

Innovative methods to assess the true genetic potentialities of newly developed inbred lines of early segregating generation (F₄) in baby corn (*Zea mays* L.)

Abstract: The innovative method to assess the true genetic potentialities of inbreds was an effective way to identify potential inbreds. The pooled analysis methods viz., simple pooled gca method, *per cent* pooled gca method and weighted pooled gca method were used to calculate over all combining ability. In the present study, two heterotic populations were crossed in line × tester method and these innovative methods were used to assess overall combining ability based on pooled analysis using eight different economic traits in baby corn. In Population A, the inbreds viz., P48, P41, P30, P14 and P50 were considered as top five for yield related traits. Likewise the inbreds viz., H95, H81, H51, H20 and H97 belonging to Population B were regarded as best combiners for yield and its related traits.

Key words: Combing ability, simple pooled gca method, per cent pooled gca method, weighted pooled gca method

1. Introduction:

Maize being a versatile crop and “Queen of cereal”, cultivated globally for its various potential uses. Maize has diverse utilization pattern as both food and fodder all over the world. Corn like Pop corn, Pod corn, Sweet corn and Baby corn are different types of corns with distinguished uses (Venkatesh *et al.*, 2003). Baby corn (*Zea mays*) refers to whole, entirely edible cobs of immature corn harvested just before fertilization at the silk emergence stage. (Dass *et al.*, 2012). It is a highly nutritious vegetable having on par or higher quality of nutrition compared to seasonal vegetables. It is one among the richest source of phosphorus along with proteins, vitamins and iron. Due to its greater potentiality for both internal and export value with year round income it is now widely accepted among producers and consumers.

It is cultivated in tropics, subtropics and temperate regions from sea level to more than 4000m above sea level. In India, it is cultivated on an area of 9.18 m. ha with production of about 27.23 m. t and 2965 kg ha⁻¹ productivity. In Karnataka, it is cultivated on an area of 2.23 m. ha with production of about 3.73 m. t and 2777 kg ha⁻¹ productivity (Anon., 2020).

Combining ability analysis is the most powerful tool in identifying the best combiners that may be used in crosses either to exploit heterosis or to accumulate productive genes. It also helps to understand the genetic architecture of various characters that enable the breeder to design effective breeding plan for other improvement of existing breeding material. Information on heterotic patterns and combining abilities among maize germplasm is essential in maximizing the effectiveness of hybrid development.

Nevertheless baby corn is gaining importance from last few decades, there is lack of popular and superior hybrids and inbreds developed which are highly profitable to farmers and very much less population improvement programmes has been initiated in India. Considering above facts, the present investigation was carried out for improvement of two populations [(PDM 4441 X PDM 53) and (HKI 1105 X HKI 323)] using line \times tester method during *Kharif*, 2018 to *Rabi*, 2020.

2. Materials and Methods

Twenty six F₄ inbreds of Population A (PDM 4441 x PDM 53) were crossed with two reciprocal testers (HKI 1105 and HKI 323) and one common tester (PDM 260-1) a line \times tester mating design to derive 78 single cross test hybrids. Similarly, twenty six F₄ inbreds of Population B (HKI 1105 x HKI 323) were crossed with two reciprocal testers (PDM 4441 and PDM 53) and one common tester (PDM 260-1) in line \times tester mating design to derive 78 single cross test hybrids. These hybrids along with parents and checks were evaluated in randomized block design with 2 replications during *Rabi* 2020 at Botany garden, Department of Genetics and Plant Breeding, University of Agricultural Sciences, Dharwad (Karnataka), India. The experimental plot was laid out with 3 m length with 60 \times 20 cm spacing. At the time of flowering primary operation of detasselling was carried out in hybrids and baby corns were harvested preferably 1-3 days of silk emergence depending on growing season (Dass *et al.*, 2012). The materials used to generate single cross hybrids were presented in table 1.

The observations were recorded on ten randomly selected plants for quantitative characters *viz.*, days to 50% silking, husked cob weight (g), dehusked cob weight (g), cob length (cm), cob diameter (cm), number of cob per plant and green fodder yield per plant (g). The hybrids were estimated for combining ability effects and their variances (Kempthorne, 1957).

3. Results and Discussion

3.1 General Combining Ability (GCA) Effects

Selection of parents is a prerequisite for success of any breeding programme. The combining ability analysis reveals the *gca* and *sca* effects along with gene action of the characters (Griffing, 1956). The *gca* effects for baby corn yield related traits were presented and discussed below

3.1.1 Baby corn yield per plant without husk (g)

Twelve newly developed F₄ inbred lines (Population A) expressed significant positive *gca* effects for the above trait. The top three lines viz., P27 (8.99), P36 (8.48) and P17 (7.48) displayed highest significant *gca* effects in desirable direction. Among the three testers, HKI 323 showed significant positive *gca* effects (3.37) (Table 2). With respect to Population B, ten new F₄ lines showed positive significant *gca* effects for the trait. The lines namely H94 (13.30) H99 (12.02) and H61 (6.15) occupied top three positions. Among three testers, PDM 4441 (3.13) recorded significant positive *gca* effects (Table 3).

3.1.2 Baby corn yield per plant with husk (g)

While considering Population A, fourteen lines registered positive *gca* effects and the lines P36 (34.77), P11 (26.29) and P27 (24.27) were highly significant. Among testers, HKI 323 (16.09) recorded significant positive *gca* effects (Table 2). In Population B, eleven lines were in positive desirable direction. New F₄ Lines viz., H94 (54.71), H99 (40.25), and H8 (28.96) revealed highly significant *gca* effects in positive direction. Among three testers, PDM 4441 (16.00), PDM 53 (4.07) documented significant positive effects (Table 3).

3.1.3 Days to 50% silking

In line with the trait, days to 50% silking, three inbred lines out of 26 new F₄ lines manifested significant *gca* effects among which lines P10 and P11 (-0.35) registered maximum *gca* effects in desirable negative direction. Among the PDM 260-1 (0.11) recorded significant *gca* effect (Table 2).

In Population B, nine F₄ lines showed significance in negative direction. The lines viz., H 91 (-2.22), H41 (-2.39) reported highly significant *gca* effects in desirable negative direction. Among three testers, PDM 53 (-0.80) and PDM 4441 (-0.75) recorded significant negative *gca* effects (Table 3).

3.1.4 Number of ears per plant

Among the 26 new F₄ lines derived from Population A, *gca* effects were found to be significant in desirable direction in two lines. The lines P36 (0.39), P17 (0.53) occupied top two positions with respect to number of ears per plant. There were no significant positive *gca* effects among the testers (Table 2).

With respect to *gca* effects of derived F₄ lines involved in Population B, lines *viz.*, H99 (0.51) and H59 (-0.42) obtained positive and negatively significant *gca* effects respectively (Table 3). None of the testers under study displayed significant *gca* effects in desirable direction.

3.2 Specific combining ability (*sca*) effects

Specific combining ability can be defined as ability of an hybrid combinations to perform better or poorer than expected based on average performance of inbred parental lines (Sprague and Tatum, 1942). The *sca* effects of 78 Single crosses derived from 26 lines and 3 testers were estimated and described below for important baby corn traits *viz.*, baby corn yield per plant without husk (g), baby corn yield per plant with husk (g), days to 50 % silking and number of cobs per plant in both the Population A and B.

3.2.1 Baby corn yield per plant without husk (g).

Considering Population A, 31 crosses showed significant positive *sca* effects for the above studied trait. The cross P12 × HKI 1105 (11.09) expressed highest *sca* effects and P11 × PDM 260-1 (-11.22) showed lowest *sca* effects. The top three best combiners that registered maximum positive *sca* effects were P12 × HKI 1105 (11.09), P47 × HKI 323 (10.40), P27 × HKI 323 (10.29) (Table 4).

With respect to *sca* effects of Population B, three single crosses registered significant *sca* effects in desirable direction. The crosses *namely*, H61 × PDM 53 (21.66), H5 × PDM 260-1 (11.00) and H 49 × PDM 53 (10.28) were occurred to be top three cross combinations (Table 5).

3.2.2 Baby corn yield per plant with husk (g)

The top three crosses with maximum *sca* effects in desirable direction were P47 × HKI 323 (53.83), P12 × HKI 1105 (39.45), P11 × HKI 1105 (37.31). Maximum significantly positive *sca* effects in desirable direction was exhibited by cross P47 × HKI 323 (53.83) for

the trait, where as minimum negative *sca* effects was shown by hybrid P32 × HKI 323 (-47.52) in case of Population A (Table 4).

Regarding *sca* effects of Population B, the three best crosses that catalogued maximum positive *sca* effects were H 5 × PDM 260-1 (73.58), H20 × PDM 4441 (51.06) and H61 × PDM 53 (49.34) (Table 5).

3.2.3 Days to 50% silking

A total of sixteen derived hybrids of Population A showed significant *sca* effects in negative direction. Among them, maximum significant *sca* effects in desirable direction was observed in crosses *viz.*, P39 × HKI 1105 (-5.80) and P13 × HKI 323 (-2.92) (Table 4).

3.2.4 Number of ears per plant

With respect to derived hybrids in Population A, three crosses *viz.*, P47 × HKI 323, P40 × HKI 323 and P19 × HKI 323 involving tester HKI 323 exhibited positive significant *sca* effects values of (0.80) (0.66) and (0.56) respectively. The largest positive *sca* effects were recorded by cross P47 × HKI 323 (0.80) (Table 4).

The top three combiners that registered positive *sca* effects were H16 × PDM 53 (0.84), H 61× PDM 53 (0.56) and H22 × PDM 260-1 (0.44) (Table 5).

3.3 Innovative methods for assessment of pooled *gca* effects

The three innovative and effective methods to calculate pooled *gca* scores based on combining ability of inbred lines were as follows,

3.3.1 Simple pooled *gca* effects

In this method, significant *gca* effect in desirable direction is given score of + 1 and – 1 score to *gca* effects significant in undesirable direction (Arunachalam and Bandyopadhyay, 1979). These values are added over different yield attributing traits to arrive at pooled score of *gca* effects.

In Population A test F₄ lines, based on simple pooled *gca* score method, the inbred lines *viz.*, P34, P27 and P36 are recognized as most potential general combiners, and among the testers, HKI 323 was emerged as best combiner for various quantitative traits of baby corn *viz.*, baby corn yield per plant without husk (g), baby corn yield per plant with husk (g),

number of ears per plant, days to 50 % silking, baby corn weight without husk (g), baby corn weight with husk (g), baby corn length (cm) and baby corn diameter (cm) (Table 6).

The F₄ lines of Population B *viz.*, H94, H8, H99, H61 and H6 and among testers, PDM 4441 was found to be good general combiner for the traits *namely* baby corn yield per plant without husk (g), baby corn yield per plant with husk (g), number of ears per plant, days to 50 % silking, baby corn weight without husk (g), baby corn weight with husk (g), baby corn length (cm) and baby corn diameter (cm) (Table 7).

3.3.2 Per cent pooled *gca* effects

It is considerate to calculate pooled scores of *gca* by ensuring quantification of differences in *gca* effects among parental genotypes by utilizing the actual *gca* values. (Deshpande, 2005). In per cent *gca* method, *gca* effects of parents for each character is converted into per cent values by comparing with respective F₁ means. Then individual per cent *gca* values are pooled to get pooled *gca* score.

With respect to per cent pooled *gca* method also the F₄ inbred lines (Population A) *viz.*, P 27, P 36 and P 17 were occupied top three for the traits (Table 8) *viz.*, baby corn yield per plant without husk (g), baby corn yield per plant with husk (g), number of ears per plant, days to 50 % silking, baby corn yield without husk (g), baby corn yield with husk (g), baby corn length (cm) and baby corn diameter (cm).

Likewise, in case of Population B, the F₄ lines *viz.*, H94, H99 and H6 were registered as best combiners in per cent pooled *gca* method (Table 9) for the traits *viz.*, baby corn yield per plant without husk (g), baby corn yield per plant with husk (g), number of ears per plant, days to 50 % silking, baby corn yield without husk (g), baby corn yield with husk (g), baby corn length (cm) and baby corn diameter (cm).

3.3.3 Weighted pooled *gca* effects

In this method, each trait was given certain weightage based on important of trait in the crop and these ascertained values were further multiplied with the respective per cent *gca* values, worked out for each trait and then added to obtain pooled *gca* score for each parent.

However, in general, the weighted *gca* method was found to be more relevant and effective in differentiating the inbred lines in Population A and Population B compared to earlier two methods.

In weighted pooled gca method the F₄ inbred lines (Population A) viz., P 48, P 41, P30 and P 14 were regarded as best combiners for the traits (Table 10) viz., baby corn yield per plant without husk (g), baby corn yield per plant with husk (g), number of ears per plant, days to 50 % silking, baby corn yield without husk (g), baby corn yield with husk (g), baby corn length (cm) and baby corn diameter (cm).

Likewise, in case of Population B, the F₄ lines viz., H81 H95 and H 51 were registered as best combiners in weighted pooled gca method (Table 11) for the traits viz., baby corn yield per plant without husk (g), baby corn yield per plant with husk (g), number of ears per plant, days to 50 % silking, baby corn yield without husk (g), baby corn yield with husk (g), baby corn length (cm) and baby corn diameter (cm).

4. Conclusion

The genetic diversity existing between breeding populations and diverse populations lay foundation for success of any plant breeding programmes, which determines the magnitude and nature of variability created for combining ability (Hallauer, 1984). In case of simple pooled gca method, P34, P27 and P36 (Population A) were occupied top three positions and whereas in case of Population B, H94, H99 and H61 were found as best combiners for important baby corn traits.

While based on pooled weighted gca method in Population A, P48, P41 and P14 were found as best and outperforming inbred line compared to the rest for all the baby corn traits and with respect to Population B, H81 and H57 were found to be best inbred lines for baby corn traits.

Hence based on weighted pooled gca method, the inbred lines which found to be potential for baby corn traits can be further used as parents in baby corn breeding corresponding to development of superior baby corn hybrids. These above mentioned new promising inbred also gain considerable importance to develop new populations through next successive cycles of reciprocal recurrent selection in population improvement programs of baby corn breeding.

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Table 1: Experimental material used for the study of reciprocal selection using line × tester design

Population A (PDM 53 × PDM 4441)		Population B (HKI 323 × HKI 1105)	
Sl. No.	F₄ line	Sl. No.	F₄ line
1	P37	1	H 5
2	P13	2	H 49
3	P40	3	H 46
4	P45	4	H 91
5	P44	5	H29
6	P17	6	H95
7	P8	7	H59
8	P10	8	H20

9	P19	9	H19
10	P50	10	H13
11	P38	11	H57
12	P39	12	H35
13	P32	13	H106
14	P14	14	H8
15	P4	15	H32
16	P15	16	H41
17	P12	17	H28
18	P27	18	H51
19	P34	19	H16
20	P48	20	H94
21	P11	21	H97
22	P41	22	H99
23	P47	23	H61
24	P24	24	H22
25	P36	25	H81
26	P 30	26	H6
TESTERS		TESTERS	
1	HKI 1105 (T1)	1	PDM 4441(T3)
2	HKI 323(T2)	2	PDM 53(T4)
3	PDM 260-1(T5)	3	PDM 260-1(T5)
CHECKS			
1	National public check	HM4	
2	Private check	CPB 468	

Table 2: General combining ability (gca) effects of parents representing Population A (F₄ lines of PDM53 × PDM 4441) derived hybrids for different quantitative traits of babycorn

Sl. No.	Parents	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% Silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (G)	Babycorn Length (cm)	Babycorn Girth (cm)	Ovule colour	Ovule arrangement
LINES											
1	P37	-5.30 **	-24.86 **	-1.51 **	-0.11 **	-1.16 **	-5.67 **	-0.34 **	-0.06 **	W	R
2	P13	-6.30 **	-19.41 **	0.82 *	-0.22 **	-1.23 **	-2.69 **	-0.31 **	-0.04 **	CY	R
3	P40	0.98 **	1.89 *	-1.01 *	0.12 **	-0.14 **	-0.71 **	-0.06	0.01	CW	R
4	P45	3.81 **	17.21 **	1.49 **	0.13 **	0.64 **	3.09 **	0.74 **	-0.03 **	W	IR
5	P44	-3.62 **	7.99 **	-0.01	0.15 **	-1.34 **	0.33 **	-0.49 **	-0.07 **	W	IR
6	P17	7.48 **	20.58 **	-2.68 **	0.54 **	0.51 **	-0.69 **	0.23 **	0.07 **	C	R
7	P8	-0.41	-10.23 **	0.82 *	-0.03	-0.02	-2.48 **	-0.16 *	0.05 **	Y	R
8	P10	5.53 **	18.48 **	-0.35	0.06 **	1.38 **	4.66 **	0.18 *	0.01	CY	R
9	P19	-1.67 **	-15.32 **	-1.51 **	0.05 *	-0.54 **	-5.21 **	-0.26**	-0.04 **	C	IR
10	P50	-7.68 **	-53.97 **	-0.01	-0.98 **	0.88 **	-3.36 **	-0.33 **	0.03 **	W	R
11	P38	1.64 **	2.59 **	0.32	-0.27 **	1.37 **	4.22 **	0.53 **	0.02 *	CW	R
12	P39	-5.38 **	-22.30 **	2.65 **	-0.12 **	-1.03 **	-4.68 **	-0.58 **	-0.09 **	W	R
13	P32	-1.95 **	-11.73 **	0.65	-0.14 **	-0.11 **	-1.34 **	0.49 **	0.09 **	Y	IR
14	P14	1.54 **	21.21 **	-2.18 **	0.05 *	0.29 **	5.21 **	-0.19 *	-0.01 **	CY	R
15	P4	1.10 **	21.38 **	0.82 *	0.07 **	0.07 *	4.78 **	0.04	-0.02	C	R
16	P15	-3.51 **	9.28 **	1.15 **	-0.20 **	-0.36 **	5.22 **	0.44 **	-0.03 **	W	R
17	P12	-0.73 **	-9.56 **	0.65	0.11 **	-0.59 **	-3.80 **	-0.33 **	0.08 **	W	IR
18	P27	8.91 **	24.27 **	0.82 *	0.21 **	1.68 **	3.72 **	0.66 **	0.17 **	CY	R
19	P34	4.88 **	7.52 **	-1.01 *	0.15 **	0.81 **	0.27 **	0.46 **	0.10 **	CW	R
20	P48	-4.59 **	-23.68 **	-1.01 *	-0.56 **	0.37 **	0.60 **	0.18 *	-0.03 **	W	IR
21	P11	5.34 **	26.29 **	-0.35	0.23 **	0.66 **	3.95 **	0.13	-0.09 **	W	R
22	P41	1.81 **	-13.19 **	-1.68 **	-0.02	0.65 **	-2.95 **	0.18 *	-0.06 **	C	R
23	P47	-0.92 **	-0.68	2.65 **	0.26 **	-1.0 **	-3.60 **	-0.63 **	-0.01	Y	R
24	P24	-3.81 **	-11.25 **	2.32 **	-0.05 **	-0.82 **	-2.04 **	-0.41 **	-0.06 **	CY	IR
25	P36	8.48 **	34.77 **	-0.18	0.69 **	0.31 **	0.95 **	0.69 **	-0.05 **	C	R
26	P 30	-5.72 **	2.64 **	-1.68 **	-0.10 **	-1.29 **	2.15 **	-0.88 **	0.16 **	CY	R
	CD(5%)	0.64	2.66	1.09	0.06	0.09	0.23	0.21	0.03		
	CD (1%)	0.84	3.53	1.45	0.08	0.12	0.31	0.28	0.04		
	SE	0.32	1.34	0.55	0.03	0.04	0.12	0.11	0.02		
TESTERS											
1	HKI 1105	-1.60 **	-6.16 **	0.47 **	-0.09 **	-0.23 **	-0.67 **	-0.01	0.002	W	R
2	HKI 323	3.37 **	16.09 **	-0.58 **	0.21 **	0.33 **	1.93 **	0.05	0.02 **	W	R
3	PDM 260-1	-1.77 **	-9.93 **	0.11	-0.11**	-0.01 **	-1.23 **	-0.04	-0.02 **	C	R
	CD(5%)	0.22	0.90	0.37	0.02	0.03	0.08	0.07	0.01		

CD (1%)	0.29	1.11	0.49	0.03	0.04	0.11	0.01	0.02		
SE	0.11	0.45	0.19	0.001	0.02	0.03	0.04	0.01		

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Table 3: General combining ability effects of parents involved in Population B (F4 lines of HKI 1105 × HKI 323) derived hybrids for different quantitative traits of Babycorn

Sl. No.	Parents	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (g)	Babycorn lngth (cm)	Babycorn girth (cm)	Ovule colour	Ovule arrangement
LINES											
1	H 5	-3.72 **	-6.56 **	-1.39 **	0.004	-1.01 **	-2.35 **	-0.12 **	-0.04 **	CW	IR
2	H 49	-4.46 **	-14.41 **	-2.72 **	-0.25 **	-0.61 **	-1.27 **	-0.02 *	0.02	W	R
3	H 46	-1.80 **	8.37 **	-2.56 **	-0.26 **	0.44 **	7.08 **	0.36 **	-0.003	W	R
4	H 91	0.75 **	5.01 **	-2.22 **	0.19 **	-0.36 **	-1.38 **	-0.56 **	0.04 **	C	R
5	H29	2.05 **	-6.21 **	-0.22	0.05 **	0.42 **	-2.44 **	0.19 **	0.05 **	Y	IR
6	H95	-4.21 **	-18.89 **	2.11 **	-0.13 **	-0.71 **	-3.57 **	0.15 **	0.01	CY	R
7	H59	-8.63 **	-23.52 **	1.28 **	-0.42 **	-1.33 **	-1.34 **	-0.80 **	-0.03 *	C	R
8	H20	-0.25 *	-14.32 **	2.44 **	-0.22 **	0.38 **	-1.88 **	0.66 **	-0.001	CW	R
9	H19	-3.71 **	-18.35 **	0.44	-0.14 **	-0.67 **	-3.13 **	-0.78 **	0.07 **	W	R
10	H13	3.61 **	15.23 **	1.61 **	0.28 **	0.34 **	1.35 **	-0.31 **	-0.02	W	R
11	H57	-4.71 **	-30.00 **	2.28 **	-0.07 **	-1.07 **	-7.27 **	-0.21 **	-0.05 **	C	R
12	H35	3.57 **	5.38 **	1.44 **	0.09 **	0.74 **	0.39 **	-0.26 **	0.09 **	Y	R
13	H106	-0.63 **	-13.64 **	-1.89 **	-0.04 **	-0.004	-3.20 **	0.32 **	-0.07 **	CY	R
14	H8	5.98 **	28.96 **	-1.39 **	0.22 **	1.16 **	5.35 **	0.69 **	0.03 *	C	R
15	H32	-1.66 **	20.28 **	-0.56	0.10 **	-0.66 **	4.11 **	0.41 **	-0.04 **	W	R
16	H41	-1.65 **	-9.08 **	-2.39 **	-0.01	-0.46 **	-2.64 **	-1.27 **	-0.01	W	R
17	H28	-5.72 **	-27.92 **	0.94 *	-0.34 **	-0.67 **	-3.51 **	0.17 **	-0.05 **	C	R
18	H51	-3.52 **	6.78 **	2.61 **	0.04 **	-1.03 **	1.79 **	-0.63 **	-0.05 **	W	R
19	H16	-3.93 **	-5.41 **	1.28 **	0.11 **	-1.35 **	-2.53 **	-0.24 **	-0.07 **	C	R
20	H94	13.30 **	54.71 **	-0.39	0.20 **	2.99 **	12.03 **	0.53 **	0.03 **	C	R
21	H97	-4.41 **	-7.91 **	0.61	-0.11 **	-0.67 **	-0.92 **	-0.59 **	-0.05 **	C	R
22	H99	12.02 **	40.25 **	-1.89 **	0.51 **	1.66 **	4.01 **	0.29 **	-0.03 **	Y	R
23	H61	6.15 **	7.54 **	-1.56 **	0.39 **	0.39 **	-2.95 **	0.56 **	0.06 **	CY	IR
24	H22	4.22 **	-6.18 **	2.11 **	-0.03 **	1.25 **	-1.17 **	0.56 **	0.04 **	C	IR
25	H81	-3.38 **	-17.08 **	-0.06	-0.34 **	0.13 **	0.02	0.45 **	0.05 **	W	R
26	H6	4.76 **	27.07 **	0.11	0.15 **	0.87 **	5.33 **	0.45 **	0.02	W	R
	CD(5%)	0.25	0.99	0.92	0.02	0.03	0.02	0.02	0.03		
	CD (1%)	0.33	1.31	1.21	0.027	0.041	0.03	0.03	0.03		
	SE	0.13	0.41	0.45	0.010	0.02	0.01	0.01	0.01		
TESTERS											
1	PDM 4441	3.13 **	11.40 **	-0.75 **	0.01 **	0.58 **	1.83 **	0.002	0.01 **	W	R
2	PDM 53	-2.41 **	4.07 **	-0.81 **	0.01	-0.67 **	1.13 **	-0.09 **	-0.002	C	R
3	PDM 260-1	-0.73 **	-15.47 **	1.56 **	-0.11 **	0.09 **	-2.95 **	0.08 **	-0.01 **	C	R
	CD(5%)	0.09	0.34	0.311	0.007	0.011	0.008	0.008	0.008		

CD (1%)	0.11	0.45	0.4123	0.0093	0.0140	0.0104	0.0107	0.0112		
SE	0.04	0.17	0.1561	0.0035	0.0053	0.0039	0.0041	0.0042		

UNDER PEER REVIEW

Table 4: Specific combining ability effects of single crosses involving Population A (F₄ lines of PDM 53 × PDM 4441) for different quantitative characters of Babycorn

Sl. No.	Derived crosses	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (G)	Babycorn Length (cm)	Babycorn Girth (cm)	Ovule colour	Ovule arrangement
1	P37 × HKI 1105	-1.24 **	-22.82 **	-1.64 *	-0.24 **	0.24 **	-4.11 **	0.25	0.01	W	R
2	P37 × HKI 323	4.15 **	8.39 **	0.92	-0.08 *	1.38 **	3.53 **	0.29 *	0.02	Y	R
3	P37 × PDM 260-1	-2.91 **	14.43 **	0.72	0.32 **	-1.62 **	0.58 **	-0.54 **	-0.03	CW	R
4	P13 × HKI 1105	-5.93 **	-5.36 **	4.53 **	-0.14 **	-1.41 **	0.07	-0.44 **	-0.02	W	R
5	P13 × HKI 323	-1.94 **	-10.03 **	-2.92 **	-0.08 *	-0.18 **	-1.64 **	-0.31 **	-0.08 **	W	R
6	P13 × PDM 260-1	7.88 **	15.39 **	-1.61 *	0.22 **	1.59 **	1.56 **	0.84 **	0.01 **	C	R
7	P40 × HKI 1105	-7.42 **	-23.78 **	0.86	-0.62 **	-0.28 **	1.01 **	-0.79 **	-0.02	Y	R
8	P40 × HKI 323	8.37 **	19.03 **	-1.08	0.66 **	0.42 **	-2.59 **	0.01	0.06 **	CY	R
9	P40 × PDM 260-1	-0.95 *	4.76 **	0.22	-0.04	-0.14 *	1.58 **	0.79 **	-0.04 *	Y	R
10	P45 × HKI 1105	4.35 **	18.59 **	-1.14	0.22 **	0.59 **	2.23 **	-0.26	-0.02	W	R
11	P45 × HKI 323	-8.81 **	-7.63 **	-2.58 **	-0.34 **	-1.41 **	1.91 **	-0.78 **	-0.08 **	CW	R
12	P45 × PDM 260-1	4.46 **	-10.97 **	3.72 **	0.11 **	0.82 **	-4.22 **	1.03 **	0.10 **	W	R
13	P44 × HKI 1105	-0.02	24.96 **	0.86	0.21 **	-0.42 **	4.26 **	-0.06	0.04	Y	R
14	P44 × HKI 323	-7.29 **	-45.55 **	1.92 **	-0.37 **	-0.99 **	-7.78 **	-0.76 **	-0.07 **	CY	R
15	P44 × PDM 260-1	7.31 **	20.59 **	-2.78 **	0.17 **	1.41 **	3.51 **	0.82 **	0.03	C	R
16	P17 × HKI 1105	2.66 **	6.65 **	-1.47 *	-0.11 **	0.91 **	2.97 **	0.378 **	-0.01 **	W	R
17	P17 × HKI 323	-3.41 **	0.15	0.58	0.02	-0.92 **	-0.53 **	-0.43 **	0.06 **	W	R
18	P17 × PDM 260-1	0.84 *	-6.71 **	0.89	0.09 *	-0.08	-2.44 **	0.05	0.03	CY	R
19	P8 × HKI 1105	-2.75 **	-12.40 **	-0.47	-0.35 **	0.24 **	0.78 **	0.26	-0.08 **	CW	R
20	P8 × HKI 323	1.07 **	14.41 **	-0.42	0.32 **	-0.54 **	0.16	-0.35 *	-0.03	W	R
21	P8 × PDM 260-1	1.68 **	-2.01	0.89	0.03	0.30 **	-0.94 **	0.09	0.11 **	W	R
22	P10 × HKI 1105	-0.42	-8.38 **	-1.31	0.32 **	-0.98 **	-6.05 **	-0.77 **	-0.04	C	R
23	P10 × HKI 323	0.67	15.29 **	0.75	-0.37 **	1.28 **	8.81 **	0.07	0.15 **	CY	R
24	P10 × PDM 260-1	-0.25	-6.92 **	0.56	0.05	-0.31 **	-2.76 **	0.70 **	-0.11 **	CY	R
25	P19 × HKI 1105	3.23 **	12.48 **	-1.14	0.05	0.74 **	3.47 **	0.21	-0.04 *	C	R
26	P19 × HKI 323	1.67 **	26.79 **	0.42	0.57 **	-0.86 **	1.39 **	-0.31 **	0.06 **	CY	R
27	P19 × PDM 260-1	-4.81 **	-39.27 **	0.72	-0.61 **	0.12 *	-4.86 **	0.19	-0.02	CY	R
28	P50 × HKI 1105	-0.05	-3.56 *	2.86 **	0.25 **	-0.999 **	-5.23 **	-0.57 **	0.11 **	Y	R
29	P50 × HKI 323	-0.71	-5.31 **	-2.08 **	-0.03	-0.133 *	-0.98 **	0.17	-0.002	CY	R
30	P50 × PDM 260-1	0.76	8.86 **	-0.78	-0.22 **	1.132 **	6.22 **	0.40 **	-0.11 **	C	R

Table 4: Contd.....

Sl. No.	Derived crosses	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (g)	Babycorn length (cm)	Babycorn girth (cm)	Ovule colour	Ovule arrangement
31	P38 × HKI 1105	-2.08 **	-33.25 **	-1.97 **	-0.14 **	-0.19 **	-7.98 **	-0.07	-0.02	W	R
32	P38 × HKI 323	-7.21 **	2.04	-0.92	0.16 **	-2.54 **	-1.67 **	0.67 **	0.09 **	Y	R
33	P38 × PDM 260-1	9.38 **	31.21 **	2.89 **	-0.01	2.73 **	9.65 **	-0.51 **	-0.07 **	C	R
34	P39 × HKI 1105	0.49	-4.20 *	-5.81 **	-0.11 **	0.29 **	-0.03	-0.12	-0.05 **	W	R
35	P39 × HKI 323	-0.11	17.82 **	4.25 **	0.62 **	-1.38 **	-1.61 **	0.17	-0.04 *	W	R
36	P39 × PDM 260-1	-0.37	-13.61 **	1.56 *	-0.51 **	1.09 **	1.64 **	-0.05	0.01 **	CY	R
37	P32 × HKI 1105	6.16 **	25.97 **	2.69 **	0.74**	-0.23 **	-1.28 **	-0.29 *	-0.02	CW	R
38	P32 × HKI 323	-9.94 **	-47.52 **	-0.25	-0.87 **	-0.34 **	-2.92 **	-0.15	0.03	W	R
39	P32 × PDM 260-1	3.78 **	21.53 **	-2.44 **	0.14 **	0.57 **	4.20 **	0.44 **	-0.01	W	R
40	P14 × HKI 1105	9.43 **	10.41 **	-0.47	0.23 **	1.87 **	-0.07	0.24	0.01	C	R
41	P14 × HKI 323	-2.92 **	-14.18 **	1.08	-0.30 **	0.34 **	1.12 **	0.14	-0.05 *	Y	R
42	P14 × PDM 260-1	-6.51 **	3.68 *	-0.61	0.16 **	-2.21 **	-1.05 **	-0.38 **	0.04	CY	R
43	P4 × HKI 1105	-7.63 **	1.51	0.53	-0.06	-1.84 **	1.74 **	0.16	0.09 **	C	R
44	P4 × HKI 323	5.50 **	17.84 **	1.08	0.24 **	0.76 **	1.19 **	-0.21 *	-0.03	CY	R
45	P4 × PDM 260-1	2.13 **	-19.44 **	-1.61 *	-0.17 **	1.08 **	-2.92 **	0.14	-0.06 **	C	R
46	P15 × HKI 1105	2.27 **	-17.64 **	1.19	0.18 **	0.13 *	-7.05 **	-0.79 **	-0.09 **	CY	R
47	P15 × HKI 323	-10.73 **	27.11 **	-2.25 **	-0.11 **	-2.71 **	8.82 **	0.21	-0.01 **	C	R
48	P15 × PDM 260-1	8.47 **	-9.47 **	1.06	-0.07	2.58 **	-1.77 **	0.59 **	0.19 **	Y	R
49	P12 × HKI 1105	11.09 **	39.45 **	2.19 **	0.65 **	1.28 **	3.16 **	0.88 **	0.07 **	CY	R
50	P12 × HKI 323	-3.19 **	-29.53 **	-1.75 *	-0.24 **	-0.09	-5.03 **	-1.08 **	0.09 **	C	R
51	P12 × PDM 260-1	-7.89 **	-9.92 **	-0.44	-0.42 **	-1.11 **	1.86 **	0.20	-0.17 **	W	R
52	P27 × HKI 1105	-10.28 **	11.25 **	0.03	-0.15 **	-2.13 **	5.54 **	0.19	0.02	Y	R
53	P27 × HKI 323	10.29 **	23.17 **	-0.42	0.45 **	1.06 **	-0.02	0.44 **	-0.05 **	CY	R
54	P27 × PDM 260-1	-0.01	-34.42 **	0.39	-0.21 **	1.07 **	-5.52 **	-0.63 **	0.03	C	R
55	P34 × HKI 1105	0.65	-6.42 **	-0.14	0.24 **	-0.33 **	-4.03 **	0.39 **	0.07 **	W	R
56	P34 × HKI 323	6.53 **	15.05 **	-0.08	0.01	1.61 **	3.45 **	0.19	0.02	W	R
57	P34 × PDM 260-1	-7.18 **	-8.63 **	0.22	-0.24 **	-1.28 **	0.57 **	-0.58 **	-0.08 **	CY	R
58	P48 × HKI 1105	-2.79 **	-6.39 **	-1.14	0.09 *	-1.19 **	-3.34 **	-0.22	0.11 **	C	R
59	P48 × HKI 323	0.41	-8.00 **	1.92 **	-0.36 **	1.45 **	3.04 **	0.42 **	-0.05 *	W	R
60	P48 × PDM 260-1	2.38 **	14.39 **	-0.78	0.28 **	-0.27 **	0.21 *	-0.11	-0.06 **	W	R
61	P11 × HKI 1105	10.15 **	37.31 **	-0.81	0.43 **	1.49 **	4.33 **	0.63 **	0.05 **	C	R
62	P11 × HKI 323	1.07 **	-16.30 **	1.25	-0.18 **	0.82 **	-2.14 **	0.27 *	-0.04 *	Y	R

Table 4: Contd.....

Sl. No.	Derived crosses	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (G)	Babycorn Length (cm)	Babycorn Girth (cm)	Ovule colour	Ovule arrangement
63	P11 × PDM 260-1	-11.22 **	-21.01 **	-0.44	-0.26 **	-2.31 **	-2.11 **	-0.81 **	-0.01	CY	R
64	P41 × HKI 1105	-0.27	-2.65	-0.97	-0.48 **	1.50 **	5.20 **	0.23	-0.001	C	R
65	P41 × HKI 323	-4.56 **	-27.93 **	0.58	-0.09 **	-1.06 **	-6.57 **	-0.28 *	-0.06 **	CY	R
66	P41 × PDM 260-1	4.83 **	30.58 **	0.39	0.58 **	-0.45 **	1.37 **	0.05	0.06 **	C	R
67	P47 × HKI 1105	-6.30 **	-17.08 **	0.69	-0.59 **	-0.14 *	2.88 **	0.43 **	0.05 *	Y	R
68	P47 × HKI 323	10.40 **	53.83 **	-2.75 **	0.81 **	0.71 **	4.38 **	-0.08	-0.03	CY	R
69	P47 × PDM 260-1	-4.10 **	-36.76 **	2.06 **	-0.21 **	-0.57 **	-7.25 **	-0.35 **	-0.02	C	R
70	P24 × HKI 1105	-2.53 **	-3.22	0.03	-0.38 **	0.22 **	3.71 **	0.06	-0.06 **	W	R
71	P24 × HKI 323	4.95 **	-10.18 **	2.08 **	-0.16 **	1.75 **	-1.08 **	1.46 **	0.09 **	CW	R
72	P24 × PDM 260-1	-2.42 **	13.31 **	-2.11 **	0.55 **	-1.97 **	-2.62 **	-1.51 **	-0.03	C	R
73	P36 × HKI 1105	-1.32 **	-20.11 **	2.53 **	-0.01 **	0.05	-3.49 **	0.26	-0.08 **	W	R
74	P36 × HKI 323	9.72 **	2.99	1.08	0.01	2.07 **	-1.14 **	0.41 **	0.08 **	W	R
75	P36 × PDM 260-1	-8.40 **	23.19 **	-3.61 **	0.09 *	-2.13 **	4.63 **	-0.67 **	0.004	CY	R
76	P30 × HKI 1105	0.55	-1.49	-0.47	-0.12 **	0.47 **	1.32 **	-0.17	0.01	CY	R
77	P30 × HKI 323	-3.78 **	-15.78 **	-0.42	-0.18 **	-0.51 **	-2.21 **	0.07	-0.02	C	R
78	P30 × PDM 260-1	3.23 **	17.27 **	0.89	0.30 **	0.05	0.89 **	0.10	0.01	C	R
CD (5%)		0.78	3.26	1.34	0.7	0.11	0.29	0.26	0.04		

Table 5: Specific combining ability effects of crosses involving Population B (F4 lines of HKI 1105 × HKI 323) for different quantitative characters of Babycorn

Sl. No.	Crosses	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (G)	Babycorn Length (cm)	Babycorn Girth (cm)	Ovule colour	Ovule arrangement
1	H 5 × PDM 4441	-11.66 **	-54.47 **	0.58	-0.51 **	-1.94**	-12.15 **	-1.42 **	-0.05 *	W	R
2	H 5 × PDM 53	0.66 **	-19.11 **	1.64 *	0.01	0.27 **	-3.25 **	0.29 **	-0.03	Y	R
3	H 5 × PDM 260-1	11.00 **	73.58 **	-2.22 **	0.50 **	1.67 **	15.41 **	1.13 **	0.08 **	CW	R
4	H 49 × PDM 4441	-3.40 **	-11.54 **	-0.08	-0.26 **	-0.10 **	2.03 **	-0.02	0.01 **	W	R
5	H 49 × PDM 53	10.28 **	40.33**	1.47	0.52 **	1.49 **	5.56 **	0.19 **	-0.02	W	R
6	H 49 × PDM 260-1	-6.87 **	-28.71 **	-1.39	-0.25 **	-1.39 **	-7.59 **	-0.17 **	-0.08 **	C	R
7	H 46 × PDM 4441	2.88 **	-10.36 **	0.25	0.36 **	-0.40 **	-8.61 **	-0.07 **	0.12 **	Y	R
8	H 46 × PDM 53	0.61 **	14.99 **	-0.69	0.33 **	-0.89 **	-1.76 **	0.02	-0.08 **	CY	R
9	H 46 × PDM 260-1	-3.48 **	-4.63 **	0.44	-0.68 **	1.21 **	10.45 **	0.05 *	-0.04 *	Y	R
10	H 91 × PDM 4441	8.33 **	39.16 **	0.92	0.56 **	0.63 **	3.26 **	0.18 **	0.08 **	W	R
11	H 91 × PDM 53	-4.09 **	-15.73 **	1.47	-0.22 **	-0.45 **	-1.29 **	-0.15 **	-0.00	CW	R
12	H 91 × PDM 260-1	-4.24 **	-23.44 **	-2.39 **	-0.34**	-0.18 **	-1.98 **	-0.03	-0.08 **	W	R
13	H29 × PDM 4441	7.12 **	36.26 **	-0.59	0.13 **	1.50 **	8.11 **	-0.31 **	-0.02	Y	R
14	H29 × PDM 53	-2.08 **	-12.63 **	-0.53	-0.10 **	-0.23 **	-2.14 **	-0.13 **	0.08 **	CY	R
15	H29 × PDM 260-1	-5.04 **	-23.63 **	1.11	-0.02	-1.28 **	-6.05 **	0.44 **	-0.07 **	C	R
16	H95 × PDM 4441	1.33 **	25.04 **	5.08 **	-0.10 **	0.73 **	9.07 **	0.04	0.01	W	R
17	H95 × PDM 53	-5.17 **	-37.78 **	-1.86 *	-0.09 **	-1.29 **	-10.69 **	-0.01	-0.01	W	R
18	H95 × PDM 260-1	3.84 **	12.74 **	-3.22 **	0.11 **	0.56 **	1.62 **	-0.04	-0.00	CY	R
19	H59 × PDM 4441	2.97 **	13.81 **	-2.08 *	0.18 **	0.51 **	2.18 **	0.33 **	-0.08 **	CW	R
20	H59 × PDM 53	-1.31 **	9.33 **	-2.03 *	-0.03	-0.39 **	3.64 **	-0.46 **	0.12 **	W	R
21	H59 × PDM 260-1	-1.66 **	-23.14 **	4.11 **	-0.14 **	-0.12 **	-5.82 **	0.13 **	-0.04 *	W	R
22	H20 × PDM 4441	7.98 **	51.06 **	-2.25 **	0.29 **	1.48 **	10.72 **	0.44 **	0.11 **	C	R
23	H20 × PDM 53	-13.04 **	-51.55 **	5.81 **	-0.49 **	-2.58 **	-9.14 **	-0.91 **	-0.04	CY	R
24	H20 × PDM 260-1	5.06 **	0.49	-3.56 **	0.11 **	1.10 **	-1.58 **	0.47 **	-0.07 **	CY	R
25	H19 × PDM 4441	4.23 **	-20.43 **	0.75	0.12 **	0.81 **	-6.87 **	-0.05 *	-0.01	C	R
26	H19 × PDM 53	2.18 **	21.43 **	-1.19	0.30 **	-0.12 **	1.79 **	0.48 **	0.07 **	CY	R
27	H19 × PDM 260-1	-6.41 **	-0.91	0.44	-0.42 **	-0.78 **	5.07 **	-0.42 **	-0.06 **	CY	R
28	H13 × PDM 4441	5.87 **	29.92 **	0.58	0.61 **	-0.30 **	-0.48 **	-0.10 **	-0.02	Y	R
29	H13 × PDM 53	0.34	6.37 **	-0.36	-0.61 **	2.19 **	11.78 **	-0.12 **	-0.05 *	CY	R
30	H13 × PDM 260-1	-6.21 **	-36.29 **	-0.22	0.08 **	-1.89 **	-11.30 **	0.22 **	0.07 **	C	R

Table 5: Contd.....

Sl. No.	Crosses	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of ears per plant	Babycorn weight without husk (g)	Babycorn weight with husk (G)	Babycorn Length (cm)	Babycorn Girth (cm)	Ovule colour	Ovule arrangement
31	H57 × PDM 4441	-1.95 **	-8.60 **	-0.08	0.09 **	-0.71 **	-2.74 **	-0.17 **	-0.04	W	R
32	H57 × PDM 53	-0.28	7.67 **	-3.53 **	-0.14 **	0.25 **	4.01 **	-0.53 **	0.02	Y	R
33	H57 × PDM 260-1	2.23 **	0.93	3.61 **	0.06 **	0.46 **	-1.27 **	0.70 **	0.02	C	R
34	H35 × PDM 4441	0.62 **	7.24 **	-2.25 **	0.20 **	-0.45 **	-0.65 **	-0.51 **	0.00	W	R
35	H35 × PDM 53	-2.40 **	-13.95 **	-0.69	-0.23 **	-0.01	-1.13 **	1.14 **	0.03	W	R
36	H35 × PDM 260-1	1.78 **	6.72 **	2.94 **	0.02	0.46 **	1.79 **	-0.62 **	-0.03	CY	R
37	H106 × PDM 4441	-2.37 **	-26.06 **	1.08	-0.18 **	-0.14 **	-4.94 **	-0.04	-0.01	CW	R
38	H106 × PDM 53	2.11 **	35.66 **	1.14	0.06 **	0.43 **	8.92 **	0.07 **	0.01	W	R
39	H106 × PDM 260-1	0.17	-9.60 **	-2.22 **	0.12 **	-0.29 **	-3.99 **	-0.03	-0.00	W	R
40	H8 × PDM 4441	0.25	17.82 **	0.08	-0.04 *	-0.01	4.61 **	0.82 **	-0.11 **	C	R
41	H8 × PDM 53	0.87 **	-7.33 **	-1.36	0.48 **	-1.05 **	-8.06 **	-0.32 **	0.02	Y	R
42	H8 × PDM 260-1	-1.12 **	-10.41 **	1.28	-0.44 **	1.06 **	3.46 **	-0.50 **	0.09 **	CY	R
43	H32 × PDM 4441	-2.03 **	10.23 **	0.75	-0.19 **	-0.06 *	6.12 **	-0.04	-0.04	C	R
44	H32 × PDM 53	2.32 **	27.87 **	-0.19	0.15 **	0.26 **	5.67 **	0.38 **	-0.05 *	CY	R
45	H32 × PDM 260-1	-0.29	-38.10 **	-0.56	0.03	-0.19 **	-11.78 **	-0.34 **	0.09 **	C	R
46	H41 × PDM 4441	7.13 **	46.00 **	0.58	0.22 **	1.32 **	9.89 **	0.26 **	0.02	CY	R
47	H41 × PDM 53	-5.44 **	-32.15 **	0.14	-0.32 **	-0.67 **	-4.73 **	-0.04	-0.08 **	C	R
48	H41 × PDM 260-1	-1.61 **	-13.85 **	-0.72	0.01 **	-0.65 **	-5.16 **	-0.22 **	0.05 *	Y	R
49	H28 × PDM 4441	-6.15 **	-17.29 **	-1.75 *	-0.16 **	-1.31 **	-2.78 **	0.41 **	-0.04 *	CY	R
50	H28 × PDM 53	6.67 **	6.75 **	-0.19	0.13 **	1.54 **	0.17 **	0.24 **	0.06 **	C	R
51	H28 × PDM 260-1	-0.52 *	10.54 **	1.94 *	0.03	-0.23 **	2.60 **	-0.64 **	-0.02	W	R
52	H51 × PDM 4441	0.51 *	-30.44 **	0.58	0.04 *	0.06 *	-8.82 **	-0.09 **	-0.04	Y	R
53	H51 × PDM 53	-1.31 **	12.25 **	-1.86 *	-0.26 **	0.25 **	6.78 **	-0.09 **	-0.03	CY	R
54	H51 × PDM 260-1	0.89 **	18.19 **	1.28	0.22 **	-0.31 **	2.03 **	0.19 **	0.07 **	C	R
55	H16 × PDM 4441	2.86 **	6.19 **	-3.08 **	-0.22 **	1.40 **	4.31 **	0.64 **	-0.01	W	R
56	H16 × PDM 53	7.59 **	17.43 **	-2.03 *	0.84 **	0.23 **	-4.82 **	0.91 **	-0.01	W	R
57	H16 × PDM 260-1	-10.45 **	-23.62 **	5.12 **	-0.62 **	-1.63 **	0.51 **	-1.55 **	0.02	CY	R
58	H94 × PDM 4441	0.52 *	-11.87 **	2.08 *	-0.15 **	0.56 **	-1.18 **	-0.00	0.04	C	R
59	H94 × PDM 53	-2.01 **	-6.42 **	3.14**	-0.15 **	-0.02	0.25 **	-0.44 **	-0.01	W	R
60	H94 × PDM 260-1	1.49 **	18.29 **	-5.22 **	0.21 **	-0.54 **	0.93 **	0.44 **	-0.04	W	R

61	H97 × PDM 4441	-4.92 **	-10.91 **	-2.42 **	0.20 **	-1.98 **	-5.05 **	-0.22 **	0.01	C	R
62	H97 × PDM 53	1.52 **	33.12 **	-2.86 **	0.27 **	-0.44 **	5.46 **	0.42 **	-0.03	Y	R
63	H97 × PDM 260-1	3.40 **	-22.12 **	5.28 **	-0.47 **	2.42 **	-0.41 **	-0.11 **	0.02	CY	R
64	H99 × PDM 4441	-2.39 **	-11.35 **	3.58 **	-0.31 **	0.27 **	0.87 **	0.71 **	0.07 **	C	R
65	H99 × PDM 53	-7.32 **	-25.13 **	0.14	-0.15 **	-1.29 **	-4.67 **	-0.13 **	-0.03	CY	R
66	H99 × PDM 260-1	9.70 **	36.49 **	-3.72 **	0.46 **	1.02 **	3.80 **	-0.57 **	-0.04	C	R
67	H61 × PDM 4441	-11.31 **	-34.81 **	0.75	-0.48 **	-1.51 **	-3.28 **	-0.08 **	0.09 **	Y	R
68	H61 × PDM 53	21.66 **	49.34 **	0.31	0.56 **	3.75 **	5.38 **	0.64 **	0.04	CY	R
69	H61 × PDM 260-1	-10.35 **	-14.44 **	-1.06	-0.09 **	-2.24 **	-2.01 **	-0.56 **	-0.13 **	C	R
70	H22 × PDM 4441	3.60 **	1.12	-1.92 *	-0.19 **	1.68 **	2.91 **	-0.06 *	-0.06 **	W	R
71	H22 × PDM 53	-10.27 **	-28.86 **	6.64**	-0.26 **	-2.19 **	-5.25 **	-1.28 **	-0.01	CW	R
72	H22 × PDM 260-1	6.67 **	27.74 **	-4.72 **	0.44 **	0.50 **	2.34 **	1.34 **	0.06 **	C	R
73	H118 × PDM 4441	-3.49 **	-4.69 **	-0.25	-0.09**	-0.77**	-0.16 **	0.11 **	-0.05 *	W	R
74	H118 × PDM 53	0.64 **	-15.24**	-0.69	0.47**	-0.57**	0.68 **	-0.29 **	0.04	W	R
75	H118 × PDM 260-1	2.86 **	19.93 **	0.94	0.47 **	-0.57 **	-0.51**	0.09 **	0.01	CY	R
76	H6 × PDM 4441	-6.53 **	-30.85 **	-0.92	-0.14 **	-1.35 **	-6.39 **	-0.82 **	-0.08 **	CY	R
77	H6 × PDM 53	-2.72 **	-16.66 **	-1.86 *	-0.11 **	-0.38 **	-3.14 **	0.4 **	-0.03	C	R
78	H6 × PDM 260-1	9.25**	47.51**	2.78**	0.24**	1.73 **	9.52 **	0.69 **	0.11 **	C	R
	CD (5 %)	0.43	1.71	1.58	0.04	0.054	0.050	0.05	0.04		

Table 7: Simple pooled gca scores of parents involved in Population B (F₄ lines of HKI 323 × HKI 1105) derived hybrids for different quantitative characters of babycorn

Sl. No.	Parents	Babycorn yield per plant without husk (g)	Babycorn yield per plant with husk (g)	Days to 50% silking	Number of cobs per plant	Babycorn weight without husk (g)	Babycorn weight with husk (g)	Babycorn length (cm)	Babycorn girth (cm)	Pooled gca score
LINES										
1	H 5	-1	-1	+1	0	-1	-1	-1	-1	-5
2	H 49	-1	-1	+1	-1	-1	-1	-1	0	-5
3	H 46	-1	+1	+1	-1	+1	+1	+1	0	3
4	H 91	+1	+1	+1	+1	-1	-1	-1	+1	2
5	H29	+1	-1	0	+1	+1	-1	+1	+1	3
6	H95	-1	-1	-1	-1	-1	-1	+1	0	-5
7	H59	-1	-1	-1	-1	-1	-1	-1	-1	-8
8	H20	-1	-1	-1	-1	-1	-1	+1	0	-5
9	H19	-1	-1	0	-1	-1	-1	-1	+1	-5
10	H13	+1	+1	-1	+1	+1	+1	-1	0	3
11	H57	-1	-1	-1	-1	-1	-1	-1	-1	-8
12	H35	+1	+1	-1	+1	+1	+1	-1	+1	4
13	H106	-1	-1	-1	-1	0	-1	+1	-1	-5
14	H8	+1	+1	-1	+1	+1	+1	+1	+1	6
15	H32	-1	+1	0	+1	-1	+1	+1	-1	1
16	H41	-1	-1	+1	0	-1	-1	-1	0	-4
17	H28	-1	-1	-1	-1	-1	-1	+1	-1	-6
18	H51	-1	+1	-1	+1	-1	+1	-1	-1	-2
19	H16	-1	-1	-1	+1	-1	-1	-1	-1	-6
20	H94	+1	+1	0	+1	+1	+1	+1	+1	7
21	H97	-1	-1	0	-1	-1	-1	-1	-1	-7
22	H99	+1	+1	+1	+1	+1	+1	+1	-1	6
23	H61	+1	+1	+1	+1	+1	-1	+1	+1	6
24	H22	+1	-1	+1	-1	+1	-1	+1	+1	2
25	H81	-1	-1	0	-1	+1	0	+1	+1	0
26	H6	+1	+1	0	+1	+1	+1	+1	0	6
27	PDM 4441	+1	+1	+1	+1	+1	+1	0	+1	7
28	PDM 53	-1	+1	+1	0	-1	+1	-1	0	0
29	PDM 260-1	-1	-1	-1	-1	+1	-1	+1	-1	-4

Table 8: Per cent pooled gca effects in F₄ generation for various quantitative traits of baby corn (Population A)

Sl. No.	F ₄ lines	Baby corn yield per plant without husk (g)	Baby corn yield per plant with husk (g)	Days to 50 % silking	Number of ears per plant	Baby corn weight without husk (g)	Baby corn weight with husk (g)	Baby corn length (cm)	Baby corn girth (cm)	Pooled scores
Lines										
1	P37	-22.32	-19.97	-2.36	-3.66	-12.24	-12.03	-3.52	-5.65	-81.75
2	P13	-23.98	-16.98	1.23	-6.89	-30.92	-6.49	-3.62	-4.31	-91.96
3	P40	2.19	0.88	-1.60	2.70	-1.57	-1.48	-0.55	0.54	1.11
4	P45	17.23	15.01	2.20	4.39	5.90	5.99	9.08	-3.12	56.68
5	P44	-12.20	6.15	-0.02	4.57	-12.90	0.67	-5.97	-5.66	-25.36
6	P17	38.24	20.45	-3.85	19.32	5.56	-1.27	3.21	6.17	87.83
7	P8	-1.40	-6.83	1.27	-0.85	-0.26	-4.84	-1.80	3.78	-10.93
8	P10	24.51	14.00	-0.54	1.48	16.50	9.97	2.50	0.50	68.92
9	P19	-4.15	-8.06	-2.52	1.31	-5.69	-8.51	-2.25	-3.02	-32.89
10	P50	-25.31	-46.30	-0.02	-30.94	12.42	-8.22	-3.42	2.88	-98.91
11	P38	7.78	2.10	0.53	-9.27	15.85	10.42	6.27	1.86	35.54
12	P39	-22.97	-18.26	4.21	-4.17	-8.58	-6.71	-8.16	-7.05	-71.69
13	P32	-3.57	-6.42	1.00	-3.15	-1.08	-2.46	5.19	8.43	-2.06
14	P14	3.70	11.07	-3.11	1.12	2.46	9.72	-2.30	-7.64	15.02
15	P4	3.47	13.52	1.16	2.12	1.17	10.49	0.41	-1.22	31.12
16	P15	-14.02	6.28	1.83	-5.65	-4.10	10.44	5.87	-2.40	-1.75
17	P12	-1.67	-4.80	1.11	2.79	-6.90	-7.86	-2.86	6.44	-13.75
18	P27	25.79	19.60	1.20	6.49	18.05	7.28	6.30	16.12	100.83
19	P34	14.59	5.54	-1.46	4.93	10.61	0.61	4.70	9.54	49.06
20	P48	-10.86	-18.50	-1.50	-13.20	4.63	1.33	2.04	-2.92	-38.98

21	P11	16.59	18.14	-0.54	6.71	5.35	7.60	1.52	-7.93	47.44
22	P41	3.86	-8.57	-2.75	-0.49	4.60	-4.88	2.42	-5.62	-11.43
23	P47	-3.16	-0.35	4.15	7.65	-8.24	-6.65	-7.23	-1.09	-14.92
24	P24	-13.62	-9.23	3.90	-1.97	-7.79	-6.14	-4.77	-4.66	-44.28
25	P36	30.97	28.97	-0.29	21.16	3.49	1.91	7.50	-4.02	89.69
26	P 30	-18.33	1.62	-2.71	-2.98	-18.40	5.91	-10.58	13.11	-32.36
Testers										
1	HKI 1105	-9.20	-4.83	-4.26	0.78	-2.89	-1.68	-0.11	0.20	-21.99
2	HKI 323	22.48	17.87	9.23	-0.89	3.69	4.30	0.52	1.96	59.16
3	PDM 260-1	-9.05	-10.74	-5.77	0.19	-0.92	-3.15	-0.38	-2.23	-32.05

Table 9: Per cent pooled gca scores for various baby corn traits of in F₄ generation (Population B)

Sl. No.	F ₄ lines	Baby corn yield per plant without husk (g)	Baby corn yield per plant with husk (g)	Days to 50 % silking	Number of ears per plant	Baby corn weight without husk (g)	Baby corn weight with husk (g)	Baby corn length (cm)	Baby corn girth (cm)	Pooled scores
Lines										
1	H 5	-13.31	-6.48	-2.14	0.16	-12.54	-5.79	-1.22	-3.43	-44.75
2	H 49	-11.69	-13.68	-4.01	-8.20	-7.59	-3.62	-0.28	2.08	-46.98
3	H 46	-6.41	4.03	-4.03	-6.40	4.77	13.61	3.64	-0.30	8.91
4	H 91	2.24	5.10	-3.22	7.28	-4.71	-3.78	-7.10	3.90	-0.30
5	H29	6.98	-5.30	-0.33	1.60	4.64	-6.27	2.28	4.12	7.72
6	H95	-11.15	-29.00	2.95	-5.16	-12.82	-13.87	2.00	0.95	-66.10
7	H59	-33.69	-15.22	1.98	-14.13	-13.71	-2.61	-9.82	-2.20	-89.41
8	H20	-1.14	-12.13	3.85	-6.51	6.72	-5.30	9.55	-0.10	-5.06
9	H19	-13.60	-7.41	0.74	-4.17	-6.53	-4.23	-7.38	5.54	-37.04
10	H13	14.96	15.23	2.70	9.43	3.53	4.06	-3.10	-1.86	44.96
11	H57	-13.12	-26.45	3.73	-2.66	-14.62	-17.18	-2.46	-3.62	-76.37
12	H35	9.66	5.74	2.33	4.34	8.90	0.90	-3.68	6.49	34.68
13	H106	-1.58	-8.52	-2.76	-0.90	-0.04	-8.69	3.42	-6.60	-25.66
14	H8	19.33	16.51	-2.02	5.40	12.34	12.20	8.28	2.42	74.46
15	H32	-8.45	13.77	-0.79	3.63	-5.91	8.06	4.10	-2.89	11.53
16	H41	-7.19	-6.41	-3.74	-0.34	-6.94	-6.53	-17.51	-0.50	-49.15
17	H28	-23.57	-12.25	1.60	-8.40	-5.27	-6.31	1.59	-4.27	-56.88
18	H51	-14.77	5.80	3.84	1.23	-9.05	4.87	-6.13	-5.35	-19.57
19	H16	-18.82	-4.54	1.85	4.24	-11.73	-5.64	-2.43	-6.04	-43.12
20	H94	63.76	50.88	-0.58	5.08	29.93	44.77	6.00	3.15	202.99

21	H97	-11.94	-7.15	0.97	-4.44	-7.07	-2.03	-6.99	-4.29	-42.95
22	H99	32.53	29.95	-3.10	13.38	28.50	11.69	4.46	-3.47	113.92
23	H61	15.39	3.40	-2.47	12.42	2.50	-4.22	4.29	5.33	36.64
24	H22	14.03	-5.51	3.57	-1.28	11.75	-2.59	6.55	3.84	30.37
25	H81	-13.46	-15.98	-0.09	-11.40	1.57	0.06	5.12	3.86	-30.31
26	H6	20.53	22.14	0.17	4.77	12.04	13.99	6.38	1.77	81.79
Testers										
1	PDM 4441	16.91	12.86	-1.27	4.37	7.10	4.66	0.02	1.19	45.84
2	PDM 53	-13.27	4.43	-1.23	0.33	-7.76	2.56	-1.29	-0.18	-16.41
3	PDM 260-1	-3.63	-17.33	2.66	-5.35	0.91	-6.55	1.16	-1.09	-29.22

Table 10:: Weighted pooled gca scores for various quantitative traits of baby corn in F₄ generation (Population A)

Sl. No.	F4 lines	Baby corn yield per plant without husk (g)	Baby corn yield per plant with husk (g)	Days to 50 % silking	Number of ears per plant	Baby corn weight without husk (g)	Baby corn weight with husk (g)	Baby corn length (cm)	Baby corn girth (cm)	Pooled scores
1	P37	-106.48	-25.93	-10.70	1.12	-75.22	-17.38	-2.44	-3.43	-240.46
2	P13	-93.51	-54.71	-20.03	-57.40	-45.53	-10.86	-0.56	2.08	-280.52
3	P40	-51.26	16.11	-20.14	-44.80	28.61	40.84	7.28	-0.30	-23.67
4	P45	17.90	20.41	-16.12	50.96	-28.24	-11.35	-14.21	3.90	23.26
5	P44	55.85	-21.22	-1.67	11.20	27.87	-18.80	4.57	4.12	61.92
6	P17	-89.20	-116.01	14.75	-36.12	-76.94	-41.61	4.00	0.95	-340.17
7	P8	-269.54	-60.88	9.89	-98.93	-82.27	-7.82	-19.63	-2.20	-531.39
8	P10	-9.10	-48.53	19.23	-45.55	40.32	-15.90	19.09	-0.10	-40.54
9	P19	-108.84	-29.63	3.68	-29.18	-39.16	-12.68	-14.77	5.54	-225.03
10	P50	119.68	60.93	13.52	66.03	21.16	12.18	-6.19	-1.86	285.44
11	P38	-104.98	-105.80	18.66	-18.65	-87.70	-51.53	-4.92	-3.62	-358.53
12	P39	77.29	22.97	11.63	30.39	53.39	2.70	-7.36	6.49	197.50
13	P32	-12.62	-34.07	-13.80	-6.30	-0.24	-26.06	6.84	-6.60	-92.86
14	P14	154.62	66.05	-10.08	37.80	74.04	36.59	16.57	2.42	378.00
15	P4	-67.62	55.09	-3.93	25.43	-35.48	24.19	8.20	-2.89	2.99
16	P15	-57.54	-25.63	-18.68	-2.40	-41.61	-19.59	-35.02	-0.50	-200.97
17	P12	-188.60	-48.99	7.98	-58.80	-31.60	-18.93	3.18	-4.27	-340.02
18	P27	-118.18	23.20	19.18	8.63	-54.33	14.61	-12.26	-5.35	-124.50
19	P34	-150.55	-18.16	9.25	29.68	-70.38	-16.93	-4.87	-6.04	-228.01
20	P48	510.11	203.52	-2.88	35.53	179.58	134.31	11.99	3.15	1075.30

21	P11	-95.55	-28.58	4.83	-31.08	-42.44	-6.10	-13.98	-4.29	-217.18
22	P41	260.21	119.79	-15.50	93.64	170.99	35.06	8.93	-3.47	669.64
23	P47	123.08	13.60	-12.37	86.92	15.02	-12.66	8.58	5.33	227.52
24	P24	112.26	-22.02	17.87	-8.96	70.49	-7.78	13.11	3.84	178.81
25	P36	-107.65	-63.91	-0.46	-79.80	9.43	0.19	10.24	3.86	-228.10
26	P 30	164.28	88.55	0.86	33.36	72.25	41.97	12.75	1.77	415.79
TESTERS										
1	HKI 1105	135.27	51.44	-6.36	30.60	42.59	13.98	0.04	1.19	268.76
2	HKI 323	-106.15	17.70	-6.17	2.34	-46.59	7.68	-2.57	-0.18	-133.94
3	PDM 260-1	-29.01	-69.33	13.32	-37.47	5.45	-19.64	2.32	-1.09	-135.45

Table 11 : Weighted pooled gca scores for various quantitative traits of baby corn in F₄ generation (Population B)

Sl. No.	F4 lines	Baby corn yield per plant without husk (g)	Baby corn yield per plant with husk (g)	Days to 50 % silking	Number of ears per plant	Baby corn weight without husk (g)	Baby corn weight with husk (g)	Baby corn length (cm)	Baby corn girth (cm)	Pooled scores
LINES										
1	H 5	-178.56	-79.87	-11.82	-25.60	-73.41	-36.08	-7.04	-5.65	-418.04
2	H 49	-191.81	-67.93	6.13	-48.21	-185.52	-19.46	-7.25	-4.31	-518.37
3	H 46	17.50	3.51	-7.98	18.89	-9.40	-4.44	-1.11	0.54	17.51
4	H 91	137.81	60.03	11.01	30.70	35.42	17.96	18.17	-3.12	307.98
5	H29	-97.57	24.59	-0.10	31.99	-77.39	2.00	-11.93	-5.66	-134.06
6	H95	305.89	81.81	-19.27	135.23	33.34	-3.82	6.42	6.17	545.78
7	H59	-11.22	-27.32	6.36	-5.95	-1.56	-14.51	-3.59	3.78	-54.00
8	H20	196.10	55.99	-2.72	10.33	98.97	29.90	5.00	0.50	394.06
9	H19	-33.16	-32.22	-12.61	9.17	-34.17	-25.54	-4.51	-3.02	-136.06
10	H13	-202.45	-185.21	-0.11	-216.60	74.54	-24.65	-6.84	2.88	-558.45
11	H57	62.27	8.40	2.65	-64.91	95.10	31.27	12.54	1.86	149.18
12	H35	-183.80	-73.06	21.06	-29.19	-51.50	-20.14	-16.31	-7.05	-359.99
13	H106	-28.58	-25.69	4.99	-22.06	-6.48	-7.39	10.38	8.43	-66.39
14	H8	29.57	44.30	-15.56	7.85	14.77	29.16	-4.60	-7.64	97.84
15	H32	27.77	54.09	5.82	14.84	7.00	31.48	0.81	-1.22	140.60
16	H41	-112.19	25.10	9.16	-39.52	-24.58	31.32	11.74	-2.40	-101.38
17	H28	-13.40	-19.22	5.54	19.52	-41.40	-23.57	-5.72	6.44	-71.80
18	H51	206.35	78.40	5.99	45.42	108.28	21.85	12.60	16.12	495.02
19	H16	116.73	22.18	-7.29	34.54	63.69	1.82	9.40	9.54	250.60
20	H94	-86.87	-73.99	-7.50	-92.40	27.81	3.98	4.07	-2.92	-227.82

21	H97	132.75	72.55	-2.70	46.94	32.09	22.81	3.03	-7.93	299.54
22	H99	30.88	-34.27	-13.76	-3.44	27.61	-14.65	4.85	-5.62	-8.40
23	H61	-25.28	-1.38	20.73	53.54	-49.47	-19.94	-14.45	-1.09	-37.32
24	H22	-108.96	-36.94	19.50	-13.80	-46.74	-18.41	-9.53	-4.66	-219.52
25	H81	247.74	115.88	-1.43	148.13	20.91	5.74	14.99	-4.02	547.96
26	H6	-146.68	6.47	-13.54	-20.86	-110.40	17.73	-21.16	13.11	-275.34
TESTERS										
1	PDM 4441	-73.61	-19.32	3.92	-29.81	-17.33	-5.03	-0.22	0.20	-141.20
2	PDM 53	179.81	71.48	-4.45	64.64	22.11	12.90	1.04	1.96	349.50
3	PDM 260-1	-72.38	-42.98	0.93	-40.36	-5.54	-9.44	-0.75	-2.23	-172.75