EVALUATION PERFORMANCE GENOTYPES OF BREAD WHEAT TO YIELD, YIELD COMPONENTS, BIOLOGICAL YIELD AND HARVEST INDEX

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ABSTRACT

A field experiments were carried out at Abu- Graib Research Station- Agricultural Research Office- Ministry of Agriculture, during the season 2014- 2015 to investigate the performance of 225 pure lines of bread wheat (*Triticum aestivum* L.), which at sixth generation after crossing among local and exotic genotypes (produced from 2008 to 2014) with their parents. The experiment was conducted using Simple Lattice Design with three replications. The objective of this experiment to evaluate those genotypes for yield and its components. The results were revealed highly significant differences among genotypes in all studied traits. The genotype 99 gave higher number of spikes plant^{-1} (44.8 spike), genotype 186 superior in grains number spike^{-1} (82 grain), a higher weight of grain (49.5g) produced by genotype 17 and a higher weight of grains plant^{-1} (82.8g) produced by genotype 99. The genotypes 149 and 189 gave higher biological yield (90g) plant^{-1}, but the higher percentage of harvest index (46.2%) achieved at genotype 75.

Key words: pure lines, plant height, spike length grain weight, number of spikes.
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تقويم اداء تراكيب وراثية من حنطة الخبز للحاصل ومكوناته والحاصل البايولوجي ودليل الحصاد

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المستخلص

نفذت تجربة حقلية في محطة ابحاث ابي غريب التابعة لدائرة البحوث الزراعية– وزارة الزراعة خلال الموسم الشتوي 2014– 2015، وتمت غربلة 225 خطا نقيا من حنطة الخبز (.*Triticum aestivum* L) في جيلها السادس والناتجة من التضريب بين الاصناف المحلية والتراكيب المدخلة (خلال الفترة من 2008 الى 2014) وابائها واصناف المقارنة. طبقت التجربة بالتصميم الشبكي البسيط وبثلاثة مكررات، بهدف تقويم اداء تلك التراكيب الوراثية لصفات الحاصل ومكوناته والحاصل البايولوجي ودليل الحصاد. اظهرت نتائج التحليل الاحصائي وجود فروق معنوية بين التراكيب الوراثية للصفات المدروسة حيث تفوق التركيب الوراثي 99 بانتاجه اعلى عدد من السنابل بالنبات (44.8 سنبلة) وسجل التركيب الوراثي 186 اعلى عدد حبوب بالسنبلة (82 حبة) واعلى وزن للحبة حققه التركيب الوراثي 17 (49.5 غم) واعلى وزن حبوب بالنبات انتجه التركيب الوراثي 99 بلغ 82.8 غم واعلى حاصل بايولوجي (90 غم) سجله التركيبين الوراثيين 149 و189 واعلى نسبة مئوية لدليل الحصاد (46.2%) حققها التركيب الوراثي 75.

كلمات مفتاحية: خطوط نقية، ارتفاع النبات، طول السنبلة، وزن الحبة، عدد السنابل.
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INTRODAUCTION

Bread wheat (*Triticum aestivum* L), considered as the most important cultivated crop in the world and Iraq. This crop provide more than 20% of calories needed and it's also a basic source of essential protein to the world populations, (10). This crop cultivate and harvest during the year at the world. Wheat, could be cultivate from the north to the south of Iraq, this country yearly need 3.25 million tones, but it's production not more than 2 million tones yearly (8). Natural genetic variations in the genetic materials, environment effects and their interaction are very useful for the development of cultivate plants. Any population improvement genetically depend on the genetic variations within the same population or using mutation induction, introduction from other regions and hybridization between different strains of the same species are more useful when they have highest genetic diversity. Hybridization is the best way to get genetic variation in second generation as new recombination. Plant breeder can select promising genotypes from segregated generation to develop new pure lines and varieties in the future, which could be superior in yield, yield components and some other desirable characters. Hybridizations is important breeding method to develop inbred lines and hybrids in the cross pollinated crops, and resources of new recombination, then selection in self pollinated crops, specially wheat crop. The selection after crossing in wheat could be carried out according to the aim of crossing, in most cases improving one or more yield components to develop grain yield. The successfully of selection generally depend to the genetic variations of the segregated generation, which increase the chance of improvement and development promising genotypes. There are different procedures of selection, mass selection, pure line selection, inbred line selection and spike per raw selection, (20). The Biological Scientist Johannnson, during 1903- 1926, he developed pure line selection, using self pollinated crops and he found that the selection was useless in pure lines (9). Allard (7) defined the selection is the picking out plants with desired traits from the heterogametic population. In general selection and it's successful depend on additive gene action, selection do to increase the frequency of favorable genes for desired characters. Selection could be applied until reducing the genetic gain (13). Selection could be increases the frequency of favorable genes for the studied traits, which causes the improvement of those traits (9). Selection program for local wheat genotypes undesirable because those genotypes were highly homozygous pure lines ,so that the improvement of local genotypes must be induce genetic variations especially by hybridization. The objective of this research, hybridization among local and exotic genotypes and application of pure line selection for the superior lines, which adapted to water stress in the future.

MATERIALS AND METHODS

Field experiments were conducted at the Research Station - Office of Agricultural Research - Ministry of Agriculture, during 2014 - 2015, using genotypes developed from crossing exotic and local genotypes. Selection, spike- row were carried out for six generations. Selected plants in 7th generation, their parents and local varieties, were evaluated, (Table 1, 2). Varietal trail was conducted, using 225 genotypes, within Simple Lattice Design (15 x 15) with three replicates,. each replicate contained 15 plots with 15 rows, row spacing was 0.50 m. and 0.25 m. within the row. The experiment was conducted at the loam clay soil, (Table 3). Soil of the experimental field fertilized with 100 kg.ha^{-1} superphosphate, (P_2O_5), which added before field preparation. Nitrogen fertilizer as urea (46% N) was added with quantity 200 kg.ha^{-1}, two times: before planting and booting stage soil samples were took from 30 cm depth and analyzed for chemical and physical characteristics of the soil (Table 3). Different growth observations were recorded; Number of spikes. plant $^{-!}$, number of grains. spike $^{-1}$, weight of 1000 grains.gm^{-1}, grain yield gm.plant^{-1}, biological yield gm. plant^{-1} and harvest index %. The results were analyzed statistically, using analysis of variance. The means were compared using LSD 5%, using statistical program, Genestate.

Table1. Genotypes, crosses and their hybrids

Number	Genotypes	Cross	Number	Genotypes	Cross
1	H4P	IPA99 x Indai9	17	H10p	Fatah x Abu- Graib3
2	H5P	IPA99 x Indai9	18	S102	A3013 x Fatah
3	H6P	Mexipak x Indai9	19	S13	M.2 x Fatah
4	H7P	IPA95 x Indai7	20	S52	IPA99 x Fatah
5	H8P	Indai9 x Mexipak	21	S175	A4.10 x Fatah
6	H9P	IPA95 x Mexipak	22	S118	Abu- Graib3 x Fatah
7	H10P	Abu- Graib3 x Sham6	23	S23	M.2 x A3103
8	H11P	Indai9 x Sham6	24	S83	IPA99 x A3103
9	H12P	IPA95 x Abu- Graib3	25	S148	A4.10 x A3103
10	H13P	Fatah x IPA95	26	S152	Abu- Graib3 x A3103
11	H14P	Indai9 x IPA99	27	S94	IPA99 x M.2
12	H15P	Abu- Graib3 x Fatah	28	S97	A4.10 x M.2
13	H2p	IPA99 x IPA95	29	S76	Abu- Graib3 x M.2
14	H5p	Fatah x IPA95	30	S130	A4.10 x IPA99
15	H6p	Fatah x IPA95	31	S46	Abu- Graib3 x IPA99
16	H8p	IPA99 x IPA95	32	S123	Abu- Graib3 x A4.10

Table2. Parents and selected genotypes from previous experiments which, evaluated during season 2014 - 2015.

No.	Gen.	No.	Gen.	No.	Gen.	No.	Gen.	No.	Gen.
1	IPA99	51	H6P3-1	101	H10P1-1	151	H12P6-5	201	H8-2
2	India 8	52	H6P3-2	102	H10P1-2	152	H12P7-1	202	H8-3
3	India9	53	H6P3-3	103	H10P1-3	153	H12P7-2	203	H8-4
4	IPA95	54	H6P3-4	104	H10P2-1	154	H12P7-3	204	H8-5
5	Mexipak	55	H7P1-1	105	H10P2-2	155	H12P7-4	205	H10-1
6	India7	56	H7P1-2	106	H10P2-3	156	H12P7-5	206	H10-2
7	Sham6	57	H7P1-3	107	H10P2-4	157	H13P1-1	207	H10-3
8	Abu- Grb	58	H7P1-4	108	H10P2-5	158	H13P1-2	208	H10-4
9	Fatah	59	H7P1-5	109	H11P2-1	159	H13P1-3	209	S102
10	AL-fatah	60	H7P2-1	110	H11P2-2	160	H13P1-4	210	S13
11	A3103	61	H7P2-2	111	H11P2-3	161	H13P1-5	211	S52
12	M.2	62	H7P2-3	112	H11P2-4	162	H13P1-6	212	S175
13	IPA99	63	H7P2-4	113	H11P2-5	163	H14P1-1	213	S118
14	A4.10	64	H7P2-5	114	H11P3-1	164	H14P1-2	214	S23
15	Abu-Graib3	65	H7P3-1	115	H11P3-2	165	H14P1-3	215	S83
16	H4P2-1	66	H7P3-2	116	H11P3-3	166	H14P1-4	216	S148
17	H4P2-2	67	H7P4-1	117	H11P3-4	167	H14P1-5	217	S152
18	H4P2-3	68	H7P4-2	118	H11P3-5	168	H15P1-1	218	S94
19	H4P2-4	69	H7P4-3	119	H11P4-1	169	H15P1-2	219	S97
20	H4P2-5	70	H7P4-4	120	H11P4-2	170	H15P1-3	220	S76
21	H4P3-1	71	H7P4-5	121	H11P4-3	171	H15P1-4	221	S130
22	H4P3-2	72	H7P5-1	122	H11P4-4	172	H15P1-5	222	S46
23	H4P3-3	73	H7P5-2	123	H11P4-5	173	H15P2-1	223	S123
24	H4P3-4	74	H7P5-3	124	H11P4-6	174	H15P2-2	224	Saberbak
25	H4P3-5	75	H7P5-4	125	H11P4-7	175	H15P2-3	225	Bohoth 22
26	H4P4-1	76	H7P5-5	126	H11P4-8	176	H15P2-4		
27	H4P4-2	77	H7P6-1	127	H12P1-1	177	H15P2-5		
28	H4P4-3	78	H7P6-2	128	H12P1-2	178	H15P3-1		
29	H4P4-4	79	H7P6-3	129	H12P1-3	179	H15P3-2		
30	H4P4-5	80	H7P6-4	130	H12P1-4	180	H15P3-3		

31	H5P1-1	81	H7P6-5	131	H12P1-5	181	H15P3-4
32	H5P1-2	82	H8P1-1	132	H12P2-1	182	H15P3-5
33	H5P1-3	83	H8P1-2	133	H12P2-2	183	H15P3-6
34	H5P1-4	84	H8P1-3	134	H12P2-3	184	H15P3-7
35	H5P1-5	85	H8P1-4	135	H12P2-4	185	H2-1
36	H5P3-1	86	H8P1-5	136	H12P2-5	186	H2-2
37	H5P3-2	87	H8P1-6	137	H12P4-1	187	H2-3
38	H5P3-3	88	H8P1-7	138	H12P4-2	188	H2-4
39	H5P3-4	89	H9P1-1	139	H12P4-3	189	H2-5
40	H5P3-5	90	H9P1-2	140	H12P4-4	190	H5-1
41	H6P1-1	91	H9P1-3	141	H12P4-5	191	H5-2
42	H6P1-2	92	H9P1-4	142	H12P5-1	192	H5-3
43	H6P1-3	93	H9P1-5	143	H12P5-2	193	H5-4
44	H6P1-4	94	H9P1-6	144	H12P5-3	194	H5-5
45	H6P1-5	95	H9P1-7	145	H12P5-4	195	H6-1
46	H6P2-1	96	H9P3-1	146	H12P5-5	196	H6-2
47	H6P2-2	97	H9P3-2	147	H12P6-1	197	H6-3
48	H6P2-3	98	H9P3-3	148	H12P6-2	198	H6-4
49	H6P2-4	99	H9P3-4	149	H12P6-3	199	H6-5
50	H6P2-5	100	H9P3-5	150	H12P6-4	200	H8-1

Table 3. Some chemical and physical soil characters of the experimental field for the season 2014 -2015

Soil characters	Units	
pH		7.0
Soil EC.	ds m^{-1}	2.3
Water EC.	Dece semen's $^{m-1}$	2.56
Available N.	$Mgkg^{-1}$	15.1
Available P	$Mgkg^{-1}$	16.61
Available K	$Mgkg^{-1}$	360
Organic matter %		0.771
Bulk density	Mgm^{-3}	1.30
Clay	$Mg.kg^{-1}$soil	204
Silt	$Mg.kg^{-1}$soil	508
Sand	$Mg.kg^{-1}$soil	288
Texture		Loamy
Field Capacity		0.30
Permanent wilting point	pwp	0.15
Available water		0.15

RESULTS AND DICUSSION

Number of spikes.plant^{-1} and number of grains .spike^{-1} : Number of spikes.plant^{-1} and number of grains .spike^{-1}, are major grain yield components of wheat, both characters are separately or combined limit grain yield in wheat. In wheat plant cultivars number of spikes depend on the tillering processes, more of wheat plants with higher number of barren spikes. Tillering activity in wheat continue to the end of booting stage, at this stage the highest number of fertile tillers could be found. A significant differences were found in number of spike.plant^{-1} among genotypes in this experiment, (Table 4). The plants of the genotype 99 were produced highest number (44.8 spikes), but this genotype didn't significantly differs from some other genotypes 10, 11, 40, 46, 50, 76, 90, 113, 126, 144, 150, 199 and 203, while the lowest number (13.6 spikes) produced from the plants of the genotype 30. The reason of those variation due to differences in number of tillers. plant^{-1} and genetic materials among genotypes used in this experiment (5, 7, 14). The results of this experiment conform with the results of AL-Essel (3), Moharram and Habib (21), Naes (22) and Salman and Mahdi (23) There are a significant correlation between number of fertile flowers and number of grains formation at maturity period. The grains development and formation depends to the genetic materials environmental effects and their interaction. The results of the Table 4, shows significant differences among genotypes used in this experiment, in number of grains. spike^{-1}. The genotype 186 produced highest average number of the grains. spike^{-1} (82 grains), but didn't significantly differs from some other genotypes (9, 30. 80. 129, 147, 148 172, 179, 189, 209 and 215). The lowest number of grains.spike^{-1} were produced (23 grains) were produced from the plants of the genotype 18. Those variation due to differences in genetic materials of the genotypes and it's affect by the environment with interaction. The results of this experiment agreed with Al-essel (3), Al-Temimi (6) Hamdan et al (14), Mohammed (20), Naes (22) and Salman and Mahdi (23)

Weight of 1000 grains.gm^{-1} and grain yield .plant gm^{-1}: Grains weight influenced by the genetic materials, anatomical and environmental factors, before and after fertilization. Genetically depends to the very complicated gene action which depend to the nature of the DNA, which control this trait, anatomically size of the embryo sac and number of endosperm cell division and relation between source and sink, while environmental effect, include successes photosynthesis and grain filling duration. The results in the Table 4, shows significant differences among wheat genotypes in weight of 1000 grains.gm^{-1} . The genotype 17 produced the highest 1000 grain weight it was an average 49.5 gm, but it was didn't significantly differs from the genotypes 27 and 45. while the genotype 208 produced the lowest, (22.5 gm). The reason of those differences was due to genetic materials and it's interaction with environment, especially wide spacing between the plants, (14). These results conform with results of Al-Anbari (1), Al-Essel (3), Al-Qyyair (4). Amer (8), Kadom (16), Mohammed (19) and and Naes (22). The grain weight also, influenced by number of tillers .plant^{-1} and number spikes. plant^{-1}, both of the traits effect to the dray matter conversion from resources o the grains The scientist and farmers are wants successful new wheat cultivars, that shows high performance for grain yield and other essential agronomic traits.The grain yield production of wheat as a sink of their components. So, the grain yield control by few genes more than it's components and influenced highly by environments. Grain yield is the final goal of the plant breeder, this character depend on the one or more of the yield components. Improvement of grain yield could be done by improving it's components, this supposition is clear that no directly genes control this trait, but the genetic control to the grain yield by it's genetic components. The results in Table 4 shows significant differences among genotypes in the grain yield.plant^{-1}. The plants of the genotype 99 produced highest average grain yield.plant^{-1} (82.8 gm grain yield.plant^{-1}), but this genotype didn't significantly differs from the genotypes 11, 37. 100, 120, 142, 144, 154, 174, 175. While the lowest average grain yield (12.6 gm) produced from the plants of the genotype 18. (28). The reason of differences among genotypes in grain yield, due to differences in yield components, (Table 4). The results of this experiment conform with the results of Al-Anbari (1), AL- Essel (3) Hassan (15) and Naes (22).

Biological yield. plant gm^{-1} and harvest index %: A significant differences were found among genotypes in the biological yield, (Tabl 4). The plants of the genotype 154 had highest biological yield (287.5 gm). The lowest biological yield was (265 gm) were produced from the plants of the genotype 37. The variation among genotype in biological yield due to variation in plant height, number of tillers .plant^{-1} and number of spikes. plant^{-1}.These results agreed with the results of, Mohammed (19) and Naes (22). Harvest index is inverse of the grain yield in relation to the biological yield in wheat plants. Table 4 shows, significant differences among genotypes in means of harvest index which was from 10.3% to 46.2%, the differences among genotypes in harvest index due to the variation in grain yield and biological yield, which both characters differ due to different genotypes. The results of this experiment agreed with results of, AL-Baldawy (2), Mer and Ama (18) and Naes (22), but doesn't agreed with the results of Mohammed and Ahmed (17). It could be concluded that the genotypes used in this excrement had highly variations in studied characters, it was necessary to conduct varietal trails under different stress especially water stress at different locations, using genotypes, 44, 186, 117, 27, 17, 129, 179, 147 and 45, to select promising genotype in grain yield.

Table 4. Means of grain yield and yield components of the genotypes for the season 2014-2015

Genotypes No.	Spikes plant^{-1}	No.grains spike^{-1}	1000 gran gm^{-1}	Grain yield plant^{-1}	Dray weight gm plant^{-1}	Harvest index
1	31.6	40	34.4	43.5	177.5	24.5
3	23.1	53	36.2	44.0	175.0	25.5
4	22.3	66	33.3	48.6	137.5	35.3
5	24.1	63	35.9	53.4	145.0	36.9
6	25.0	60	33.5	46.6	158.3	29.7
7	22.7	49	31.6	29.1	131.2	22.3
8	22.4	65	30.4	45.5	155.0	28.6
9	24.8	72	32.1	61.8	191.6	30.5
10	40.2	48	34.3	65.1	180.2	36.9
11	37.8	60	35.2	73.6	218.7	33.9
12	34.5	42	36.4	48.2	150.0	32.2
13	23.3	46	38.5	36.7	125.0	32.1
14	25.7	50	31.1	40.5	150.0	27.0
15	31.9	52	30.6	47.0	118.7	40.6
16	25.3	42	43.8	47.1	153.7	31.1
17	18.6	46	49.5	42.6	155.0	27.4
18	18.9	23	29.5	12.6	162.5	7.7
19	34.5	52	33.7	57.5	206.2	27.9
20	17.5	26	32.7	14.7	116.6	12.3
21	32.6	35	40.2	47.4	167.5	27.3
22	22.0	43	39.3	38.2	187.5	19.7
24	23.2	60	37.4	49.7	165.0	29.6
26	24.6	57	35.3	48.6	200.0	24.3
27	31.7	26	46.3	35.4	210.0	17.1
28	17.3	36	34.5	19.6	154.1	13.1
29	29.7	41	41.2	47.6	168.7	28.1
30	13.6	79	26.4	21.7	112.5	22.7
32	18.2	65	37.2	45.5	165.0	27.1
33	19.9	51	39.3	39.4	140.0	28.1
34	23.1	43	32.6	32.8	177.1	19.4
35	25.3	35	40.2	36.0	158.7	22.7
36	23.6	55	38.7	50.2	150.0	33.3
37	38.2	56	35.5	78.3	265.0	29.6
38	25.1	60	40.5	59.5	193.3	30.5
39	24.0	35	32.5	26.3	165.0	16.5
40	43.1	32	34.4	47.6	237.5	20.1
41	33.0	40	26.2	33.6	220.0	15.2
42	23.3	43	30.9	28.7	130.0	22.1
43	22.5	57	42.0	53.7	132.5	40.5
44	31.2	37	44.0	50.4	187.5	27.4
45	21.6	47	47.7	46.4	140.0	33.6
46	38.3	29	28.3	31.8	191.6	16.6
47	31.0	31	40.6	44.3	175.0	23.2
49	17.3	41	38.5	31.7	115.0	25.6
50	37.0	37	40.1	54.8	206.2	26.5
51	29.7	48	34.3	48.1	214.2	22.5
52	19.2	57	38.3	51.8	197.9	26.3
53	24.2	63	36.1	54.7	155.0	36.7
54	20.6	41	41.1	35.5	138.7	25.6
55	27.5	39	36.3	36.0	143.7	25.6
56	16.0	49	26.6	19.2	125.0	14.8
57	28.1	52	37.4	54.8	200.0	26.7
58	23.5	42	28.6	28.6	165.0	17.7
59	27.7	33	29.7	27.1	158.3	17.2
60	29.3	51	32.6	47.8	162.5	29.3
61	33.8	49	33.5	55.1	170.0	33.0
62	27.0	51	43.6	60.6	193.7	31.2
63	20.7	40	40.6	30.4	125.0	24.7

64	27.3	60	36.1	54.6	186.6	29.3
65	22.5	58	31.5	42.1	131.2	31.1
66	23.9	56	34.0	44.8	155.0	29.0
67	32.4	45	34.6	49.7	160.0	30.8
68	24.5	57	37.5	51.4	158.7	32.3
69	31.9	51	35.1	57.1	225.0	25.8
70	30.8	56	33.1	57.9	220.8	26.3
71	30.1	57	32.1	56.1	158.3	41.7
72	27.8	37	39.3	41.0	120.0	36.4
73	26.0	57	30.8	44.4	165.0	27.4
74	25.5	52	31.6	41.7	152.5	28.0
75	34.0	55	35.2	65.0	150.0	46.2
76	44.7	35	34.7	54.2	193.7	27.8
77	23.1	59	36.4	49.6	140.0	35.6
78	26.7	56	37.1	55.8	168.3	33.2
79	22.7	60	35.3	46.9	148.3	31.3
80	15.7	70	30.2	31.5	120.0	24.8
81	32.3	51	34.0	56.8	206.0	27.8
82	16.1	55	35.6	31.2	120.8	25.8
83	25.2	39	33.0	32.4	115.0	27.0
84	30.4	45	33.9	42.1	179.1	24.3
85	32.3	63	32.1	64.9	183.7	35.3
86	33.2	51	34.7	54.5	200.0	27.5
87	25.1	60	33.3	49.8	181.1	27.9
90	39.6	38	34.3	51.1	183.3	28.4
91	22.0	44	35.9	33.8	140.0	24.7
92	34.9	57	30.4	61.2	225.0	27.2
93	32.7	57	31.5	58.7	195.8	30.1
94	24.2	63	35.0	47.7	195.0	25.5
95	29.7	55	33.6	55.4	177.5	31.2
96	26.0	39	36.3	38.0	155.0	24.3
97	31.8	54	34.1	59.7	192.5	30.3
98	33.7	50	32.5	54.8	183.3	29.8
99	44.8	58	33.6	82.8	237.5	34.8
100	35.0	58	34.3	67.5	205.0	32.9
101	33.1	19	39.1	24.5	145.0	20.8
102	23.8	68	31.5	49.5	165.0	31.1
103	24.1	60	38.7	57.1	167.0	33.3
104	22.3	67	26.6	36.5	162.5	23.2
105	18.1	42	33.6	25.9	137.2	18.9
106	26.3	66	35.7	55.1	170.0	32.4
107	27.1	56	34.9	53.9	162.5	34.0
108	29.2	58	32.5	55.4	165.0	34.1
109	32.5	57	33.3	62.2	204.0	30.2
110	34.2	49	33.1	54.0	147.5	36.6
111	22.5	58	31.8	41.6	130.0	32.2
112	30.7	48	34.8	52.7	125.0	41.4
113	38.8	39	32.8	46.5	190.5	26.2
114	31.5	35	40.7	41.1	173.5	23.0
116	23.0	38	32.9	20.1	143.7	14.5
117	14.4	49	45.8	31.6	126.2	25.7
118	29.6	49	41.4	60.1	175.0	34.7
119	25.0	38	31.3	29.9	135.0	22.3
120	25.2	62	34.1	46.2	140.0	33.4
121	19.8	67	33.0	43.9	140.0	31.2
122	30.0	48	30.2	40.1	162.5	27.4
124	31.9	35	33.9	34.7	141.2	26.1
125	20.9	56	31.8	36.7	125.0	29.2
126	40.9	38	35.2	74.8	229.3	32.6
128	32.8	35	36.1	38.4	148.3	25.5
129	23.6	75	29.6	52.2	177.5	29.4
130	19.9	54	31.3	34.0	125.4	26.5
131	29.6	67	31.1	60.9	176.6	34.5

132	19.1	46	31.2	25.8	115.0	23.2
133	27.6	36	35.6	35.3	138.7	25.5
134	33.8	27	34.2	28.8	97.5	28.6
136	25.5	55	33.0	46.6	148.7	31.5
137	29.5	60	28.1	49.0	191.5	25.6
138	24.6	63	31.3	43.0	130.0	38.5
140	26.2	58	37.9	57.5	153.5	38.2
141	27.6	55	36.1	50.0	141.6	35.5
142	27.5	69	37.3	70.5	210.0	33.8
143	25.5	58	33.9	49.0	180.0	27.0
144	38.5	56	35.1	73.6	229.1	32.2
145	26.4	59	33.0	52.2	190.0	27.3
146	29.4	41	35.8	42.0	138.8	30.4
147	24.8	79	34.6	63.8	140.0	44.5
148	14.2	71	31.8	31.0	120.0	27.8
149	17.6	59	32.1	33.6	90.0	43.3
150	41.0	41	37.5	60.6	225.0	27.0
151	21.0	53	33.0	36.5	122.5	29.8
152	26.8	52	33.0	44.0	177.5	26.1
153	23.2	65	35.3	53.2	157.5	33.4
154	33.7	69	35.1	81.0	287.5	28.1
155	26.1	55	31.9	45.2	160.0	28.2
156	15.1	75	33.6	36.9	150.0	24.6
158	34.4	51	33.6	56.2	190.0	29.5
159	29.4	57	35.3	59.9	218.7	27.3
160	23.6	57	34.6	43.4	115.0	37.6
161	30.2	50	33.0	49.3	183.7	28.0
162	27.0	38	33.0	33.4	140.0	24.1
163	22.7	59	32.5	42.6	176.1	23.9
164	21.2	52	31.7	34.9	135.0	25.9
165	21.1	57	32.2	44.2	140.0	32.0
166	30.5	60	28.6	54.1	185.4	28.5
167	24.9	49	31.0	38.1	145.0	26.4
168	22.7	57	33.1	43.4	144.7	29.8
169	20.0	46	34.4	30.7	140.0	22.0
170	19.7	61	31.5	38.8	147.5	25.8
171	24.6	59	35.1	50.4	162.7	31.2
172	19.0	70	32.8	42.3	135.0	32.4
173	17.8	56	32.5	32.9	135.0	24.1
174	33.2	63	32.4	68.4	227.5	29.6
175	36.6	52	35.6	68.5	208.3	32.6
177	21.3	54	34.1	39.2	160.1	24.4
178	16.2	61	33.8	32.3	145.0	22.5
179	22.0	81	31.5	55.3	270.0	22.7
180	18.7	60	37.0	41.7	135.0	31.2
181	26.9	52	33.7	46.1	168.7	27.9
182	27.1	62	32.8	55.5	166.6	33.0
183	18.7	54	34.6	32.7	156.6	21.1
184	29.6	54	34.0	53.9	143.7	37.9
185	19.3	65	29.0	35.3	116.6	30.9
186	18.3	82	35.0	44.0	117.6	37.8
187	27.0	48	32.9	42.9	142.5	41.7
188	18.5	65	36.3	43.6	121.2	36.3
189	14.2	73	33.6	33.7	90.0	37.4
190	23.1	49	38.6	43.0	155.0	28.0
191	30.8	48	42.5	62.3	185.8	34.0
192	30.5	42	26.8	34.1	225.0	15.5
193	28.8	42	35.4	42.1	150.0	28.1
194	30.2	61	31.0	57.5	200.0	28.5
195	29.6	43	39.6	51.4	170.0	29.6
196	25.1	66	35.6	50.3	161.6	34.8
197	24.3	59	33.1	45.6	200.0	22.8
198	23.3	54	36.4	41.8	141.6	29.6

199	**40.3**	**33**	**37.6**	**50.7**	**237.5**	**21.0**
200	**23.3**	**58**	**26.9**	**36.5**	**140.0**	**26.3**
201	**28.0**	**57**	**36.2**	**59.6**	**197.5**	**29.4**
202	**20.3**	**47**	**32.6**	**31.2**	**109.2**	**33.2**
203	**42.1**	**45**	**31.4**	**48.0**	**216.6**	**23.1**
204	**27.2**	**55**	**29.0**	**43.9**	**150.0**	**29.1**
205	**37.3**	**43**	**35.0**	**56.0**	**205.0**	**27.2**
206	**31.7**	**41**	**36.3**	**39.8**	**165.5**	**26.7**
207	**29.7**	**35**	**36.6**	**38.7**	**218.7**	**18.2**
208	**24.2**	**36**	**22.5**	**18.2**	**180.0**	**10.3**
209	**25.5**	**73**	**31.7**	**59.2**	**181.2**	**32.3**
210	**34.5**	**58**	**32.4**	**63.6**	**231.2**	**27.5**
212	**30.7**	**43**	**30.3**	**40.0**	**135.0**	**30.3**
213	**23.1**	**50**	**33.6**	**38.5**	**122.5**	**31.5**
214	**30.6**	**42**	**42.9**	**55.7**	**220.8**	**25.0**
215	**19.8**	**73**	**33.1**	**47.4**	**143.7**	**32.9**
216	**14.0**	**62**	**39.5**	**33.1**	**103.0**	**32.1**
217	**32.8**	**54**	**36.2**	**55.9**	**166.6**	**33.9**
218	**20.9**	**58**	**34.3**	**41.3**	**131.0**	**31.4**
219	**23.5**	**45**	**37.9**	**45.5**	**237.5**	**18.6**
220	**19.2**	**54**	**38.4**	**39.9**	**155.7**	**25.6**
221	**31.5**	**60**	**32.5**	**61.1**	**205.0**	**29.8**
222	**23.0**	**49**	**32.9**	**36.7**	**138.7**	**26.4**
223	**31.3**	**46**	**36.5**	**50.8**	**158.9**	**31.7**
225	**28.3**	**54**	**35.7**	**49.3**	**166.7**	**29.6**
Means	**26.8**	**52**	**34.6**	**46.0**	**165.4**	**28.4**
LSD5%	**9.6**	**17.3**	**3.2**	**15.4**	**42.8**	**8.1**

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