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Estimation of combining ability and it's variances in the cultivars of bread wheat (Triticum aestivum L.)

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Abstract:

Ten of the genotypes of bread wheat (Abu-Graib(1), Kawz (2), Osais (3), Site mall(4), Florka (5), Kalak (6), Millan (7), Hithab (8), Ibaa 99 (9) and Sham 6 (10) were used in this study with its half-diallel crosses, all of them were planted to be (10 parents + 45 crosses) in Dialla Governorate – Blad ruz province in the (2017-2018) season. (RCBD) Randomized Complete Block Design was used with three replicates to study the Combining Ability for the traits: number of the days to spike formation stage, plant height (cm), leaf area (cm^2), number of the grains in the spike, number of the spikes/plant, the weight of 1000 grains (g) and single plant yield (g). Analysis of variance table showed significant difference of all parents and first filial crosses in the all studied traits at (1%) level of probability and the ratio between general combining ability to specific combining ability was less than one in the traits: number of the days to spike forming, plant height, leaf area and number of the spike (m^2), while in the grain number of the spike, weight of 1000 grains and single plant yield was more than one to refer to the role of the Dominance action of the genes. The parent (Florka) showed a general combining ability for plant height, a number of the grains, and the grains yield, while the crosses (Abo-Graib X Heithab) and (Kawz X Site mall) showed significant differences to specific combining ability to the desired direction for more number of the traits included grain yield.

Keyword: Triticum aestivum L., bread wheat, genotypes, Dialla Governorate

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1. Introduction

Wheat Crop (Triticum aestivum L.) consider from most important strategy crops due to a source of nutrition, energy, proteins, and some salts, relate of one of three nutrition of the world people more of than other uses like animal feeds genetic studies concentered on wheat Crop to be the main nutrition for the human and demand it moreover with people exceeding, there for it came important demand in the future due to genetic programs with new variances with high production and quality through the selection from respectively isolated generation, then evaluate these variances to select the

* **The research is based on the doctoral thesis of the second researcher**

superior of it's in grain yield over- lab the parents and local variances to release a new variety, which means knowing gene systems for the grain yield and its component in the parental varieties which breeding programs demand (Simmonds, et al. 2014), Pagtash(2006) referred that genotype which can in hybridization programs be had highly general combining ability, whereas the general and specific combining ability had studied in white crop postponing on a diallel cross which noted by Abdullah and Jassim (2017) and AL-hailey (2018), also it can be studied theses combining ability from giving the mean of the nature of limited gene systems to select the parents which used in the cross production with high Heterosis in the case of additive gene action, also it be useful in combining ability study in the parental strains arrangement as it crosses (Singh, et al. 2004).

Now, this idea considers an important thing to estimate the energy of breeding straights or lines in breeding and considering the gene nature systems of different quantitative traits (Alam, et al. 2008).

The aim of this study is to limit the genetic behavior for entered parents in the crosses from knowing the nature of the gene action which controlled in the traits as general and specific combining ability.

2. Material and methods

Ten genotypes were used in this study from bread white (Abo –Graib (1), Kawz (2), Osais(3), Sitemall (4), Florka (5), and Kalak (6), Millan (7), Hithab (8), Ibaa 99(9) and Sham 6(10)) as parents of bread white (Triticum aestivum L.) entered as half crosses from the first filial of the crop . These ten parents and it crosses were planted as (45) genotypes in Dillia Governorate – Balad Ruz province on 15-11-2017 under native conditions of planting with a normal irrigated method (water irrigation) complimentary.

Randomized Complete L Block Design (RCBD) was applied in this study with three replicates, every replicates contains (55) lines the length of one line was to 2 m, the distance between one line and other was 60 cm with using one genetic system for every line, the grain were planted in every line were 12 grains and the distance between grain and other was 10 cm. as randomized. the field was protected strongly from the damage of the animals, were as fertilized by (P_2O_5 46%) superphosphate as 320 kg. h^{-1} and (K_2O 52%) potassium sulphate as 260 kg. h^{-1} added at planting, also fertilized with urea (N46%) as 320 kg. h^{-1} on two dosages, half of it at planting and another half at the tillering stage. The data were recorded as sequences to the maturation stages of the plant selected randomized. The data often protect plants were recorded for the trials (number of the days to spike forming, plant height (cm), leaf area (cm^2), number of the grains /spike, number of the spikes /plant, the weight of 1000 grains (g) and single plant yield (g).

The data analyzed statistically as the design of RCBD genetically as a half diallel cross-system, then partied it's mean squares to general and specific combining ability as the first stable symbol which suggested by Griffing (1956), then calculated the general combining ability for every variety and effects of specific combining ability for every cross and tested its signification with general and specific ability variances for every parent which used in this study as mentioned by Singh and Chaudhary (2007).

3. Results and Discussion

The table of analysis of variance showed from the table (1) a significant difference for all the studied traits at 1% level of probability which can be continued in genetic behavior study of these (parents and crosses), and the reason for the difference in its variances due to the presence of different genetic factors controlled in the inheritance of these traits and the interaction with external factors of climatic, soil and internal factors related by genotype symbol, also referred to differences in gene systems for the parents which used, reflected on the crosses resulted at half diallel crosses between the parents.

* **The research is based on the doctoral thesis of the second researcher**

Table (1) Analysis of variances

S.O.V	df	Days to spike forming	Plant height	Leaf area	No. of grains/spike	No. of spike/plant	Weight of 1000 grains	Single plant yield
Replicates	2	973.99	6274.87	8253978.1	3884.42	6486.13	489.49	6021.3
Genotypes	54	**37.20	**120.44	**172241.43	**53.33	**102.43	**42.25	**75.21
Parents	9	**28.46	**100.39	**184666.86	*44.71	**94.58	**25.66	*68.65
Parents vs. crosses	1	*46.09	^{ns} 52.98	^{ns} 5450.37	^{ns} 42.12	**199.82	^{ns} 10.32	^{ns} 10.16
Crosses	44	**38.78	**126.07	**173490.57	**55.34	**101.83	**46.38	**78.03
Error	108	11.55	53.96	63943.1	28.57	43.45	4.02	29.57

The table (2) shows the values of parents and it's half diallel crosses which studied, which refer that plant height of the parent (7) was more earliest varieties recorded less time period to get spike forming stage (97.3) days, this agree with Al-Jubouri (2014), while the variety (Kawz) was more delay variety to get spike forming stage (107) days, the other parents were moderate and the general rate of the parents was (102.7) days, agree with (Meena and Jastory, 2003), other hands for the crossing of the first filial, the crosses (1*8) and (5*8) was earliest in the flowering reached to (96.3) and (97.6) days respectively, and the more crossing which delayed in the flowering were (4*8) and (2*5) reached to (113 and 109) days respectively, this refers that the crossing which shares with the parent Hethab timed less duration for the flowering, whereas to plant height trait the parent (8) surpassed on all the parents gave a higher rate of plant height (115.220) cm, while the variety (Kawz) gave less plant height (97.217)cm, and the high hybrid in the plant height trait was (3*6) reached to (114.3)cm, the cross (2*7) came secondly (114.107)cm with no significant difference, this agrees with Al-Obady (2013) and Al-Jubori (2014), whereas the least rate of the plant height was the hybrid (4*9) reached to (91.5)cm, and for the leaf area trait the parent (4)gave higher leaf area (186.3)cm^2 after it the parent (1) was the second with no significant difference (1823.4)cm^2, while the parent (9) gave less leaf area (151.7)cm^2.

The parental variation caused to the difference in the diallel crossing of this trait clearly, the hybrid (2*9) gave leaf area reached to (1986.6)cm^2, after it came the hybrid (1*7) gave area reached to (1951) cm^2, while the less area gave by the hybrid (5*6) reached to (1176.400) $cm^{2,}$ these result similar to Al-Tawil (2009).

For the number of the grains in the spike grains reached (56.4) grains, and the lowest number of spike grains was in the parent (1) reached to (43.2) grains, while for the hybirds, the cross (3*4) gave a heigher rate (57.7) grains, and the less rate for this trait was in the hybrid (8*10), this agrees with (Zhai et al.,2016), and for the number of the spikes trait cleared that the parent (10) gave heigher rate reached to (38.7) spike, and the less rate was for the parent (1) reached to (19.7) spikes, whereas for the hybrids, the hybrid (4*7) reached to (40.7) spikes, while for the hybrid (1*3) gave the least rate for this trait (15.443) spikes, for the weight of 1000 grains, we noted that the parent (4) gave heigher rate for this trait reached to (44.5) g, while the less rate for this trait was the parent (7) reached to (34.1)g. The parent (5) surpassed in single plant yield trait (48.4) g, and for the same trait the hybrid (6*9) gave higher mean (50.3) g. This agrees with (Kumar, 2007).

Table (2). The parents (Ten genotypes) and its half diallel crosses performance means for studied traits:

The traits	No. of days to spike forming	Plant height cm	Leaf area Cm^2	No. of spike grains	No. of spikes/plant	Weight of 1000 grains (g)	Single plant yield
1	99.667	108.773	1823.467	43.21	19.773	37.033	45.587
2	107	97.217	1730.7	56.443	20.44	38	38.877
3	105.667	101.14	1734.733	49.733	28.663	35.8	42.92
4	101.333	109.553	1860.333	47	24.55	44.5	41.063
5	106.333	103.33	1483.633	51.687	23.44	36.7	48.413
6	103	107.44	1302.767	45	25.44	36.333	37.26
7	97.333	98.777	1817.133	50.12	28.22	34.167	31.12
8	101.333	115.22	1384.267	51.667	31.55	39.733	37.817
9	102	111.33	1151.707	47.02	37.773	37.167	41.527
10	104.333	103.403	1506.767	51.51	32.173	40.467	39.053
1*2	99	105.777	1426.38	45.687	24.33	35.1	44.46
1*3	100.333	105.773	1789.2	41.553	15.443	37.533	34.933
1*4	101	93.22	1323.6	44.01	23.33	31	46.933
1*5	98.333	109.55	1582.467	46.12	25.883	38.8	37.433
1*6	107	103.997	1941.167	51.787	28.44	40.367	41.52
1*7	105.667	96	1951.367	44.1	17.44	31.667	36.433
1*8	96.333	109.883	1566.733	47.667	24.553	40.5	47.92
1*9	107	108.773	1611.333	45.567	24.887	34.9	37.427
1*10	105.667	105.887	1483.1	47.867	22.773	36.8	41.063
2*3	102.333	110.997	1712.633	46.343	31.217	37.067	38.867
2*4	101.667	94.773	1733.533	47.877	28.55	41.2	44.573
2*5	109	100.887	1889.867	49.877	27.663	43	35.823
2*6	105	108.263	1256.3	44.3	30.133	44.9	42.813
2*7	107	114.107	1201.6	48.887	21.887	38.8	42.53
2*8	100.333	108.887	1819.9	47.333	23.553	40.6	39.897
2*9	106.667	98.553	1779.9	50.653	17.553	38.733	48.077
2*10	105.667	102.43	1986.667	53.387	22.62	38.567	38.537
3*4	102.667	101.553	1262.767	57.767	33.33	31.133	36.503
3*5	106.667	98.883	1352.883	52.133	35.883	44.767	38.77
3*6	107	114.33	1621	42.333	25.107	36.933	42.21
3*7	102.667	95.443	1435.8	48.453	21.11	38.9	42.603
3*8	101.667	111.217	1377.693	41.653	17.55	40.567	47.033
3*9	106.667	104.33	1366.667	52.333	29.44	33.433	48.03
3*10	104	98.44	1667.2	50.443	27.553	44.767	41.513
4*5	105	98.887	1868.067	51.867	12.997	36.133	41.67
4*6	105	103.33	1246.2	46.653	17.55	36.5	34.017
4*7	110	99.773	1605.7	46.587	40.993	32.533	27.49
4*8	113	106.997	1811.367	55.553	22.777	31.2	30.37
4*9	105.667	91.553	1555.867	52.553	27.663	41.833	44.447
4*10	101.667	109.663	1800.167	50.577	18.997	37.567	35.953
5*6	98.333	113.663	1176.4	46.2	17.553	39.833	42.737

5*7	105.667	113.777	1633.633	55.777	26.107	30.933	40.75
5*8	97.667	107.33	1601.067	41.533	26.773	38.067	45.533
5*9	99	108.55	1200.133	48.867	19.773	40.233	39.95
5*10	107	111.33	1452.82	50.01	26.107	40.167	45.343
6*7	103	100.33	1305.1	50.22	21.887	39.3	34.107
6*8	107	89.377	1640.433	47.61	20.33	36.067	44.163
6*9	106.333	96.997	1774.733	45.01	35.997	31.7	50.373
6*10	105.667	102.107	1925.333	42.753	19.997	31.833	46.063
7*8	104.333	102.107	1537.033	50.087	17.777	32.7	47.15
7*9	108.667	107.667	1288.533	53.567	27.773	40.033	45.177
7*10	100.333	109.663	1543.4	44.753	22.773	31.933	34.1
8*9	106.667	111.33	1876.9	42.433	19.22	36.633	41.703
8*10	101.667	96.33	1925.467	38.353	22.33	39	34.88
9*10	106.667	103.997	1842.233	52.21	30.107	36.133	43.44
Parental general mean	102.8	105.62	1579.55	49.34	27.2	37.99	40.36
L.S.D0.05	4.873	15.619	307.7	10	8.716	4.595	13.205
L.S.D0.01	6.676	21.4	421.58	13.71	11.942	6.269	18.092
Crosses general mean	104.17	104.15	1594.45	48.03	24.35	37.34	41.01
L.S.D0.05	5.715	11.317	422.4	8,433	11.227	2.967	12.625
L.S.D0.01	7.571	14.993	559.62	11.174	14.874	3.931	16.726
Genotypes general means	103.92	104.42	1591.74	48.27	24.87	37.46	40.89
L.S.D0.05	5.5	11.889	409.25	8.651	10.668	3.234	12.492
L.S.D0.01	7.276	15.727	541.38	11.444	14.112	4.29	16.525

Table (3) showed that the ratio of variances component of general combining ability to specific combining ability was less from one in the traits: number of days to spike forming, plant height, leaf area, and number of the spikes in the plant. This refers to non-additive gene action caused exceeding of specific combining ability components which has a role in controlling in the inheritance of these traits in the first filial, while in the grains in the spike, the weight of 1000 grains and single plant yield were higher than one, which refers to additive action controlled in the inheritance of these traits in second filial variances, this agrees with (Ali et al., 2011). The highly significant of specific combining ability for the parents and mothers of these traits refer to ability useful from Heterosis information of new varieties superior in its traits (Abdulla and Jassium, 2017).

Table (3) variance of Griffing analysis (1956) for specific and general combining ability for studied traits as second method of stable sembol

variances	No.of days to spike forming	Plant height	Leaf area	No. of spike grains	No. of spikes/plant	Weight of 1000 grains	Single plant yield
σ^2G.C.A.	9.84	21.569	52648.408	24.711	25.093	14.875	33.13
σ^2 S.C.A	12.911	43.862	58366.891	16.388	35.955	13.925	23.457
σ^2 E.	3.85	17.986	21314.365	9.524	14483	1.339	19.857
σ^2 G.C.A	0.762	0.491	0.902	1.507	0.697	1.068	1.412
σ^2 S.C.A							

** Significant at 1% level of probability & * significant at 5% level of probability

From the table (4) noted that the parent 1 and 8 distinguished that they had a general combining ability to the desired direction (-1.956 and -0.983) respectively, and the variance of its specific combining ability were (103.2 and 145.17) respectively as shown in the table (5), which refer that these genotypes transported the trait (earliest in spike forming) to some crosses without others, we expected that these genotypes gave earliest variances in spike forming at the hybridization with it, and gives the best-isolated generation for early selection of these plants, while in the trait of plant height, the parent (5) distinguished in desired general combining ability(1.645), and it had highly specific combining ability variances (218.331) that means it transported this trait to its crosses by no regular method. In the trait of leaf area the parental varieties1 (67.756), 2(63.251), and 10(94.229) distinguished and it had desired general combining ability, and the effect of specific combining ability variance was (538711.7), (448120.1) and (260864.5) respectively. This refers to that the exceeding in leaf area to its crosses as non-reullar, while the parent (10) transport this exceeding in leaf area as regular to its crosses, therefor we expected that the plants gives large leaf area plants at hybridization between them, and gave the best-isolated generation which can get new varieties from wheat with wide leaf area.

In the number of grains in the spike trait, we show that the parental varieties 2,4 and 5 had desired general combining ability reached (1.538, 1.375, and 1.235) respectively, and the effect of the variance of specific combining ability as in the table (5) reached to (30.766, 30.382 and 64.61) respectively, this means that the varieties 2 and 5 transport the exceeding of a number of the spike to most it crosses regularly which affect to get plants with a high number of the grains in the spike and get varieties with good spikes, while the variety 4 distributes its gene which controls to exceeding a number of the grains in the spike to some of these hybrids without others. While in a number of the spikes per m^2 trait showed that the parental varieties 3 and 9 had general combining ability reached (1.701 and 2.868) respectively, whereas the effect of variance to specific combining ability reached to (230.815 and 251.343) respectively it is higher value controlled by other parental varieties transport it's controlled genes of a number of the spikes per m^2 to some hybrids without others. In weight of 1000 grains, we noted

that the parental varieties 2,3,5 and 10 were distinguished in desired general combining ability reached to (54.994, 15442, 79.2 and 93.67) respectively as mentioned in the table (5). These parental varieties 1,5 and 10 transport it controlled genes by exceeding the weight of 1000 grains to its hybrids regularly referred to get isolation with a high rate of grain weight, while the parent 3 was transported its controlled genes of this trait irregularly on its hybrids. In single plant yield trait, the parental varieties 5 and 9 gave higher general combining ability with the desired direction to exceed single plant yield, the effects of variances of specific combining ability reached to (73.739and 97.086) respectively, it is low values which controlled with other parental varieties, which refers that these verities distribute it's controlled genes for grain yield trait to its hybrids regularly, we expected, the possibility of selecting plants with good yield distinguished in an isolated generation.

Table (4).Estimation of general combining ability effect for every parent of studied traits.

parents	No. of days to spike forming	Plant height	Leaf area	No. of grains spike	No. of spikes/plant	Weight of 1000 grains	Single plant yield
1	-1.956	0.652	67.759	-2.514	-2.243	-0.943	0.792
2	0.628	-0.789	63.251	1.358	-0.43	1.826	0.295
3	0.183	-0.444	-37.822	0.128	1.701	0.387	0.543
4	0.433	-2.477	34.897	1.375	0.145	-0.329	-2.142
5	-0.317	1.745	-65.381	1.235	-0.661	1.107	1.254
6	0.6	-0.109	-84.748	-2.006	-0.473	-0.163	0.228
7	-0.094	-1.013	-31.061	0.978	0.053	-2.243	-3.101
8	-0.983	2.11	34.663	-1.282	-1.299	0.229	0.374
9	1.183	0.486	-75.788	0.525	2.868	-0.341	2.657
10	0.322	-0.16	94.229	0.203	0.338	0.471	-0.899
S.E.	**0.537**	**1.161**	**39.982**	**0.845**	**1.042**	**0.316**	**1.22**

Table (5). Estimation of variance effect of general and specific combining ability for every parent of studied traits.

Traits / **Parents**	**The variance**	**No. of days to spike forming**	**Plant height**	**Leaf area**	**No. of grains in the spike**	**No. of spikes/plant**	**Weight of 1000 grains**	**Single plant yield**
1	σ_g^2	3.535	-0.923	2992.727	5.603	3.946	0.789	-0.862
	σ_s^2	103.213	146.542	538711.796	97.68	147.302	75.118	190.665
2	σ_g^2	0.105	-0.726	2402.091	1.129	-0.901	3.234	-1.402
	σ_s^2	50.059	281.558	448120.114	30.766	171.755	54.994	87.403
3	σ_g^2	-0.255	-1.152	-168.099	-0.698	1.808	0.05	-1.195
	σ_s^2	20.942	292.241	178120.879	124.51	230.815	154.422	53.02
4	σ_g^2	-0.101	4.786	-380.781	1.177	-1.065	0.008	3.1
	σ_s^2	142.285	219.521	275116.271	130.382	502.673	116.604	181.089
5	σ_g^2	-0.188	1.695	2676.04	0.811	-0.65	1.124	0.083
	σ_s^2	130.682	218.331	341034.278	64.618	326.229	79.211	73.739
6	σ_g^2	0.071	-1.337	5583.561	3.31	-0.863	-0.074	-1.437
	σ_s^2	46.984	519.58	497786.053	43.363	209.399	116.464	86.495
7	σ_g^2	-0.28	-0.322	-633.768	0.241	-1.083	4.932	8.127
	σ_s^2	70.191	303.45	245160.83	78.491	311.543	112.063	193.049
8	σ_g^2	0.678	3.102	-397.05	0.929	0.6	-0.048	-1.349
	σ_s^2	145.174	430.416	203536.043	223.058	142.367	53.988	198.05
9	σ_g^2	1.112	-1.113	4145.252	-0.439	7.138	0.016	5.571
	σ_s^2	50.198	210.217	388725.739	53.145	251.343	100.226	97.086
10	σ_g^2	-0.185	-1.323	7280.558	-0.673	-0.972	0.121	-0.681
	σ_s^2	30.758	230.36	260864.518	121.416	53.49	93.675	56.452

From the table (6) showed the values of specific combining ability effects, the values of number of days to spike forming of the hybrids (1*2), (1*3), (2*3), (2*4), (2*8), (3*4), (4*10), (5*6), (5*8),(5*9) and (7*10) were negative significant effects for specific combining ability, so it is desire for earliest of spike forming, while for the plant height it showed that the hybrids (2*3), (2*6), (2*7), (3*6), (3*8), (4*10), (5*6), (5*7), (5*10), (7*9), (7*10) and (8*9) were gave a positive significant specific combining ability effects, by exceeding in plant height, while in the leaf area trait the hybrids (1*3) , (1*6), (1*7), (2*5), (2*8), (2*9), (2*10), (3*6), (4*5), (4*8), (5*7), (6*9), (6*10), (8*9), (8*10) and (9*10) were showed a positive significant effects for specific combining ability by exceeding in leaf area in these hybrids. In spike grains trait, the hybrids or crosses (1*6), (1*8), (1*10) (2*10), (3*4), (3*5), (3*9), (3*10), (4*5), (4*8),(4*9), and (7*8) showed a positive significant effect for specific combining ability by exceeding in spike grains number in these crosses, while in spikes number in the plant trait, the crosses while in spikes number in the plant traits the crosses (1*5), (1*6), (1*8), (2*3), (2*4), (2*5), (2*6), (3*4), (3*5), (4*7), (5*8), and (6*9) were positive significant effects for specific combining ability by exceeding in the number of the spikes in area unit, all of these variations caused dominance for controlled allelic interaction for these traits. In weight of 1000 grains, noted that the crosses (1*5), (1*6), (1*8), (2*4), (2*5), (2*6), (2*7), (2*8), (3*5), (3*7), (3*8), (3*10), (4*9), (5*6), (5*9), (5*10), (6*9) and (7*9) were positive significant effects for specific combining ability by exceeding weight of the grain trait in the hybrids. In the grain yield trait for the plant, the hybrids (1*4), (1*5), (2*4), (2*7), (2*9), (3*7), (3*8), (3*9), (5*10), (6*9), (6*10), (7*8) and (7*9) had positive significant effects for specific combining ability by exceeding in grain yield in the plant.

From all the information above, it showed that the effects of specific combining ability were in desire direction in the hybrids (1*8) in five traits which it was earliest of spike forming, grain yield, number of spikes per m^2 and weight of 1000 grains, though we can able to make useful from the genotypes above to enter these genotypes in breeding programs because it had desire genetic system and transport the traits so the hybrids for the leaf area trait, the effects of highly specific combining ability due to its performance and strength, also to (Abdulla and Jassim, 2017) and(Al-Haily,2018) the non-additive effects of the genes.

Table (6).Estimation of specific combining ability effects for every single cross to half diallel crosses of studied traits.

crosses	days to spike forming	Plant height	Leaf area	No. of grains in the spike	No. of spikes/plant	Weight of 1000 grains (g)	Single plant yield
1*2	-3.593	1.497	-296.373	-1.425	2.135	-3.242	2.483
1*3	-1.816	1.149	167.52	-4.329	-8.882	0.63	-7.292
1*4	-1.399	-9.372	-370.799	-3.119	0.56	-5.187	7.393
1*5	-3.316	2.737	-11.655	-0.868	3.919	1.177	-5.503
1*6	4.434	-0.963	366.412	8.039	6.288	4.013	-0.39
1*7	3.795	-8.055	322.926	-2.631	-5.238	-2.606	-2.148
1*8	-4.649	2.705	-127.432	3.195	3.227	3.755	5.863
1*9	3.851	3.219	27.619	-0.712	-0.606	-1.276	-6.913
1*10	3.379	0.979	-270.631	1.91	-0.189	-0.187	0.28
2*3	-2.399	7.814	95.461	-3.41	5.078	-2.606	-2.861

2*4	-3.316	-6.377	43.643	-3.123	3.967	2.244	5.531
2*5	4.768	-4.485	300.254	-0.983	3.886	2.608	-6.615
2*6	-0.149	4.745	-313.946	-3.319	6.168	5.777	1.401
2*7	2.545	11.493	-422.332	-1.716	-2.605	1.758	4.446
2*8	-3.232	3.15	130.243	-1.01	0.414	1.086	-1.663
2*9	0.934	-5.56	200.694	0.504	-9.752	-0.212	4.235
2*10	0.795	-1.036	237.444	3.559	-2.156	-1.189	-1.749
3*4	-1.871	0.058	-326.051	7.996	6.616	-6.384	-2.787
3*5	2.879	-6.833	-135.657	2.503	9.975	5.813	-3.917
3*6	2.295	10.467	151.826	-4.056	-0.99	-0.751	0.55
3*7	-1.343	-7.515	-87.06	-0.92	-5.512	3.297	4.271
3*8	-1.455	5.135	-210.891	-5.46	-7.72	2.491	5.226
3*9	1.379	-0.128	-111.466	3.413	0.003	-4.073	3.94
3*10	-0.427	-5.371	19.05	1.845	0.646	6.449	0.98
4*5	0.962	-4.798	306.808	0.989	-11.356	-2.103	1.668
4*6	0.045	1.499	-295.692	-0.983	-6.99	-0.467	-4.959
4*7	5.74	-1.153	10.122	-4.033	15.927	-2.353	-8.157
4*8	9.629	2.947	150.064	7.193	-0.938	-6.159	-8.752
4*9	0.129	-10.872	5.015	2.386	-0.217	5.044	3.042
4*10	-3.01	7.884	79.298	-0.92	-6.354	-0.034	-1.895
5*6	-5.871	7.611	-265.215	-2.451	-6.181	1.43	0.365
5*7	2.157	8.629	138.333	0.31	1.846	-5.389	1.707
5*8	-4.955	-0.941	40.041	-1.423	3.865	-0.728	3.015
5*9	-5.788	1.903	-250.441	-1.473	-7.302	2.008	-4.851
5*10	3.073	5.329	-167.771	-0.22	1.561	1.13	4.099
6*7	-1.427	-2.964	-170.834	0.743	-2.562	4.247	-3.91
6*8	3.462	-17.041	98.775	0.277	-2.766	-1.459	2.671
6*9	0.629	-7.797	343.526	-0.24	8.734	-5.256	6.598
6*10	0.823	-2.04	324.109	-0.254	-4.736	-5.934	5.845
7*8	1.49	-3.406	-58.311	1.305	-5.846	-2.745	8.986
7*9	3.657	3.778	-196.36	-0.145	-0.016	5.158	4.73
7*10	-3.816	6.421	-111.511	-1.226	-2.486	-3.753	-2.79
8*9	2.545	4.318	326.282	-0.345	-7.217	-0.714	-2.218
8*10	-1.593	-10.036	204.832	-0.093	-1.577	0.841	-5.485
9*10	1.24	-0.745	232.049	0.257	2.033	-1.456	0.792
S.E(S)	1.62	3.501	120.55	0.676	3.1425	0.955	3.679

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