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Original article

Effect of photosynthetic resource restriction on grain yield and other agronomic characteristics of cultivars and advanced barley lines under water deficit conditions

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Extended abstract

Introduction

Barley (*Hordeum vulgare* L.) is a widely cultivated cereal crop in many rainfed areas in the Mediterranean region where drought is considered the main yield-limiting factor. In such marginal lands, yield losses are associated with drought conditions resulting from low and inconsistent precipitation during the whole plant growth cycle, either early in the fall or winter (initial drought conditions) or late during spring (terminal drought). Drought stress reduces grain yield of barley by negatively affecting the yield components i.e., number of plants per unit area, number of spikes and grains per plant or unit area and single grain weight, which are determined at different stages of plant development.

Materials and methods

In order to investigate the effect of sources limitation on yield and physiological characteristics in barley cultivars and advanced lines in various environmental conditions, an experiment was done in the Agricultural and Natural Resources Research Station of Miandoab in cropping 2016-2017. In this study, 12 varieties and lines of barley were evaluated in five sources limitation treatments including control (without limitation), leaf removal under flag leaf, flag leaf removal, half spike removal and spike coating in normal irrigation and water deficit conditions were evaluated in a randomized complete block design with three replications. In this study spike weight, leaf weight, peduncle weight, internode weight, seed number per spike, total plant weight and single plant yield were measured. Analysis of variance was performed using the SAS9.4 and SPSS programs.

Result and discussion

The results of the combined analysis of variance showed that the effect of year on leaf weight and seed yield was significant at the level of 0.01. There was a significant difference between irrigation levels on all studied traits at the level of 0.01, the interaction effect of year in irrigation was also significant on all traits except total plant weight at the level of 0.01 probability. The effect of resource constraint, irrigation on resource constraint, genotype and the interaction of genotype on resource constraint were significant on all studied traits at the level of 0.01 probability. The interaction effect of year on resource constraint

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on leaf weight, peduncle weight, number of seeds per spike and seed weight was significant at 0.01 probability level. The interaction effect of year on genotype on total plant weight and number of seeds per spike was also significant. The interaction effect of irrigation in genotype was also significant on all traits at 0.01 probability level. Finally, the triple interaction of irrigation in source restriction in genotype on leaf weight and total plant weight was significant at the level of 0.01 and the number of seeds per spike and grain yield at the level of 0.05 probability was significant. Comparison of the mean of genotype with source restriction interaction treatments showed that most of the studied genotypes under normal irrigation conditions showed the lowest grain yield in treatments of flag leaf removal restriction, half spike target and spike cover, while under water deficit stress conditions, the lowest grain yield was recorded in the studied genotypes under the treatments of flag leaf removal and spike cover. Under normal irrigation conditions under control and removal under the flag leaf, genotypes No. 10, 2, 3, 4, 5, 6, 7, 8 and 12 had the highest grain yield and there was no significant difference between them. Under water deficit stress conditions, in the control treatment, all genotypes except genotype No. 11 and in flag removal treatment, all genotypes, except for genotypes No. 2 and 11, had higher yields compared to genotypes. Under normal irrigation conditions and Water-deficit stress in genotype 3, there was no significant difference between control treatment and resource limitation treatments of remove below the flag leaf, flag leaf removal and half spike removal. In this study, the studied advanced lines did not show a significant advantage over the released barley cultivars in terms of grain yield.

Conclution

It can be concluded that in this study, the studied advanced lines did not show a significant advantage over the released barley cultivars in terms of grain yield.

***Keywords*:** Drought stress, Flag Leaf, Grain yield, Spike

Table 1. characteristics of studied barley genotypes

No.	Genotype	Pedigree
1	Tajadin	
2	FAJRE30	
3	JONOOB	
4	ARASS	
5	RIHANE 03	
6	SINA	
7	Chaldoran	
8	M-84-14	Cr115/Por//Bc/3/Api/CM67/4/Giza120/5/H272/Bgs/3/Mzq/Gva//Alanda-01
9	M-86-5	Bgs/Dajia//L.1242/4/L.B.IRAN/Una8271//Gloria'S'/3/Alm/Una80
10	M-88-2	Kavir/Badia/3/Torsh/9cr.279-07/Bgs/4/Karoon/Kavir
11	MD-88-15	Rojo/3/LB.IRAN/Una8271//Gloria"S"/Com"S"
12	W-83-4	Zrn/Shiroodi/6/Zrn/5/Omid/4/Bb/Kal//Ald/3

Table 1. Physical and chemical characteristics of soil testing

Sp	EC	W.P	Bulk density	pH	T. N. V	O.C	N	P	K	Sand	Silt	Clay	Soil texture
%	dS m^{-1}	%	g cm^{-3}		---------- % ----------			-------- ppm --------		--------- % ---------			
43	1.3	12	1.4	8	4.7	1.3	0.13	14.2	444	16	58	28	sandy clay loam

Table 3. Combined analysis of variance of morphophysiological traits in barley cultivars and lins in two years

S.O.V	df	Spike weight	Leaf weight	Pedankel weight	seeds per spike	Biological yield	Grain yield
Year	1	3.58^{ns}	0.05^{*}	0.75^{*}	1.29^{ns}	0.02^{ns}	0.25^{ns}
Conditions (C)	1	22.08^{*}	0.06^{*}	9.74^{**}	2142.51^{**}	17.66^{**}	1.87^{*}
Y× C	1	8.13^{ns}	0.006^{ns}	0.25^{ns}	71.82^{ns}	0.001^{ns}	0.14^{ns}
Ea	4	1.24	0.003	0.04	69.95	0.75	0.11
Sources limitation (SL)	4	87.42^{**}	0.01^{ns}	11.25^{ns}	4785.05^{ns}	8.16^{**}	212.46^{*}
SL×Y	3	0.11^{ns}	0.44^{**}	277.60^{**}	1595.77^{**}	0.03^{ns}	21.04^{**}
SL×C	3	25.11^{**}	0.01^{**}	8.91^{**}	413.55^{**}	15.41^{**}	0.68^{**}
Genotype	11	4.44^{**}	0.04^{*}	0.29^{*}	628.79^{ns}	2.78^{ns}	0.67^{**}
G ×Y	11	0.58^{ns}	0.003^{ns}	0.08^{*}	375.60^{**}	1.67^{**}	0.13^{ns}
G ×C	11	4.18^{**}	0.04^{**}	0.27^{**}	320.26^{**}	0.25^{**}	0.29^{**}
G × SL	33	2.85^{**}	0.002^{ns}	0.16^{**}	127.77^{**}	0.15^{**}	0.15^{**}
G × SL×Y	33	0.61^{ns}	0.002^{ns}	0.03^{ns}	85.59^{ns}	0.02^{ns}	0.09^{ns}
G ×SL×C	33	0.31^{ns}	0.001^{ns}	0.05^{ns}	59.96^{ns}	0.02^{ns}	0.06^{ns}
G×C× Y	11	0.17^{ns}	0.002^{ns}	0.03^{ns}	22.41^{ns}	0.09^{ns}	0.11^{ns}
IS×C×Y	3	0.45^{ns}	0.002^{ns}	0.01^{ns}	19.81^{ns}	0.03^{ns}	0.05^{ns}
G ×C× SL×Y	47	0.22^{ns}	0.02^{ns}	0.03^{ns}	34.51^{ns}	0.08^{ns}	0.08^{ns}
Eb	264	0.52	0.002	0.04	70.53	0.07	0.09

^{ns}, * and **: non-Significant, Significant at 5% and 1% levels probability, respectively

Table 4. Mean comparison of the treatment combinations of irrigation and source limitition treatments on the studied traits in barley cultivars and lins in normal condition

sources limitation	Genotype	Spike weight	Leaf weight	Peduncle weight	seeds per spike	Biological yield	Grain yield
		g				t / ha	
control	1	1.60^{abc}	0.075^{a-d}	0.25^{a-e}	31.25^{a-m}	6.69^{c-l}	3.61^{d-k}
	2	1.75^{a}	0.099^{ab}	0.28^{a-e}	35.85^{a-g}	7.02^{c-l}	4.30^{a-f}
	3	1.67^{abc}	0.077^{a-d}	0.36^{a}	38.79^{abc}	7.92^{a}	4.74^{abc}
	4	1.59^{abc}	0.056^{b-g}	0.25^{a-e}	30.80^{b-m}	5.61^{b-e}	3.99^{a-i}
	5	1.68^{abc}	0.031^{b-g}	0.27^{a-e}	36.43^{a-g}	8.61^{b-e}	4.52^{a-d}
	6	1.70^{ab}	0.064^{b-g}	0.28^{a-e}	38.35^{a-d}	8.73^{bcd}	4.33^{a-e}
	7	1.72^{ab}	0.067^{b-f}	0.25^{a-e}	34.53^{a-h}	9.07^{abc}	4.11^{a-g}
	8	1.71^{ab}	0.077^{ad}	0.32^{a-d}	37.75^{a-e}	8.64^{b-e}	4.02^{a-i}
	9	1.77^{a}	0.12^{a}	0.32^{ab}	42.05^{a}	8.42^{c-f}	4.77^{ab}
	10	1.80^{a}	0.075^{a-d}	0.30^{a-d}	39.16^{ab}	10.63^{ab}	4.92^{a}
	11	1.71^{ab}	0.04^{c-g}	0.26^{a-d}	37.85^{a-e}	9.07^{abc}	3.36^{k-p}
	12	1.32^{a-e}	0.055^{b-g}	0.28^{a-e}	30.71^{b-n}	8.20^{c-g}	4.08^{a-h}
Under Flag Leaf	1	1.47^{a-d}	0.02^{efg}	0.22^{b-e}	27.20^{d-o}	4.55^{mn}	2.65^{k-p}
	2	1.70^{ab}	0.041^{c-g}	0.22^{b-e}	32.56^{a-j}	5.05^{j-n}	4.30^{a-f}
	3	1.59^{abc}	0.0042^{c-g}	0.23^{a-e}	34.73^{a-h}	6.55^{d-m}	4.33^{a-e}
	4	1.32^{a-e}	0.036^{d-g}	0.24^{a-e}	29.27^{b-o}	5.99^{h-n}	3.99^{a-i}
	5	1.42^{a-e}	0.038^{c-g}	0.23^{a-e}	34.64^{a-h}	5.67^{h-n}	4.74^{abc}
	6	1.62^{abc}	0.035^{d-g}	0.25^{a-e}	35.39^{a-g}	4.17^{c-j}	4.02^{a-i}
	7	1.64.^{abc}	0.040^{c-g}	0.17^{cde}	38.79^{abc}	6.80^{d-m}	4.11^{a-g}
	8	1.67^{abc}	0.041^{c-g}	0.30^{a-d}	32.08^{a-l}	6.42^{e-n}	4.49^{a-d}
	9	1.55^{abc}	0.047^{a-d}	0.26^{a-e}	39.16^{ab}	7.05^{c-k}	4.92^{a}
	10	1.77^{a}	0.046^{c-g}	0.22^{a-e}	40.05^{ab}	6.67^{d-m}	4.77^{ab}
	11	1.64^{abc}	0.042^{c-g}	0.22^{b-e}	37.85^{a-e}	6.61^{d-m}	3.61^{d-k}
	12	1.25^{b-f}	0.030^{efg}	0.19^{b-e}	30.71^{b-n}	6.08^{g-n}	4.08^{a-h}
Flag Leaf	1	0.55^{hij}	0.04^{c-g}	0.19^{b-e}	20.40^{mno}	4.80^{lmn}	3.36^{k-p}
	2	0.46^{ij}	0.054^{c-g}	0.20^{b-e}	25.70^{g-o}	5.30^{i-n}	3.08^{g-o}
	3	0.76^{g-j}	0.069^{a-e}	0.22^{b-e}	37.75^{a-e}	6.67^{d-m}	3.15^{g-o}
	4	0.53^{hij}	0.045^{c-g}	0.26^{a-e}	30.80^{b-m}	6.30^{f-n}	2.30^{nop}
	5	0.42^{j}	0.028^{e-g}	0.24^{a-e}	38.35^{a-d}	6.52^{d-n}	3.12^{g-o}
	6	0.57^{hij}	0.038^{c-g}	0.23^{a-e}	26.50^{e-o}	7.48^{c-i}	3.12^{g-o}
	7	0.66^{g-j}	0.021^{g}	0.17^{cde}	31.40^{a-m}	6.64^{c-j}	3.05^{g-o}
	8	0.55^{hij}	0.023f^{g}	0.26^{a-e}	23.90^{h-o}	7.11^{c-j}	3.40^{d-m}
	9	0.83^{f-j}	0.063^{b-g}	0.26^{a-e}	34.80^{a-h}	7.67^{g-h}	3.33^{e-n}
	10	0.95^{e-h}	0.054^{b-g}	0.25^{a-e}	29.70^{b-n}	7.48^{c-i}	3.58^{d-k}
	11	0.73^{g-j}	0.047^{c-g}	0.21^{b-e}	37.40^{a-f}	6.61^{d-n}	3.24^{f-o}
	12	0.68^{g-j}	0.055^{b-g}	0.24^{a-e}	21.91^{i-o}	5.74^{h-n}	2.34^{m-p}
Half Spike	1	0.70^{g-j}	0.076^{a-d}	0.25^{a-e}	21.19^{no}	5.21^{j-n}	1.93^{p}
	2	0.87^{e-j}	0.099^{a}	0.22^{a-e}	20.32^{mno}	4.77^{lmn}	3.12^{go}
	3	0.83^{f-j}	0.081^{abc}	0.35^{a}	21.35^{j-o}	5.83^{h-n}	3.77^{jb}
	4	0.77^{g-j}	0.053^{c-g}	0.26^{a-e}	18.14^{o}	5.17^{j-n}	2.30^{m-p}
	5	0.88^{e-j}	0.044^{c-g}	0.27^{a-e}	20.90^{ko}	4.86^{k-n}	3.58^{d-k}
	6	0.81^{f-j}	0.048^{c-g}	0.28^{a-e}	20.80^{l-o}	5.89^{h-n}	3.33^{e-v}
	7	0.93^{e-h}	0.067^{b-f}	0.25^{a-e}	20.85^{mno}	5.14^{j-n}	3.55^{d-k}
	8	0.92^{e-i}	0.077^{a-d}	0.31^{abc}	19.65^{no}	5.39^{i-n}	3.12^{g-o}
	9	1.04^{d-g}	0.061^{b-g}	0.32^{ab}	27.60^{c-o}	5.42^{i-n}	3.52^{d-l}
	10	0.93^{e-h}	0.050^{c-f}	0.30^{abc}	26.21^{f-o}	5.02^{j-n}	3.99^{a-i}
	11	0.85^{f-j}	0.042^{c-g}	0.25^{a-e}	22.54^{i-o}	4.77^{lmn}	3.12^{g-o}
	12	0.67^{g-j}	0.052^{c-g}	0.30^{a-d}	17.86^{o}	4.36^{n}	2.24^{m-p}
spike coating	1	1.46^{abc}	0.052^{c-g}	0.27^{a-e}	31.25^{a-m}	6.98^{c-l}	2.93^{i-p}
	2	1.51^{abc}	0.054^{c-g}	0.28^{a-e}	35.85^{a-i}	7.02^{c-l}	2.93^{i-p}
	3	1.75^{a}	0.054^{a-d}	0.15^{e}	33.25^{a-i}	8.73^{bcd}	3.68^{ck}
	4	1.50^{abc}	0.056^{b-g}	0.16^{de}	27.40^{c-o}	8.42^{b-e}	2.37^{m-p}
	5	1.63^{abc}	0.061^{b-g}	0.26^{a-e}	32.27^{a-k}	8.61^{b-e}	3.55^{d-k}
	6	1.59^{abc}	0.064^{b-g}	0.26^{a-e}	36.43^{a-g}	11.04^{a}	2.71^{j-p}
	7	1.69^{abc}	0.052^{c-g}	0.24^{a-e}	37.28^{a-f}	10.63^{ab}	3.21^{g-o}
	8	1.63^{abc}	0.054^{c-g}	0.27^{a-e}	34.53^{a-h}	8.64^{b-f}	4.02^{a-h}
	9	1.67^{abc}	0.11^{a}	0.29^{a-d}	37.16^{a-f}	8.39^{c-f}	3.52^{d-l}
	10	1.51^{abc}	0.061^{b-g}	0.27^{a-e}	42.35^{a}	9.07^{abc}	3.83^{a-i}
	11	1.63^{abc}	0.039^{c-g}	0.19^{b-e}	36.45^{a-g}	9.07^{abc}	2.99^{h-p}
	12	1.24^{abc}	0.045^{c-g}	0.22^{b-e}	25.60^{g-o}	8.20^{c-g}	2.43^{p}

Means in each column, followed by similar letter(s) are not significantly different at 5% probability level, using Duncan's Multiple Range Test

Table 5. Mean comparison of the intraction effect of genotype and source limitition treatments studied traits in barley cultivars and lins in water deficit condition

sources limitation	Genotype	Spike weight	Leaf weight	Peduncle weight	seeds per spike	Biological yield	Grain yield
		g				t ha^{-1}	
control	1	1.36^{a-k}	0.060^{ab}	0.20^{f-o}	21.22^{pq}	3.64^{l-r}	3.12^{ab}
	2	1.62^{abc}	0.063^{ab}	0.25^{a-e}	30.90^{c-i}	3.97^{p-s}	2.94^{a-d}
	3	1.64^{abc}	0.096^{a}	0.31^{ab}	30.85^{c-i}	5.61^{ab}	3.17^{ab}
	4	1.64^{abc}	0.060^{ab}	0.25^{a-l}	19.56^{p-s}	5.42^{a-d}	2.98^{abc}
	5	1.76^{abc}	0.060^{ab}	0.30^{ab}	32.50^{b-f}	5.35^{a-f}	2.77^{a-d}
	6	1.78^{ab}	0.071^{ab}	0.30^{ab}	33.50^{a-e}	4.86^{a-i}	3.05^{a-b}
	7	1.59^{a-e}	0.070^{ab}	0.24^{a-n}	32.90^{a-f}	5.40^{a-e}	2.79^{a-d}
	8	1.73^{a-b}	0.075^{ab}	0.25^{a-l}	28.08^{g-k}	5.19^{a-f}	3.12^{a-b}
	9	1.63^{abc}	0.090^{a}	0.31^{a}	34.03^{a-d}	5.59^{ab}	3.40^{a}
	10	1.69^{abc}	0.058^{a}	0.29^{ab}	38.76^{a}	5.80^{a}	3.36^{a}
	11	1.91^{a}	0.060^{ab}	0.20^{g-o}	36.50^{a}	4.79^{a-f}	2.49^{b-e}
	12	1.59^{a-d}	0.060^{ab}	0.20^{c-o}	22.8^{l-p}	3.99^{c-o}	2.93^{a-d}
Under Flag Leaf	1	1.63^{abc}	0.059^{ab}	0.19^{j-o}	16.19^{r-u}	3.68^{l-q}	3.12^{ab}
	2	1.53^{a-g}	0.041^{ab}	0.20^{f-o}	30.85^{c-i}	3.50^{l-s}	2.49^{b-e}
	3	1.58^{a-f}	0.049^{ab}	0.27^{a-h}	30.90^{c-i}	3.50^{l-s}	3.29^{a}
	4	1.14^{b-m}	0.027^{b}	0.24^{a-n}	22.81^{l-p}	5.38^{ab}	3.12^{ab}
	5	1.56^{a-f}	0.044^{ab}	0.24^{a-n}	20.28^{d-j}	4.86^{a-i}	2.77^{a-d}
	6	1.53^{a-g}	0.044^{ab}	0.21^{e-o}	32.90^{a-f}	5.35^{e-f}	3.17^{ab}
	7	1.65^{abc}	0.035^{b}	0.18^{l-o}	33.67^{a-e}	5.31^{ab}	3.12^{ab}
	8	1.62^{abc}	0.039^{ab}	0.24^{a-m}	28.08^{g-k}	4.79^{a-k}	2.94^{abc}
	9	1.80^{ab}	0.061^{ab}	0.29^{ab}	31.95^{b-g}	5.00^{a-g}	3.17^{abc}
	10	1.62^{abc}	0.050^{ab}	0.28^{a-f}	36.97^{a}	5.31^{a-f}	2.93^{a-d}
	11	1.76^{abc}	0.053^{ab}	0.18^{l-o}	30.76^{c-i}	6.65^{a}	2.39^{b-f}
	12	1.08^{b-m}	0.051^{ab}	0.19^{i-o}	19.56^{p-s}	3.99^{c-o}	2.79^{a-d}
Flag Leaf	1	0.75^{h-m}	0.010^{b}	0.15^{o}	12.70^{uv}	3.97^{p-s}	1.29^{ij}
	2	0.83^{e-m}	0.063^{b}	0.19^{j-o}	26.40^{j-m}	2.63^{qrs}	0.987^{j}
	3	1.52^{a-g}	0.025^{b}	0.26^{a-i}	34.60^{abc}	3.73^{e-q}	2.82^{a-d}
	4	0.96^{c-m}	0.025^{b}	0.19^{h-o}	16.40^{r-u}	3.99^{c-n}	1.83^{e-i}
	5	0.84^{d-m}	0.006^{b}	0.23^{b-n}	25.5^{k-o}	4.58^{b-l}	2.11^{d-h}
	6	1.05^{b-m}	0.004b	0.21^{e-o}	29.50^{e-k}	4.51^{b-m}	1.01^{j}
	7	0.84^{d-m}	0.005^{b}	0.19^{j-o}	33.50^{a-e}	4.01^{g-o}	1.76^{e-j}
	8	0.80^{g-m}	0.009^{b}	0.24^{a-n}	21.30^{opq}	3.68^{k-q}	1.31^{hij}
	9	1.41^{a-j}	0.002^{b}	0.26^{a-k}	34.3^{a-d}	3.97^{g-o}	1.90^{ei}
	10	1.47^{a-i}	0.006^{b}	0.24^{a-n}	25.90^{k-n}	3.73^{j-p}	1.52^{g-j}
	11	0.74^{i-m}	0.005^{b}	0.17^{mno}	27.10^{h-k}	3.33^{n-s}	2.18^{c-g}
	12	0.65^{klm}	0.06^{b}	0.19^{h-o}	15.60^{s-v}	1.47^{m-s}	1.41^{g-j}
Half Spike	1	0.44^{m}	0.054^{ab}	0.18^{k-o}	11.70v	1.09^{r-s}	1.19^{ij}
	2	0.96^{c-m}	0.06^{ab}	0.21^{e-o}	20.10^{prq}	2.46^{s}	2.91^{a-d}
	3	1.30^{a-k}	0.08^{ab}	0.30^{ab}	21.22^{pq}	3.73^{i-q}	3.05^{ab}
	4	0.52^{l-m}	0.05^{ab}	0.25^{a-l}	15.25^{tuv}	4.25^{f-n}	2.74^{a-d}
	5	0.75^{i-m}	0.044^{ab}	0.26^{a-j}	17.62^{q-t}	3.78^{i-p}	2.91^{a-d}
	6	0.82^{f-m}	0.039^{ab}	0.24^{a-m}	27.10^{h-k}	3.87^{h-o}	3.07^{ab}
	7	0.65^{klm}	0.035^{b}	0.21^{d-o}	22.27^{m-p}	3.94^{g-o}	3.33^{a}
	8	1.08^{b-m}	0.036^{ab}	0.26^{a-j}	21.90^{nop}	3.54^{l-s}	3.05^{ab}
	9	1.26^{a-l}	0.05^{ab}	0.31^{a}	20.86^{pq}	3.61^{l-r}	3.12^{ab}
	10	1.50^{a-h}	0.038^{ab}	0.29^{ab}	19.53^{p-s}	3.64^{l-r}	3.07^{ab}
	11	0.66^{j-m}	0.038^{ab}	0.20^{g-o}	21.40^{opq}	3.38^{n-s}	2.42^{b-f}
	12	0.62^{klm}	0.032^{b}	0.20g^{-o}	12.70^{uv}	3.00^{o-s}	2.39^{b-f}
spike coating	1	0.80^{g-m}	0.041^{ab}	0.15^{o}	15.13^{tuv}	3.52^{l-s}	1.71^{e-j}
	2	0.84^{d-m}	0.056^{ab}	0.20^{a-e}	20.12^{g-k}	3.64^{l-r}	1.26^{hij}
	3	1.06^{b-m}	0.066^{ab}	0.28^{a-e}	28.73^{f-k}	2.91^{a-f}	1.55^{g-j}
	4	0.80^{f-m}	0.057^{ab}	0.16^{n-o}	21.19^{po}	5.47^{abc}	1.55^{ghi}
	5	0.75^{i-m}	0.060^{ab}	0.29^{ab}	32.50^{b-f}	4.34^{d-n}	1.36^{hij}
	6	0.66^{klm}	0.070^{ab}	0.29^{ab}	31.11^{c-h}	4.84^{a-j}	1.71^{e-j}
	7	0.65^{klm}	0.067^{ab}	0.24^{a-n}	29.60^{e-k}	5.99^{ab}	1.55^{g-j}
	8	0.87^{d-m}	0.075^{ab}	0.26^{a-j}	26.75^{i-j}	5.19^{a-f}	1.64^{f-j}
	9	1.11^{d-m}	0.074^{ab}	0.27^{a-g}	32.02^{b-g}	5.40^{a-e}	1.62^{f-j}
	10	1.25^{a-l}	0.067^{ab}	0.27^{a-h}	33.29^{a-e}	5.80^{a}	1.45^{g-j}
	11	0.84^{d-m}	0.058^{ab}	0.19^{j-o}	35.76^{a}	4.93^{a-h}	1.88^{e-i}
	12	0.46^{m}	0.065^{ab}	0.22^{c-o}	18.95^{p-t}	4.08^{g-o}	1.55^{g-j}

Means in each column, followed by similar letter(s) are not significantly different at 5% probability level, using Duncan's Multiple Range Test