x VL-108154) show the positive heterosis over the bothstandard checks, Phule Champion (SC1) and PDKV Arambh (SC2), respectively. Comparable large positive heterosis for cob length in maize has been reported by Tafa *et al.* (2020) [13].

100 seed weight (g)

The range of heterosis for 100-grain weight varied from 18.06% and 18.03% (CML451 x 167-SNL-18960) to 36.76% and 29.58% (PFSR3 x ZL-19598) when compared to the mid parent and better parent, respectively. Heterotic values ranged from-26.03% and-26.86% (CML 451 x ZL-19598) to 9.90% and 8.67% (CML 141 x VL-108154) when compared to the standard checks, Phule Champion (SC1) and PDKV Arambh (SC2), respectively. Among the twenty crosses, fifteen showed significant positive heterosis over the mid parent and ten over the better parent. The cross PFSR 3 x ZL-19598 (36.76%) exhibited the highest significant positive heterosis over the mid parent, followed by CML 451 x ZL155281 (32.12%) and PFSR 3 X 115VL-1013592 (24.65%). For better parent heterosis, the cross PFSR 3 x ZL-19598 (29.58%) showed the highest positive heterosis, followed by CML 451 x ZL155281 (25.88%) for 100-grain weight. The crosses demonstrating significant positive heterosis over the Phule Champion (SC1) check were CML 141 x VL-108154 (9.90%). For PDKV Arambh (SC2) the crosses showing significant positive heterosis were CML 141 x VL-108154 (8.67%). These results align with earlier observations by Amiruzzaman *et al.* (2010) and Kage *et al.* (2013).

Seed yield per plant (g)

Positive heterosis for grain yield per plant is a crucial aspect of improving crop performance. The heterotic values for grain yield per plant of the cross PFSR3 x 115VL-1013592 (222.02%) is recorded as a highest positive heterosis followed by CML141 x 167-SNL-18960 (130.44%) over the mid parent, better parent, and both the checks. In comparison to the standard checks, sixteen crosses are recorded to positive heterosis over it. Similar high yield heterosis was documented by Reddy *et al.* (2018), Uddin *et al.* (2006), Atif *et al.*, and Agarwal *et al.* (2021).

Table 2: The Estimation of heterosis over mid parent (MP), better parent (BP) and standard checks Phule Champion and PDKV Arambh for different caracters in Maize.

Sr. No.	Crosses	Days to tasseling				Days to silking			
		MP	BP	SC1	SC2	MP	BP	SC1	SC2
1.	CML 451 x ZL155281	-2.84	-9.52*	-1.62	-3.95	-5.99**	-11.99**	1.80	2.36
2.	CML451 x 167-SNL-18960	-2.41	-4.64	3.69	1.23	-2.47	-4.52*	10.45**	11.05**
3.	CML451 x VL-108154	1.39	-3.15	5.31	2.81	0.58	-5.45**	-9.37**	-9.96**
4.	CML 451 x 115VL-1013592	3.93	-2.61	5.90	3.38	2.73	-3.43	11.71**	12.32**
5.	CML 451 x ZL-19598	-4.55	-9.77*	-1.89	-4.22	-5.86**	-12.46**	1.26	1.81
6.	PFSR 3 x ZL155281	6.52	2.11*	4.41	1.93	-0.79	-2.09	1.44	1.99
7.	PFSR 3 x 167-SNL-18960	-2.32*	-3.04	0.63	-1.76	-2.52	-5.69**	4.50*	-5.07*
8.	PFSR 3 x VL-108154	-1.70	-3.26	-1.08	-3.43	-0.35	-1.22	2.34	2.90
9.	PFSR 3 x 115VL-1013592	0.36	-3.17	-0.99	-3.34	-0.88	-1.74	1.80	2.36
10.	PFSR 3 x ZL-19598	1.72	-0.97	1.26	-1.14	-0.62	-2.61	0.90	1.45
11.	CML218 x ZL 155281	4.29	-0.61	2.88	0.44	10.92**	9.38**	13.51**	14.13**
12.	CML 218 x 167-SNL-18960	0.48	0.35	4.14	1.67	-2.60	-5.69**	4.50*	5.07*
13.	CML218 x VL-108154	-1.33	-3.48	-0.09	-2.46	2.72	1.74	-5.59*	6.16**
14.	CML 218 x 115VL-1013592	-1.72	-5.74	-2.43	-4.75	0.79	-0.17	3.60	4.17
15.	CML 218 x ZL-19598	6.56*	3.13*	6.75	4.22	10.82**	8.51**	12.61**	13.22**
16.	CML 141 x ZL155281	-3.11	-6.20	-6.03	-8.26*	-1.23	-3.09	1.62	2.17
17.	CML 141 x 167-SNL-18960	3.80	1.99	5.85	3.34	1.92	-0.81	-9.91**	10.51**
18.	CML 141 x VL-108154	-3.57	-4.13	-3.96	-6.24	0.26	-1.20	3.60	4.17
19.	CML 141 x 115VL-1013592	3.37	0.72	0.90	-1.49	2.09	0.60	5.50*	-6.07**
20.	CML 141 x ZL-19598	1.51	-0.18	0.00	-2.37	-1.23	-3.78	0.90	1.45
	SE±	1.8163	2.0973	2.0973	2.0973	1.0057	1.1613	1.1613	1.1613
	CD 5%	3.8016	4.3897	4.3897	4.3897	2.1050	2.4307	2.4307	2.4307
	CD 1%	5.1963	6.0002	6.0002	6.0002	2.8774	3.3225	3.3225	3.3225

Sr. No.	Crosses	Plant height (cm)				Days to maturity			
		MP	BP	SC1	SC2	MP	BP	SC1	SC2
1.	CML 451 x ZL155281	10.34	3.85	-8.48	-7.78	-1.37	-3.51	-1.96	-3.68
2.	CML451 x 167-SNL-18960	10.86	0.68	-4.10	-3.36	-0.89	-2.19	-0.62	-2.36
3.	CML451 x VL-108154	19.70**	10.55	1.49	2.27	-0.49	-2.19	-0.62	-2.36
4.	CML 451 x 115VL-1013592	12.26	4.51	-5.71	-4.98	-0.42	-1.75	-0.18	-1.93
5.	CML 451 x ZL-19598	10.08	0.72	-5.62	-4.89	-2.08	-6.14*	-4.63	-6.30*
6.	PFSR 3 x ZL155281	12.94*	8.61	3.66	4.45	-5.02	-5.86*	-6.86*	-8.49**
7.	PFSR 3 x 167-SNL-18960	9.02	8.92	3.95	4.75	1.80	1.80	0.71	-1.05
8.	PFSR 3 x VL-108154	6.16	4.14	-0.61	0.15	-5.92*	-6.31*	-7.31*	-8.93**
9.	PFSR 3 x 115VL-1013592	9.05	6.07	1.23	2.00	0.47	0.45	-0.62	-2.36
10.	PFSR 3 x ZL-19598	8.09	7.11	2.22	3.01	4.85	1.80	0.71	-1.05
11.	CML218 x ZL 155281	12.90	12.62	-0.76	0.00	4.34	4.08	1.16	-0.61
12.	CML 218 x 167-SNL-18960	10.03	5.65	0.64	1.42	-2.96	-4.05	-5.08	-6.74*
13.	CML218 x VL-108154	16.77*	14.15	4.80	5.60	-0.73	-1.45	-3.30	-4.99
14.	CML 218 x 115VL-1013592	11.82	10.25	-0.53	0.24	2.98	1.85	0.71	-1.05
15.	CML 218 x ZL-19598	11.97	8.37	1.55	2.33	5.14	3.23	-0.18	-1.93
16.	CML 141 x ZL155281	12.32	10.47*	0.67	1.44	-5.78*	-6.89*	-7.31*	-8.93**
17.	CML 141 x 167-SNL-18960	0.64	-1.54	-6.20	-5.48	4.18	3.85	3.39	1.58
18.	CML 141 x VL-108154	10.03	9.62	0.64	1.42	-1.71	-2.42	-2.85	-4.55
19.	CML 141 x 115VL-1013592	10.24	9.70	-0.03	0.74	-0.29	-0.63	-1.07	-2.80
20.	CML 141 x ZL-19598	13.99*	12.43*	5.35	6.16	2.47	-0.81	-1.25	-2.98
	SE±	9.3846	10.8364	10.8364	10.8364	2.6800	3.0946	3.0946	3.0946
	CD 5%	19.6421	22.6807	22.6807	22.6807	5.6093	6.4771	6.4771	6.4771
	CD 1%	26.8487	31.0022	31.0022	31.0022	7.6673	8.8535	8.8535	8.8535

Sr. No.	Crosses	Cob per plant				Cob length (cm)			
		MP	BP	SC1	SC2	MP	BP	SC1	SC2
1.	CML 451 x ZL155281	25.00**	25.00**	-24.24**	8.70	105.89**	104.87**	-4.78	-8.36
2.	CML451 x 167-SNL-18960	-8.33	-21.43**	-33.33**	-4.35	104.70**	80.11**	-17.12**	-20.24**
3.	CML451 x VL-108154	10.00	10.00	-33.33**	-4.35	35.54**	17.44*	-26.27**	-29.05**
4.	CML 451 x 115VL-1013592	10.00	10.00	-33.33**	-4.35	14.85	-2.35	-55.06**	-56.75**
5.	CML 451 x ZL-19598	25.00**	25.00**	-24.24**	8.70	15.39	11.84	-48.53**	-50.47**
6.	PFSR 3 x ZL155281	2.33	-4.35	-33.33**	-4.35	45.95**	30.53**	-39.33**	-41.61**
7.	PFSR 3 x 167-SNL-18960	13.73*	3.57	-12.12*	26.09**	66.98**	63.11**	-40.21**	-42.45**
8.	PFSR 3 x VL-108154	-6.98	-13.04	-39.39**	-13.04	12.62	-10.81	-44.01**	-46.12**
9.	PFSR 3 x 115VL-1013592	62.79**	52.17**	6.06	52.17**	205.67**	187.24**	5.30	1.34
10.	PFSR 3 x ZL-19598	16.28*	8.70	-24.24**	8.70	107.15**	91.49**	-17.30**	-20.41**
11.	CML218 x ZL 155281	30.43**	15.38*	-9.09	30.43**	86.54**	76.33**	-18.05**	-21.13**
12.	CML 218 x 167-SNL-18960	-14.81*	-17.86**	-30.30**	0.00	43.70**	32.55*	-45.14**	-47.20**
13.	CML218 x VL-108154	-13.04	-23.08**	-39.39**	-13.04	39.83**	16.01*	-27.17**	-29.91**
14.	CML 218 x 115VL-1013592	17.39*	3.85	-18.18**	17.39*	125.28**	100.37**	-17.07**	-20.19**
15.	CML 218 x ZL-19598	-13.04	-23.08**	-39.39**	-13.04	94.04**	90.00**	-17.94**	-21.03**
16.	CML 141 x ZL155281	48.94**	29.63**	6.06	52.17**	102.89**	79.62**	8.33	4.26
17.	CML 141 x 167-SNL-18960	-20.00**	-21.43**	-33.33**	-4.35	32.27**	4.48	-36.99**	-39.36**
18.	CML 141 x VL-108154	10.64	-3.70	-21.21**	13.04	87.22**	83.54**	15.22**	10.89*
19.	CML 141 x 115VL-1013592	6.38	-7.41	-24.24**	8.70	91.11**	46.63**	-11.57*	-14.89**
20.	CML 141 x ZL-19598	-14.89*	-25.93**	-39.39**	-13.04	15.30	-1.07	-40.33**	-42.58**
	SE±	0.0734	0.0847	0.0847	0.0847	0.7984	0.9220	0.9220	0.9220
	CD 5%	0.1536	0.1773	0.1773	0.1773	1.6712	1.9297	1.9297	1.9297
	CD 1%	0.2099	0.2424	0.2424	0.2424	2.2843	2.6377	2.6377	2.6377

Sr. No.	Crosses	Seed Yield per plant (g)				100 seed weight(g)			
		MP	BP	SC1	SC2	MP	BP	SC1	SC2
1.	CML 451 x ZL155281	80.54**	74.96**	-8.76	-19.38**	32.12**	25.88**	-0.73	-1.84
2.	CML451 x 167-SNL-18960	108.34**	81.61**	-11.14	-21.48**	18.06**	18.03**	-6.88	-7.92
3.	CML451 x VL-108154	34.18**	26.87*	-30.34**	-38.44**	9.55	9.32	-13.43**	-14.40**
4.	CML 451 x 115VL-1013592	14.31	-1.30	-51.71**	-57.33**	7.54	4.71	-12.82**	-13.80**
5.	CML 451 x ZL-19598	20.06	14.33	-44.06**	-50.57**	-1.93	-6.21	-26.03**	-26.86**
6.	PFSR 3 x ZL155281	67.55**	40.76**	-26.59**	-35.14**	18.57**	11.93*	-9.98*	-10.99*
7.	PFSR 3 x 167-SNL-18960	73.19**	71.04**	-37.78**	-45.03**	19.92**	18.78**	-4.48	-5.55
8.	PFSR 3 x VL-108154	35.72*	89.70**	34.69**	-45.80**	-5.28	-6.01	-24.41**	-25.26**
9.	PFSR 3 x 115VL-1013592	222.02**	221.60**	14.37	1.06	24.65**	22.52**	2.01	0.87
10.	PFSR 3 x ZL-19598	110.40**	89.53**	-16.13*	-25.89**	36.76**	29.58**	4.21	3.04
11.	CML218 x ZL 155281	56.70**	50.56**	-21.49**	-30.63**	15.60**	5.37	-8.57	-9.59*
12.	CML 218 x 167-SNL-18960	52.78**	34.21*	-35.50**	-43.01**	22.33**	16.78**	1.33	0.20
13.	CML218 x VL-108154	35.62**	27.16*	-30.17**	-38.30**	6.48	1.83	-11.64*	-12.63**
14.	CML 218 x 115VL-1013592	96.53**	70.97**	-17.83*	-27.39**	24.48**	21.96**	5.83	4.64
15.	CML 218 x ZL-19598	101.00**	93.03**	-7.23	-18.02**	34.04**	22.61**	6.39	5.20
16.	CML 141 x ZL155281	99.92**	83.17**	22.26**	1.40	29.69**	15.40**	5.71	4.53
17.	CML 141 x 167-SNL-18960	130.44**	82.12**	21.50*	0.82	18.83**	10.59*	1.30	0.17
18.	CML 141 x VL-108154	97.81**	85.59**	23.81**	2.74	28.70**	19.97**	9.90*	8.67*
19.	CML 141 x 115VL-1013592	86.32**	46.04**	-8.50	-19.15**	18.14**	12.76*	3.29	2.14
20.	CML 141 x ZL-19598	12.53	-4.00	-39.85**	-46.85**	15.99**	3.56	-5.14	-6.20
	SE±	8.3896	9.6875	9.6875	9.6875	1.0675	1.2326	1.2326	1.2326
	CD 5%	17.5596	20.2760	20.2760	20.2760	2.2342	2.5798	2.5798	2.5798
	CD 1%	24.0021	27.7152	27.7152	27.7152	3.0539	3.5263	3.5263	3.5263

Note:*, **Significantat 5% and1% level of significance, respectively.

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