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Estimation of heterosis and inbreeding depression in bottle gourd [*Lagenaria siceraria* (Mol) Standl]

Sandeep K Mauriya, AK Pal and Anand Kumar Singh

Abstract
In the present investigation, 10 lines and 4 testers of bottle gourd were taken in line x tester analysis for analyzing the magnitude of heterosis and degree of inbreeding depression studied for 10 characters of bottle gourd. Some crosses showed high degree of heterosis coupled with high degree of inbreeding depression indicating thereby that there is a greater role of non-additive gene action controlling the expression of those characters. In contrast, there are few crosses where low heterosis is linked with high degree of inbreeding depression. This indicates that, probably, gene having additive effects are cancelled leading to appreciable degree of inbreeding depression for such characters. In addition, crosses showing high degree of heterosis are linked with low degree of inbreeding depression indicating that, possibly, genes with additive as well as non-additive gene effect play important role in expression of heterosis in such cases.

Keywords: Heterosis, inbreeding depression, cucurbits

Introduction

Bottle gourd [*Lagenaria siceraria* (Mol) Standl.] is one of the important cucurbits commonly grown in both rainy and summer season in various parts of India. The chromosome number of bottle gourd is 2n = 22 (X = 11). The fresh fruit has light green smooth skin and white flesh. They come in a variety of shapes. They can be huge and round, small and bottle shaped or slim and serpentine, some times more than a meter long. It is a monoceious annual having vine with a long ribbed stem and strong tendrils (Pal *et al.*, 2002) [1]. Andromonoecious lines were also reported in bottle gourd (Hari Har Ram, 1999). Bottle gourd is one of the best vegetables and is rich in various essential minerals and proteins, making it of high medicinal value.

It is widely accepted that hybrid vigour represents hybrids superiority over parents-mid parent, better parent and economic parent. Basic concept of heterosis has been provided by Shull (1914) [14] which was further explained by different workers. Of them, dominance hypothesis being proposed by Kebel and Pello followed by Johnes (1918) has been accepted widely. Heterosis may be expressed in terms of mid parent (MP) or over better parent (BP) or over standard check (SC) (Hayes *et al*., 1956) with respect to agronomically useful traits. The primary objective of heterosis breeding is to achieve a quantum jump in yield and quality traits of crop. Heterosis is a natural phenomenon where by hybrid from genetically diverse parents show increased vigour relative to their parents (Shull, 1914; Coors and Pandey, 1997) [14, 10]. The high degree of heterosis is shown by the hybrids over better parents as well as over commercial varieties (Thakur *et al.,* 2017).

Material and methods

The experiment was conducted at Horticulture Research Farm of the Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, during rainy- summer and rainy season of 2017 and 2018. The experimental material of this investigation consisted of 10 lines, 4 testers resulting in 40 hybrids under line × tester mating design (Kempthorne, 1957) and 10 characters of bottle gourd *viz.*, vine length (m), number of fruit per vine, fruit set percentage, number of seeds per fruit, 100 seed weight (g), sex ratio (male : female), T.S.S (brix), Ascorbic acid (mg per 100 g), yield per plant and yield per hectare (q) were taken for genetical analysis like heterosis and inbreeding depression.

Seeds were sown at 2 x 0.75 m spacing in randomized block design with three replications. The selected 10 parental lines *i.e.* L_1 (Pant BG-1), L_2 (Pusa Samaridhi), L_3 (Narendra Pratibha), L_4 (KBGL-1), L_5 (KBGL-19), L_6 (KBGL-21), L_7 (KBGL-22), L_8 (Kalyanpur Long Green (KLG), L_9 (Azad Harit) and L_{10} (Kalyanpur Long Green (KLG) and 4 testers *i.e.*,

T_1 (Pusa Samaridhi), T_2 (Narendra Reshami), T_3 (Kashi Ganga) and T_4 (Arka Bahar) were used for production of 40 hybrids along with one check. All the recommended agronomic package of practices and protection measures were followed to raise a good crop. Observations on metric traits were recorded on single plant basis on five randomly selected competitive plants in each genotype from each plot for all the 10 traits mentioned above.

Results and discussion

For vine length, the highest positive heterosis was reported in the cross Pusa Naveen × Punjab Komal by Janaranjani *et al*. (2016) [2] in bottle gourd. In concomitant to theses, Patil *et al.* (2012) [3] studied heterosis in 28 crosses involving 8 parents under half diallel model where mid parent heterosis was highly significant for different characters in a number of crosses like Pusa Vishesh x PR-2, showing maximum mid parent heterosis followed by Pusa Vishesh x PRD-5, Palm Green Long x 85614, and IC-68310 x PRD- 2 for 14 characters of bottle gourd.

For number of fruits, none of the crosses showed significant positive heterosis (Sharma *et al.*, 2009) [12]. For fruit set percentage, eight crosses showed significant and positive heterosis of them, four crosses showed significant inbreeding depression over mid parent. In case of number of seeds per fruit, negative significant heterosis has been reported in three crosses (KBGL-19 x Narendra Rashmi, KBGL-21 x Narendra Rashmi and Purnima S-1 x Narendra Rashmi) which is supposed to be desirable trait from edible point of view in bottle gourd. Similarly, for 100 seed weight, eight crosses showed negative and significant heterosis which is a desirable trend of heterosis for this character from edible point of view. For sex ratio, significant heterosis has been reported in twelve crosses over mid parents, where some crosses also showed high degree of inbreeding depression. In such cases, there may be predominance of dominant gene action which operates in controlling the expression of this trait.

For T.S.S. (brix) heterosis over the mid parents has been reported for thirteen crosses. In most of the cases inbreeding depression is also high. For ascorbic acid content, twelve crosses showed heterosis over mid parent and five crosses showed heterosis over better parent. The magnitude of inbreeding depression was also high in certain cases like in KBGL-22 x Arka Bahar, KBGL-1 x Narendra Rashmi and KBGL-22X Pusa Samaridhi. For fruit yield per plant, heterosis has been reported in ten crosses over mid parent, but there was no associated trend of inbreeding depression for this character. For fruit yield, negative and significant heterosis has been reported for a number of crosses and inbreeding depression was not found linked with the magnitude of heterosis. This finding indicates that there was pronounced heterosis over better parents, best parents and commercial varieties for different characters like fruit yield per vine. Fruit yield per ha. expressed maximum standard heterosis for number of fruits per vine and the magnitude of heterosis is of similar to that of Choudhary *et al*. (2003) showing maximum standard heterosis for average fruit weight and is comparable with that reports by Dhaliwal and Lal (1996), Shashikumar and Pitchaimuthu (2016) [13].

However, crosses showing low heterosis also displayed high degree of inbreeding depression like in crosses Azad Harit X Pusa Samaridhi and KBGL-19 x Arka Bahar. This showed that heterosis depends upon nicking for genes (Singh, 2008) [15]. This may be due to cancellation of effect of dominance and epistatic gene which may be responsible for expression of above traits. Fruit yield per plant being a complex trait and is a multiplicative product of several basic component traits (Singh *et al*., 2005) [16]. The main objective of bottle gourd breeding is to increase fruit yield per plant. Pyzhenkov and Kosarreva (1981) [11] concluded in their study that hybrids showed desirable heterosis for total yield for both outdoor and greenhouse cultivation. Pandey *et al*. (2005) [10] and Hanchinamani and Patil (2009) [7] reported maximum yield attributed to increase in average fruit weight and total number of fruits per plant. Bairagi *et al*. (2002), Kumbhar *et al*. (2005) [8] and Munshi *et al*. (2005) [9] found promising heterosis for fruit yield in cucumber. This indicated that there was a strong tendency of transmission of higher gain from the parents to the offspring.

Table 1: Extent of heterosis and inbreeding depression for Vine length (m), Number of fruit per vine and Fruit set percentage

S.N.	Crosses	Vine length (m)				Number of fruit per vine				Fruit set percentage			
		MPH	HB	EH	ID	MPH	HB	EH	ID	MPH	HB	EH	ID
1.	L1 x T1	22.71	21.19	-13.34	7.47	-18.37	-20	-25.93	8.33	12.97*	7.99	2.01	18.78**
2.	L2 x T1	45.73**	3.8	-6.98	21.29*	10.39	-26.54 *	-26.54	9.41	14.41**	9.56	0.96	0.74
3.	L3 x T1	-1.79	23.94	-13.57	0.67	-1.89	-16.46	-18.52	1.92	0.11	2.94	-6.72	4.17
4.	L4 x T1	4.59	-10.26	-30.49	-3.84	0.67	-4.17	-14.81	7.33	-5.93	2.75	-2.18	-3.28
5.	L5 x T1	24.26*	33.51 **	14.71	-0.91	-5.30	7.59	4.94	7.69	-1.02	12.98 *	6.72	-5.57
6.	L6 x T1	-11.83	15.97	3.92	-5.68	-5.88	4.32	4.32	4.17	-1.19	5.11	-3.14	9.66
7.	L7 x T1	-1.39	11.96	-3.80	-8.95	-22.78	-5.06	-7.41	4.26	-1.76	-0.99	-8.81	-1.26
8.	L8 x T1	-14.22	-0.93	-14.88	3.61	-23.87*	-10.13	-12.35	11.86	8.31	4.49	-0.52	-7.22
9.	L9 x T1	32.12**	-15.98	-15.50	-2.11	2.90	-7.14	-3.70	40.85**	-6.49	-3.51	-1.75	-12.74
10.	L10 x T1	27.03*	-2.09	-1.53	13.00	-6.49	-7.14	-3.70	4.17	-1.66	8.4	10.38	0.00
11.	L1 x T2	16.75	3.16	3.75	5.37	-22.22	-13.1	-9.88	12.61	13.26*	-7.8	-6.11	14.52*
12.	L2 x T2	18.41	-12.59	-12.10	9.51	5.62	-8.33	-4.94	14.79	5.14	-2.31	-0.52	3.15
13.	L3 x T2	3.55	0.03	-21.64	4.04	-5.45	0	-7.41	8.97	13.81**	-7.5	-9.60	10.75*
14.	L4 x T2	12.25	5.2	-5.74	20.66*	-35.48**	-38.27 **	-38.27	-14.00	-4.23	-6.96	-9.08	-6.81
15.	L5 x T2	2.90	44.53 **	13.23	8.97	-22.29	-30.38 *	-32.10	1.64	-9.43	-9.64	-11.69	-17.64*
16.	L6 x T2	-13.49	16.85	-8.46	18.96	1.89	-31.08 *	-37.04	1.23	-9.12	-9.02	-11.08	-7.07
17.	L7 x T2	-9.88	18.42	-6.53	12.08	-8.54	-5.92	-11.73	1.33	-5.13	-5.5	-10.73	-8.63
18.	L8 x T2	15.06	-3.23	-13.29	25.37**	3.48	-24.69	-24.69	11.16	26.85**	-12.50 *	-19.37	8.12
19.	L9 x T2	19.84	-3.31	-23.68	13.84	1.39	-18.99	-20.99	3.42	1.33	-1.2	-10.47	-6.94
20.	L10 x T2	-5.45	17.55	-7.21	0.70	-8.75	1.32	-4.94	19.18	11.86*	1.92	-2.97	4.34
21.	L1 x T3	23.99	-21.58 *	-28.00	-11.70	-12.58	-7.69	-11.11	-7.58	5.55	-3.6	-4.28	3.37

22.	L2 x T3	23.65*	-14.53	-21.52	3.01	-5.06	0	0.00	-0.67	-0.19	-12.39 *	-13.00	-1.53
23.	L3 x T3	21.88*	-25.42 *	-31.52	18.34*	-10.43	-17.72	-19.75	2.74	-2.43	-0.09	-0.79	-0.60
24.	L4 x T3	53.00**	4.51	-4.03	10.73	-28.10*	-23.08	-25.93	5.45	-6.23	-6.5	-7.16	-8.99
25.	L5 x T3	2.71	-3.83	-27.65	1.04	-17.42	-26.51 *	-24.69	-26.56	1.43	-4.57	-9.86	-6.43
26.	L6 x T3	-15.19	-17.11	-25.72	-11.94	-17.20	-9.64	-7.41	24.62	4.48	-6.72	-14.05	2.90
27.	L7 x T3	-1.87	-5.5	-28.90	4.39	-27.16*	-28.92 *	-27.16	-32.20	13.16*	12.18	1.66	10.04
28.	L8 x T3	17.44	2.49	-20.61	5.98	-29.56*	-50.60 **	-49.38	1.79	24.35**	0.18	-4.62	19.52**
29.	L9 x T3	10.16	-19.86	-34.01	7.38	8.45	-26.25	-27.16	1.30	7.54	-4.02	-9.34	-9.57
30.	L10 x T3	27.51*	10.39	-1.08	8.03	-16.46	2.84	2.84	-6.06	7.72	13.64 *	4.71	6.10
31.	L1 x T4	-5.56	8.41	-10.73	-12.75	2.22	-30.00 *	-30.86	1.45	7.89	12.23	1.70	5.26
32.	L2 x T4	4.21	-3.38	-20.44	11.27	0.00	-5.69	-6.85	5.63	6.22	-19.80 **	-23.65	7.02
33.	L3 x T4	-1.24	28.18 *	-8.35	9.04	4.76	-5.33	-12.35	-0.65	0.97	-7.9	-13.00	-7.54
34.	L4 x T4	17.51	4.88	-6.02	20.72*	-25.55	-9.88	-9.88	5.88	-7.82	1.04	-6.89	-2.40
35.	L5 x T4	18.66	8.23	-24.59	9.42	10.79	-2.53	-4.94	11.04	7.15	6.95	-2.01	3.42
36.	L6 x T4	13.38	5.72	-18.11	16.57	-14.89	-11.11	-30.86	0.00	-4.53	2.2	-2.71	-2.91
37.	L7 x T4	3.99	19.44	-3.01	-2.58	-43.84**	-8.86	-11.11	-4.88	3.53	-5.31	-10.56	1.83
38.	L8 x T4	-0.43	-9.89	-19.25	12.92	5.52	-9.88	-9.88	23.13	-9.19	9	0.44	-24.91**
39.	L9 x T4	13.19	18.46	-3.80	8.25	-11.11	-16.46	-18.52	3.57	4.16	5.83	-4.10	10.81
40.	L10 x T4	-10.95	-13.01	-29.36	-7.56	-4.23	-13.92	-16.05	5.15	5.69	1.37	-3.49	3.53

Table 2: Extent of heterosis and inbreeding depression for Number of seeds per fruit, and 100-Seed weight (g) andSex ratio (male: female)

S.N.	Crosses	Number of seeds per fruit				100-Seed weight (g)				Sex ratio (male : female)			
		MPH	HB	EH	ID	MPH	HB	EH	ID	MPH	HB	EH	ID
1.	L1 x T1	1.29	-4.22	-3.07	2.94	5.32	-5.68	-2.70	9.12	-10.84	-28.30 **	27.84	-7.07
2.	L2 x T1	6.64	-2.72	0.02	3.35	-10.62*	-10.57 *	-7.56	0.48	-26.47**	-13.89	53.54	2.08
3.	L3 x T1	6.67	1.36	2.57	10.56	-17.23**	-4.93	-17.84	0.50	14.00	-20.81 **	41.20	16.61
4.	L4 x T1	-1.93	-4.58	-3.44	-3.85	-2.41	-15.67 **	-18.06	9.03	44.86**	-25.21 **	33.35	14.14
5.	L5 x T1	3.40	1.71	1.07	0.35	-0.62	-14.60 **	-11.91	9.41	28.44**	-37.69 **	-2.74	32.69**
6.	L6 x T1	5.99	-1.22	1.56	4.24	-4.19	-9.72 *	-6.68	4.29	22.14*	-36.88 **	-1.48	10.95
7.	L7 x T1	5.67	-6.17	-6.76	1.84	-10.48*	5.47	-0.91	-8.54	33.79**	-0.69	55.00	38.54**
8.	L8 x T1	3.87	-7.63	-8.21	1.60	-17.84**	-11.10 *	-13.61	14.18*	54.21**	-17.46	28.83	5.70
9.	L9 x T1	7.17	0.8	2.15	2.68	-13.21**	-17.56 **	-14.96	0.75	-0.91	-1.42	46.56	0.18
10.	L10 x T1	4.40	2.34	5.22	0.06	-8.94	-4.47	-1.25	2.60	-4.42	-35.23 **	-3.70	-16.01
11.	L1 x T2	-1.94	1.4	2.75	0.91	-0.05	-34.63 **	-33.12	4.52	19.67*	-6.42	39.13	36.94**
12.	L2 x T2	0.46	3.59	4.98	0.64	-5.41	-10.59 *	-8.51	-0.54	-15.94	-26.26 **	9.63	-25.67
13.	L3 x T2	3.08	-4.47	-9.14	4.31	-3.98	-5.68	-2.70	5.16	-15.15	39.03 **	50.79	-39.56*
14.	L4 x T2	0.62	-3.15	-0.42	0.28	-18.43**	-21.24 **	-18.59	2.54	45.39**	29.77 *	29.43	-20.59
15.	L5 x T2	-9.96*	5.34	0.18	3.44	-8.83	-22.61 **	-25.51	2.28	22.94*	4.91	54.86	-3.56
16.	L6 x T2	-12.25*	6.49	1.28	1.56	-10.33*	-11.28 *	-13.79	-5.72	21.42*	7.83	36.30	6.94
17.	L7 x T2	0.15	-2.09	-1.21	1.78	-13.48**	4.3	-6.13	5.69	29.50**	11.09	65.08	8.63
18.	L8 x T2	1.26	-10.8	-8.29	1.85	-7.45	-16.60 **	-13.79	8.32	7.89	-6.14	39.48	-14.77
19.	L9 x T2	-1.88	1.36	2.27	1.12	-7.96	-9.11	-21.45	-0.66	-19.94	-3.26	43.76	-56.36**
20.	L10 x T2	-10.85*	-3.21	-2.35	0.86	7.43	-13.42 *	-15.87	10.61*	7.32	-4.58	41.80	18.55
21.	L1 x T3	5.86	0.02	1.66	2.53	-2.21	-15.52 **	-12.85	0.41	-13.36	6.29	55.67	-11.29
22.	L2 x T3	-2.86	-12.75 *	-10.30	-8.18	9.87*	-21.00 **	-18.34	13.42**	2.07	-6.83	36.46	21.49
23.	L3 x T3	5.97	-1.45	0.16	0.47	-29.13**	-5.57	-18.40	-40.03**	-6.09	-20.52 *	17.33	-15.23
24.	L4 x T3	6.75	-2.11	-0.50	2.20	-18.44**	-8.7	-11.28	-6.52	25.21*	-24.49 *	10.58	-6.94
25.	L5 x T3	5.71	-0.24	1.30	5.34	-8.75	-16.80 **	-14.17	-7.25	-2.94	18.75	66.14	6.88
26.	L6 x T3	3.14	-0.47	2.33	1.15	-1.20	-19.66 **	-16.95	-5.80	-20.20*	0.99	41.29	5.75
27.	L7 x T3	0.81	-3.63	-2.14	0.60	-5.14	-6.3	-16.99	5.65	-5.89	-8.35	35.29	25.73*
28.	L8 x T3	3.85	-2.11	-0.61	1.03	-10.03*	-12.20 *	-14.69	-3.05	5.41	32.75 **	85.71	-2.60
29.	L9 x T3	6.26	-1.23	-1.21	3.76	16.31**	-20.49 **	-17.97	12.66**	10.17	45.37 **	57.67	35.33**
30.	L10 x T3	0.74	-0.12	2.69	32.65**	6.88	-10.53 *	-7.51	1.16	-15.65	-2.07	-5.95	-9.10
31.	L1 x T4	7.58	0	0.02	-0.10	-8.33	-14.74 **	-17.72	0.37	-12.47	-13.01	28.41	-14.19
32.	L2 x T4	3.31	-2.63	-2.61	-0.68	-9.60*	-14.82 **	-17.23	1.02	-8.79	15.42	45.89	-32.25*
33.	L3 x T4	16.87**	2.58	1.17	3.28	-8.28	-19.07 **	-16.51	4.33	-20.29*	-8.67	17.46	10.71
34.	L4 x T4	16.80**	-3.88	-1.17	1.54	-10.86*	-14.25 **	-11.36	3.20	20.55	-35.59 **	-17.17	-9.47
35.	L5 x T4	8.99	3.02	1.60	0.99	-8.01	14.47 *	2.16	-0.44	3.13	3.08	52.17	31.34**
36.	L6 x T4	10.58	-4.57	-5.89	1.12	0.86	-2.02	-4.79	3.37	-18.95*	-4.97	22.22	-9.57
37.	L7 x T4	10.53	-0.16	-1.33	7.04	-8.15	-17.74 **	-15.14	1.06	39.48**	-16.33	20.86	39.03**
38.	L8 x T4	9.22	-12.57 *	-10.11	1.14	-14.52**	-3.04	0.23	-3.59	31.18**	-17.25	19.53	10.78
39.	L9 x T4	6.38	-2.44	-3.58	3.16	9.60*	4.9	-9.35	17.78**	-4.15	-16.55	23.18	-1.73
40.	L10 x T4	5.30	-5.63	-6.74	3.80	-0.01	-7.19	-9.81	2.18	3.85	-2.64	40.63	9.71

Table 3: Extent of heterosis and inbreeding depression for 100-Seed weight (g) and Sex ratio (male: female)TSS Brix and Ascorbic acid (mg per 100 g)

SN.	Crosses	TSS Brix				Ascorbic acid (mg per 100 g)				Fruit yield per plant kg				Yield q/ha			
f		MPH	HB	EH	ID	MPH	HB	EH	ID	MPH	HB	EH	ID	MPH	HB	EH	ID
1.	L1 x T1	23.76*	22.61	-15.73	26.70**	14.21	2.74	-16.01	-0.84	-20.93	-23.62	-35.99	2.36	-20.93	-23.62	-35.99	2.36
2.	L2 x T1	-34.13**	-23.17 **	-18.76	-11.92	11.34	-9.09	-14.15	-1.81	13.03	-28.18 *	-32.20	4.00	-21.39	-28.18 *	-32.20	4.00
3.	L3 x T1	7.63	38.12 **	-6.83	29.68**	16.92	10.5	-9.67	3.95	-13.98	-11.12	-25.64	4.25	-8.06	-11.12	-25.64	4.25
4.	L4 x T1	10.03	5.91	-28.56	15.75	6.91	-4.11	-21.61	-10.45	1.61*	-4.05	-25.05	17.05	1.54	-4.05	-25.05	17.05
5.	L5 x T1	3.54	-39.59 **	-50.23	29.17**	57.56**	-0.45	-17.51	-5.31	2.55	7.9	0.54*	16.42	13.03	7.9	0.54*	16.42
6.	L6 x T1	43.01**	-51.22 **	-48.42	35.88**	34.55**	-19.76	-24.23	12.74	-6.05	3.79**	2.02**	0.77	5.03	3.79	2.02**	0.77
7.	L7 x T1	54.80**	4.85	-13.60	42.40**	14.06	6.31	6.38	-30.70**	-30.72*	-8.43	-15.60	6.90	-4	-8.43	-15.60	6.90
8.	L8 x T1	8.59	12.68	-7.16	34.17**	47.67**	-0.45	-17.51	5.61	-34.15**	-12.75	-19.57	-8.88	-0.51	-12.75	-19.57	-8.88
9.	L9 x T1	-10.76	-3.5	-16.38	-8.39	25.89*	6.05	-14.89	-6.32	-1.34	-18.94	-23.22	49.60**	-13.98	-18.94	-23.22	49.60**
10.	L10 x T1	-8.63	-35.06 **	-31.33	-0.11	2.59	-15.81	-20.49	-16.06	-14.48	1.52**	-3.84	16.08	1.69	1.52	-3.84	16.08
11.	L1 x T2	-6.19	-11.16	-23.02	18.25*	-2.54	1.86	-18.25	12.13	-21.39	-14.93	-19.43	3.83	-9.66	-14.93	-19.43	3.83
12.	L2 x T2	-45.17**	-25.74 **	-35.65	-15.75	-14.53	-1.86	-21.24	-7.09	5.03*	-3.76	-8.84	18.92	11.01	-3.76	-8.84	18.92
13.	L3 x T2	-28.62**	6	-27.14	16.15	-8.97	0	-24.97	3.76	1.69*	0.97*	-14.31	17.61	1.61	0.97	-14.31	17.61
14.	L4 x T2	-3.20	-22.44 **	-17.99	27.67**	5.73	-5.14	-10.41	22.92*	-28.29*	-31.91 *	-35.73	1.21	-28.29 *	-31.91 *	-35.73	1.21
15.	L5 x T2	-3.05	2.02	-35.01	36.15**	4.37	20.9	-9.29	-5.91	-25.35*	-37.07 *	-46.59	3.08	-36.62 **	-37.07 *	-46.59	3.08
16.	L6 x T2	5.01	20.04	-23.53	30.92**	-9.29	2.49	-23.11	0.71	-0.47	-32.22 *	-42.47	8.81	-25.48	-32.22 *	-42.47	8.81
17.	L7 x T2	17.83*	-9.08	-23.21	39.73**	-1.54	40.00 **	-8.55	-15.63	-24.96*	1.9	-13.52	-1.91	2.55	1.9	-13.52	-1.91
18.	L8 x T2	-59.49**	-12.8	-7.80	-38.21*	-8.62	-19.76	-24.23	-5.09	5.71	-29.12 *	-33.09	12.44	-25.35 *	-29.12 *	-33.09	12.44
20.	L10 x T2	2.70	-11.07	-24.89	34.17**	-6.03	25.99	-16.76	2.39	-10.93	-4.68	-19.10	9.20	4.81	-4.68	-19.10	9.20
21.	L1 x T3	45.94**	27.58 *	-12.31	28.51**	23.79*	23.33	-3.32	15.58	-8.06	-8.95	-18.68	-25.63	-6.05	-8.95	-18.68	-25.63
22.	L2 x T3	21.16*	-20.73 **	-16.18	30.30**	19.80	-17	-21.61	0.00	-4.00	-3.15	-8.57	8.42	-0.47	-3.15	-8.57	8.42
23.	L3 x T3	4.83	34.26 *	-19.15	21.11*	13.18	4.76	-17.88	1.83	-9.66	-27.2	-34.98	9.04	-24.82 *	-27.2	-34.98	9.04
24.	L4 x T3	4.89	27.62 *	-21.34	20.24	30.29*	-6.19	-26.47	12.76	-36.62**	-32.69 *	-39.88	7.60	-24.3	-32.69 *	-39.88	7.60
25.	L5 x T3	21.39*	40.71 **	3.29	24.29**	34.42*	6.44	-19.75	-8.70	-12.87	-31.45 *	-41.32	-13.03	-30.72 *	-31.45 *	-41.32	-13.03
26.	L6 x T3	41.69**	-9.76	-4.58	23.92**	15.18	-11.46	-16.39	-12.41	-24.82*	-28.46 *	-32.47	26.44	-24.96 *	-28.46 *	-32.47	26.44
27.	L7 x T3	2.33	-1.07	-40.43	4.76	24.06*	14.85	-13.40	8.19	-33.87**	-34.62 *	-44.03	-27.42	-33.87 **	-34.62 *	-44.03	-27.42
28.	L8 x T3	22.50*	29.71 *	-20.05	37.78**	42.35**	46.53 **	10.49	14.97	-27.04*	-47.12 **	-54.73	7.02	-41.63 **	-47.12 **	-54.73	7.02
29.	L9 x T3	5.48	-8.7	-7.93	21.36*	-1.10	35.07 **	6.38	-15.00	10.96	-35.62 *	-43.53	-10.89	-34.15 **	-35.62 *	-43.53	-10.89
30.	L10 x T3	41.72**	-60.43 **	-58.16	30.94**	10.18	-16.21	-20.87	-8.20	-10.96	1.96	*3.74	-0.75	5.71	1.96	*3.74	-0.75
31.	L1 x T4	10.68	-2.17	1.35	-1.62	6.06	29.19 *	5.26	-34.48**	1.54*	-28.72 *	-37.47	6.58	-27.04 *	-28.72 *	-37.47	6.58
32.	L2 x T4	28.92**	-29.09 **	-28.50	30.14**	10.78	6.64	-16.01	3.17	-0.51	-12.11	-22.90	7.84	-1.93	-12.11	-22.90	7.84
33.	L3 x T4	-13.22	-11.01	-38.49	-7.82	7.65	20.31	-13.77	-6.16	11.01	-7.94	-22.85	3.23	-1.34	-7.94	-22.85	3.23
34.	L4 x T4	22.02	-41.52 **	-38.17	24.79**	8.99	-3.56	-8.92	-9.22	-25.48	-32.17 *	-35.97	7.92	-23.32	-32.17 *	-35.97	7.92
35.	L5 x T4	2.82	-1.31	-31.79	22.32*	41.85**	-6.25	-32.81	-1.35	4.81	3.62**	-13.30	30.34*	10.96	3.62	-13.30	30.34*
36.	L6 x T4	36.16**	37.13 **	-5.22	26.72**	1.81	28.65 *	0.78	-4.06	-24.30	-17.41	-40.04	4.19	-15.61	-17.41	-40.04	4.19
37.	L7 x T4	41.14**	-13.6	-40.62	27.29**	56.20**	-6.16	-26.09	29.46**	-41.63**	-14.55	-28.28	-13.02	-14.48	-14.55	-28.28	-13.02
38.	L8 x T4	-11.98	-18.90 *	-14.25	22.81*	15.98	-13.83	-18.63	0.93	-1.93	-15.87	-20.58	22.60	-10.93	-15.87	-20.58	22.60
39.	L9 x T4	44.97**	40.53 **	-13.93	37.96**	33.88**	0	-21.24	8.95	-15.61	-11.11	-25.39	21.66	-10.96	-11.11	-25.39	21.66
40.	L10 x T4	43.76**	43.31**	-	31.36**	15.46	6.16	-16.39	-8.75	-7.43	-15.39	-28.98	3.28	-7.43	-15.39	-28.98	3.28

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