Influence of Dap and Foliar (EcoZink) fertilizers on growth and yield of two different types of barley (*Hordeum distichum*) in two locations

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Abstract

This study was conducted in two different location Sharya and Doggata, during the growing seasons 2019/2020 to study the effect of fertilization for two types of Barley well as studying their growth and yield performance under rainfed environments. Four forms of fertilization: Control treatment, Soil fertilizer; DAP 18:46:0, Foliar fertilizer (EcoZink), and both DAP plus Foliar fertilizer, the study designed in spilt plot design. The analysis variance indicated highly significant ($P < 0.01$) for number of head and plant height (cm) by effect of varieties, while the fertilizer effected significantly in above traits and leaf area cm^{-2}. However, their interaction were not significant for all other studies characters. The location was significantly effected in biomass, grain yield , number of head m^{-2} , plant height and leaf area cm^{-2}. From the results, the role of varieties, fertilizer types and locations individually effected in the studied characters While the interaction less role effected. For 1000 seed weight the combination Dap and foliar Ecozink gave the batter 1000 seed weight and recorded 44.667g for Black barley and 44.83 g for White barley increasing 8% and 5% compare with control treatment, respectively . The treatment (Dap + foliar Ecozink) is superior in all characters biomass, grain yield, 1000 seed weight, spike length , plant height and leaf area. The result showed that the foliar Ecozink and Dap gave the highest value for grain yield at Sharya location where are the foliar Ecozink recorded the lowest value with White barley.

KeyWords; Barley, EcoZink, Dap, Location.

تأثير سماد Dap و الورقي Ecozink في نمو وحاصل نوعين من الشعير(*Hordeum distichum*) في موقعين

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الخلاصة

نفذت التجربة في موقعين مختلفين الأول في مزرعة خاصة في مجمع شاريا تابع لمحافظة دهوك والثاني في مجمع دوغاتا التابع لمحافظة نينوى خلال الموسم الزراعي 2019-2020 لدراسة الحاصل ومكوناته لصنفيين من الشعير المحلي (الاسود والابيض) تحت تأثير أربع معاملات تسميد مختلفة حيث كانت معاملة الاولى كنترول والثانية سماد المعدني داب 18:46:0 والثالثة سماد الورقي عن طريق الرش زنك Ecozink و الاخيرة مزج السمادين الداب والزنك معا . اظهر تحليل التباين عند مستوى ($P < 0.01$) فرقا عالي المعنوية لكلا الصنفيين لطول النبات وعدد السنابل في المتر المربع الواحد ، بينما كان تأثير

معاملات السماد معنويا على الصفتيين المذكورتين بالأضافة لمساحة الورقية وكان تداخلهما غير معنويا لبقية الصفات. كان لموقع تاثير معنوي على كلا الصفتين عدد السنابل و حاصل المحصول. وأظهرت النتائج ان تاثير معاملات الاصناف والتسميد والموقع معنوي بشكل انفرادي بينما كان التأثير غير معنوي في حالة التداخل بين معاملات الثلاثة. سجلت صفة الف حبة اعلى قيمة لمعاملة تسميد المختلط (داب + الرش) وكانت 46.667غم لشعير الاسود و 44.83غم لشعير الابيض بنسبة زيادة 8% و5% مقارنة مع كنترول، على التوالي. واظهر التسميد المختلط (داب + الرش) تفوقا في جميع الصفات (الوزن البايلوجي والحاصل و وزن الف بذرة و طول السنبلة و ارتفاع النبات والمساحة الورقية). كما اظهرت النتائج ان موقع شاريا كان متفوقا في حاصل الحبوب تحت تأثير معاملة لسماد المختلط بينما اقل قيمة سجلت تحت تاثير سماد الرش EcoZink مع شعير الابيض في نفس الموقع .

الكلمات المفتاحية : الشعير، سماد الورقي، سماد Dap ، الموقع

Introduction

Barley (*spp Hoirdeum*) rank fourth in area among the world crops harvested. Barley is grown throughout the more temperate regions of the world. It thrives in a cool climate. It will stand more heat under semi arid than humid conditions. In the warmer climate barley is sown in fall or winter. The best barley soils appear to be well drained loams. Soil fertility is the most limiting factor for barley production in the Kurdistan rgion of Iraq. Furthermore , in Kurdistan region , low productivity of barley is due to low soil fertility and poor organic practices. Gate *et al*., 2010, Getachew *et al*.,2014 reported that the continuous application of inorganic fertilizers alone resulted in deterioration of soil health in terms of physical, chemical and biological properties of soil, thereby providing a better environment for root development by improving the soil structure (Dejene and Lemlem, 2002). Foliar application of micronutrients is 6 to 20 times more useful than the soil application and improves the nutrition (Arif *et al*., 2006). Foliar application of Zn reduces the micronutrient deficiencies and it is an efficient method because nutrients are easily absorbed through leaves and is best option to compensate micronutrient deficiencies in shorter period of time under rainfed regions (Nasiri et al., 2010). Zinc an essential mineral for the proper functioning of our daily intake. It is also used as the food supplement and bio fortification of cereals.

Zinc is an important part of cellular metabolism as well as the catalytic activity of enzymes (Ahmed *et al*., 2017). According to Hajighasemi et al.,2016; Khalil *et al*., 2011; kovacevic and kovacevic 2010 to determination of optimum mineral fertilizer (DAP) ; they reported indicated that increasing trend with fertilization by the fertilizers combination (125N+80P+120K Kg.ha^{-1}), thus the grain yield increased by the fertilized treatment give 6.73 tons ha^{-1} comparison treatment (without fertilization) which gave 5.42 tons ha^{-1}, and also the same researchers have reported that the interaction between seeding rates and N fertilizer rate (600 seed m^{-2} and 100 kg N ha^{-1}) respectively gave the highest barley production in grain only . The aim of this study was to investigate the response of tow barley types to Dap an biofertilizer on productivity and yield components in two locations of Kurdistan region Iraq.

Materials and methods

This study was conducted in two different location Sharya and Doggata, the two villages located in, 36˚77'.71"N, 42˚98'.32"E, and 36˚64'.37"N, 43˚10'.65"E respectively, during the growing seasons 2019/2020 to study the effect of foliar fertilization for two types of local Barley white (Syria) and black (Iraq) well as studying their growth and yield performance under rainfed environments. Also four forms of fertilization: Control treatment without any treatments, soil fertilizer; DAP 18:46:0, Conventional NPK 120 kg. ha^{-1} + Urea at the sowing day= 72g/6 m^2. The second dose of N (Urea 46%) fertilizer applied at the tillering stage (30 $kg.ha^{-1}$ equivalent to 75g/unit ÷ 2= 37.5g/ unit, Foliar fertilizer (EcoZink) which sprayed at the beginning of tillering stage at the early March in a rate of 5000 $ml.ha^{-1}$, and both DAP plus Foliar fertilizer (at the setting stage) were suggested as the study factors with four replications. The study designed in split plot design.

The nearest stations to the study site the climate data were collected from the College of Agricultural Engineering Sciences meteorological station, for Sharya location, and for Doggata location data collected from Baeedra Agricultural Center (Table 1). The land was plowed prior sowing day by disc plow. Sowing date was at last week of November 2019. Physical and chemical analysis tests were carried out for the soil samples collected randomly from 30 cm depth in tow locations. All soil properties analysis was conducted at the University of Duhok, College of Agricultural Engineering Sciences, Central Laboratory (Table 1). Plot size was 6 m² (Six rows of 5 m long and 1.2 m width) which are matching the seeding rate of 120 $kg.ha^{-1}$ based on germination and weight of 1000 grains (seeds for each line were separated , 12 g to control the sowing process accurately). Distance between units was 0.5 m and 1m between replications.

Table 1. Meteorological data of the site of experiment

Growing season 2019/2020	Months	Rainfall (mm)		Soil characteristics			
		Sharya	Dogatta	Characteristics	Sharya	Doggata	Units
2019	Oct.	3	16.5	pH	8.01	7.91	------
2019	Nov.	30	5	N	130	80	mg.kg-1
2019	Dec.	107	133	P	6.13	5.66	mg.kg-1
2020	Jan.	89.5	94.5	K	4.8	6.8	mg.kg-1
2020	Feb.	76	104.5	OM (%)*	1.21	1.35	%
2020	Mar.	310	200	Sand	43.1	10.5	%
2020	Apr.	55	34	Silt	33.4	40.9	%
2020	May	16.5	8.5	Clay	23.5	48.6	%
Total Rainfall (mm)		**687**	**596**	Soil type (texture)	Loam	Silty Clay	

* OM, Organic material

Weeding was conducted manually when required. At the time of data measurements; ten guarded plants from one of the middle rows were measured and then the average per one plant was calculated. All possible growth and yield related traits were measured at time. The yield was harvested at the second week of June. The data collection on biomass, yield m^{-2}, 1000 seeds weight, number of head m^{-2}, spike length cm and plant height cm. The data analysis using SAS software according to split plots with randomize complete block design and the mean of treatment comparison using probability 0.01 and 0.05 levels.

Results and Discussion

The analysis variance indicated highly significant ($P < 0.01$) in number of head m^2 and plant height (cm) by effected by varieties, while the fertilizer effected significantly in above traits and leaf area(cm). For the other characters, the same table revealed non-significant effected among varieties and fertilizer levels and interaction between them (Table 2-A).

Table2-A. Analysis of variance for barley characters in Sharya location.

Dependent Variable:		Biomass gm		Yield gm.m^{-2}		1000 seed gm		Number of head M		Spike length cm		Plant hight cm		Leaf area cm^2	
Source	DF	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F
R	2	110259.38	0.192	957.22	0.703	17.972	0.060	8975.17	0.079	0.116	0.912	2.64	0.563	0.30	0.798
A	1	14259.38	0.629	1197.09	0.514	1.525	0.591	102835.04	<.0001	0.073	0.813	135.42	0.000	3.85	0.110
r(a)	2	20365.63	0.711	971.47	0.700	18.148	0.058	1635.17	0.576	0.247	0.823	2.55	0.574	0.08	0.942
B	3	128909.38	0.138	27435.20	0.001	9.599	0.180	77799.07	<.0001	1.371	0.387	168.98	<.0001	11.74	0.002
Ab	3	12609.38	0.882	7066.23	0.094	0.940	0.903	8692.40	0.069	0.490	0.760	2.53	0.641	0.72	0.655
Error	12	57975.00		2640.18		4.998		2831.36		1.246		4.39		1.29	
Corrected total	23														

In the table 2-B, the result exhibited that the varieties effect significantly in yield m^2, 1000 seed weight and plant height. While, the mean fertilizer levels effected significantly in yield m^{-2}, number of head , plant height and leaf area . However , their interaction was not significanton all other studies characters. The result indicated that there is significant difference between cultivars in number of head , plant height and yield m^{-2}. This is consistent with Lamiaa *et al*.,2019 ; Alrabaiee, 2019 and Al-Jubouri *et al*., 2017.

Table 3. Analysis of variance for barley characters in Sharya and Doggata location.

Dependent Variable:		Biomass gm		Yield gm.m^{-2}		1000 seed gm		Number of head M		Spike length Cm		Plant hight cm		Leaf area cm^2	
Source	DF	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F
L	1	33737887	<.0001	175450	<.0001	12.87	0.12	392951	<.0001	0.78	0.38	91.66	0.00	95.15	<.0001
r(l)	4	56705	0.26	689	0.91	13.03	0.06	5645	0.08	1.11	0.36	1.51	0.93	0.49	0.77
A	1	1900	0.83	13101	0.04	20.74	0.05	56925	<.0001	0.33	0.57	0.52	0.79	2.95	0.11
Al	1	15696	0.54	4294	0.23	7.88	0.22	46190	0.00	0.91	0.34	295.17	<.0001	1.12	0.32
r*a(l)	4	31391	0.55	1249	0.78	10.25	0.12	2130	0.48	0.25	0.90	9.21	0.30	0.21	0.94
B	3	143474	0.03	36104	<.0001	18.60	0.02	72548	<.0001	2.48	0.08	201.03	<.0001	14.49	<.0001
Ab	3	4378	0.95	6512	0.10	1.89	0.77	9876	0.02	0.13	0.94	0.74	0.96	0.77	0.56
Bl	3	27107	0.58	2320	0.50	0.20	0.99	18895	0.00	0.56	0.64	18.87	0.07	1.25	0.35
Abl	3	13199	0.81	1494	0.67	0.42	0.97	3648	0.23	0.48	0.69	3.51	0.69	0.14	0.94
Error	24	40424		2825		4.93		2387		0.97		7.15		1.09	
Corrected total	47														

Table2-B. Analysis of variance for barley characters in Doggata location.

Dependent Variable:		Biomass gm		Yield gm.m^{-2}		1000 seed gm		Number of head M		Spike length cm		Plant hight cm		Leaf area cm^2	
Source	DF	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F	Mean Square	Pr > F
R	2	3150	0.87	422	0.87	8.09	0.23	2316	0.34	2.11	0.08	0.38	0.96	0.68	0.49
A	1	3337	0.71	16198	0.04	27.09	0.04	280	0.71	1.16	0.22	160.27	0.00	0.22	0.63
r(a)	2	42417	0.20	1527	0.61	2.34	0.63	2625	0.30	0.26	0.69	15.87	0.24	0.33	0.70
B	3	41671	0.20	10989	0.04	9.20	0.19	13644	0.01	1.66	0.12	50.93	0.02	4.00	0.03
Ab	3	4968	0.88	940	0.82	1.37	0.84	4831	0.11	0.12	0.91	1.72	0.91	0.20	0.88
Error	12	22873		3010		4.87		1943		0.69		9.92		0.90	
Corrected total	23														

The data in Table 3 represented the analysis of variance for barley characters in both location (Sharya and Doggata). The location was significantly effected in biomass, grain yield , number of head m^{-2} , plant height and leaf area cm^2, their the location was not significant in other characters. Regarding to barley varieties , the result in the same table exhibition non-significant effected on all characters exception 1000 seeds weight and number of head m^{-2}, while the fertilizers levels showed significant effected for all studies characters except spike length. Concerning to interaction between varieties and fertilizer levels, the result indicated that all characters appear not significant effect except the number of head m^{-2}. For interaction between fertilizer and location the results showed in Table 2, the number of head was effected by their interaction , while the rest characters were not affected significantly by this interaction. Also the interaction between varieties X locations and foliar Ecozink were not affected significantly on all characters

. From the results above, the role of varieties, fertilizer types and locations individually effected

Table4. Effect of interaction between types of barley and fertilizers levels on mean of some barely characters in Sharya location.

Types of Barley	Fertilizers levels	Biomass gm	yield gm.m^{-2}	1000 seed gm	number of head.m^{-2}	Spike length cm	plant hight cm	leaf area cm^2
BB	Control	941.7a	279.17cd	41.33a	455c	5.47a	71.333e	7.66c
	Dab	1056.7a	344.17abc	43.67a	676.33a	6.89a	77.89cd	9.68abc
	Dab +Foliar	1175a	365.67abc	44.67a	697.67a	7.05a	84.33b	10.37ab
	Foliar	966.7a	328 bcd	42.93a	468c	6.94a	76.89cd	8.54bc
WB	Control	965a	231.83d	42.67a	402.5cd	6.2a	75.78d	7.51c
	Dab	1150a	421ab	44.62a	580b	6.35a	84.56b	10.73ab
	Dab +Foliar	1320a	435.83a	44.83a	467.5c	6.72a	88.33a	11.21a
	Foliar	900a	284.83cd	42.5 a	323.33d	6.63a	80.77bc	10.02ab

in the studied characters. While the interaction less role effected compare with individually factors. Similar result was reported by Asal, *et al*., 2028, Getachew, *et al*., 2014 and Dejen and lemlem, 2012. Biomass, grain yield, 1000 seeds weight, number of head m^{-2}, plant height cm and leaf area cm^2 of two varieties of barley in location Sharya are indicated in table 4. For biomass the Black barley recorded the highest value 1175 g under Dab+ biofertilizer, while the lowest value obtained 941 g by control treatment , also the White barley gave the maximum value (1320 g) at Dab + foliar fertilizer and minimum value (900 g) obtained by foliar fertilization. Concerning to the yield , the results in the same table exhibited that the mean yield of Black barley was effect by application Dab and foliar Ecozink and gave the highest value (365.67 g) and the same dose recorded the highest value (435.83 g). From the data above the combine application of Dab and foliar Ecozink increased the biomass and grain yield . For 1000 seed weight the combination Dap and foliar Ecozink gave the batter 1000 seed weight and recorded 44.667g for Black barley and 44.83 g for White barley increasing 8% and 5% compare with control treatment, respectively

The number of head m^{-2} the maximum value exhibited by Black barley (697.67) and (580) for White barley at application combine Dap + foliar Ecozink , also for spike length and plant height the Black barley gave the maximum value for these traits (7.046 and 84.33 and White barley recorded 6.72 and 88.33) at application of Dap + foliar Ecozink. The leaf area cm^2 increased by application of combine foliar Ecozink and Dap, the Black barley obtained (10.37cm^2) and White barley recorded the highest value (11.20 cm^2) respectively.

The data in Table 5 exhibited that the interactions between the fertilizer and varieties were not significant in Doggata location, but it caused a small increase in biomass, grain yield, 1000 seed weight, spike length and leaf area, except number of head m^{-2}, Keram *et al* 2012 indicated that the wheat yield was increase by application Zink and Dap fertilizers. Also the results indicated that, White barley outperformed Black barley in all studied characters. The treatment (Dap + foliar Ecozink) is superior in all characters and recorded 2800.7, 284.67, 47, 7.17, 83.77 and 7.41 for biomass, grain yield, 1000 seed weight, spike length , plant height and leaf area, respectively. Similar, Alrubaiee, 2019, Mousavi *et al*., 2013, also reported that the application of integrated fertilizers gave the highest nutrients.

Table 5. Effect of interaction between types of barley and fertilizers levels on mean of some barely characters in Doggata locations.

Types of Barley	Fertilizers levels	Biomass gm	yield gm.m^{-2}	1000 seed gm	number of head.m^{-2}	Spike length cm	plant hight cm	leaf area cm^2
BB	Control	2665a	141.83b	42.33b	283.33cd	5.69a	82.29abc	5.63ab
	Dab	2776.7a	200.83ab	43.33ab	311.67bcd	6.26a	87.23ab	6.96ab
	Dab +Foliar	2840a	220ab	44.83ab	405 a	6.51a	87.93a	6.97ab
	Foliar	2710a	195ab	43ab	325 abcd	5.78a	83.89abc	6.65ab
WB	Control	2580a	171.67ab	44.33ab	263.33d	5.85a	76.11d	5.28b
	Dab	2753.3a	281.83a	46.67ab	388.33ab	6.96a	81.22bcd	7.32a
	Dab +Foliar	2800.7a	284.67a	47 a	358.33abc	7.18a	83.78bcd	7.42a
	Foliar	2763.3a	227.33ab	44 ab	287.67cd	6 a	79.56cd	6.95ab

From the result in Table 6 , the interaction between Dap and foliar Ecozink and white barley recorded high values in biomass (2060.3g), grain yield (360.25g) , 1000seed weight (45.91g), spike length (6.94cm), plant height (86.05cm) and leaf area (9.31cm2) except the number of head m^{-2}, while the interaction between Black barley and Dap+ foliar Ecozink the highest value in the number of head m2. This means that there a high response the White barley to combine fertilizers (Dap + foliar Ecozink) in two locations compare with Black barley. This result were agreement with finding of AL-Jobouri *et al*.,2017, Mousavi *et al*., 2013, Chakrawary *et al*., 2009 , and Kinaci, G. and E. Kinaci 2005.

Table 6. Effect of types of barley and different fertilizers levels on mean of some barely characters in two locations.

Types of Barley	Fertilizers Levels	Biomass gm	yield gm.m^{-2}	1000 seed gm	number of head.m^{-2}	Spike length cm	plant hight cm	leaf area cm^2
BB	Control	1803.3ab	210.5de	41.83b	369.17cd	5.58b	76.82c	6.64c
	Dab	1916.7ab	272.5dc	43.5ab	494ab	6.57ab	82.56b	8.32ab
	Dab +Foliar	2007.5ab	292.83bc	44.75ab	551.33a	6.76ab	86.13a	8.67ab
	Foliar	1838.3ab	261.5cde	42.97ab	396.5c	6.36ab	80.39b	7.6bc
WB	Control	1772.5b	201.75e	43.5ab	332.92de	6.03ab	75.95c	6.39c
	Dab	1951.7ab	351.42ab	45.64a	484.17b	6.66ab	82.89ab	9.03a
	Dab +Foliar	2060.3a	360.25a	45.92a	412.92c	6.95a	86.06a	9.31a
	Foliar	1831.7ab	256.08cde	43.25ab	305.5e	6.32ab	80.167b	8.49ab

Notes from Table 7, there are many differences in the effect of overlap between fertilization treatments and locations. In the first location the treatment (Dap+ foliar Ecozink) was superior in grain yield, number of head m^{-2}, spike length cm , while the Dap treatment was superior in biomass. In second location , the control treatment gave highest value in spike length (6.88cm), plant height (86.33cm) and leaf area (10.78cm^2), from the results, the zink is important for enzyme activation as proteinase and dehydrogenase as well as enhancing of growth characteristics in wheat (Ortiz-Monasterio *et al*, 2002), while , the foliar Ecozink treatment in the same location gave high value in 1000 seed weight and the foliar Ecozink exhibited the maximum value 2736.7g in biomass. It appears from the above table that the fertilization treatments showed different results in the studied characters by the difference of location. These results are in confirmation with those (Mitiku *et al*., 2014; Tariku, 2016 and Asal *et al*.,2018). Who reported highly influence of location and genotypes of barley effect on yield and some growth parameters.

Table 7. Effect of interaction between locations and fertilizers levels on mean of some barely characters .

Location	Fertilizers levels	Biomass gm	yield gm.m^{-2}	1000 seed gm	number of head.m^{-2}	Spike length cm	plant hight cm	leaf area cm^2
L1	Control	953.3c	255.5bc	42b	428.75b	5.83a	73.56c	7.58c
	Dab	2622.5a	156.75d	43.33ab	273.33e	5.77a	79.2c	5.45d
	Dab +Foliar	1103.3bc	382.58a	44.14ab	628.17a	6.62a	81.22bc	10.20ab
	Foliar	2765a	241.33bc	45ab	350cd	6.61a	84.22ab	7.14c
L2	Control	1247.5b	400.75a	44.75ab	582.58a	6.88a	86.33a	10.79a
	Dab	2820.3a	252.33bc	45.92a	381.67bc	6.84a	85.86a	7.20c
	Dab +Foliar	933.3c	306.42b	42.72ab	395.67bc	6.79a	78.83c	9.28b
	Foliar	2736.7a	211.17cd	43.5ab	306.33de	5.89a	81.72bc	6.80c

The results in Table 8, represented the effect of interaction between location x varieties and foliar Ecozink levels on different studies characters. For biomass in Sharya location, the foliar Ecozink gave the highest value (2776.79g) with Black barley, while the same fertilizers record (2710g) with White barley. Also in Doggata location the same fertilizer (foliar Ecozink) recorded the maximum value with White barley (2763.3g), while the same dose of foliar Ecozink exhibited the minimum value (2753.3g) with Black barley. The result in table 8, showed that the foliar Ecozink and Dap gave the highest value for grain yield (344.179g) at Sharya location where are the biofertilizer recorded the lowest value with (195g) with White barley. In the Doggata location the same fertilizer recorded the highest value (421g) with Black barley but the control treatment in the same location gave highest value (435.89g) with White barley. Combined mean over location of number of head m^{-2}, spike length and leaf area cm^{-2} in the control treatment obtained the highest value (697.67, 7.04 and 10.37) respectively with White barley , also the Dap treatment recorded the maximum value for 1000seed weight (44.83g) and plant height (87.93cm)with White barley. Table 8. Effect of interaction between location, barley varieties and fertilizers levels on mean of some barely characters

Location	Types of Barley	Fertilizers levels	Biomass gm	yield gm.m^{-2}	1000 seed gm	number of head.m^{-2}	Spike length cm	plant hight cm	leaf area cm^2
l1	BB	Control	941.7bc	279.17cde	41.33c	455c	5.47a	71.33g	7.66c
		Dab	2665a	141.83f	42.33bc	283.33ef	5.69a	82.29bcd	5.62de
		Dab + Foliar	1056.7bc	344.17abc	43.67abc	676.33a	6.89a	77.89def	9.68ab
		Foliar	2776.7a	200.83ef	43.33abc	311.67def	6.26a	87.22ab	6.96cde
	WB	Control	1175bc	365.67abc	44.67abc	697.67a	7.05a	84.33abc	10.37ab
		Dab	2840a	220ef	44.83abc	405dc	6.50a	87.93a	6.97cde
		Dab + Foliar	966.7bc	328bcd	42.93abc	468c	6.94a	76.88ef	8.54bc
		Foliar	2710a	195ef	43abc	325def	5.78a	83.89abc	6.65cde
l2	BB	Control	965bc	231.83edf	42.67abc	402.5cd	6.2a	75.78fg	7.5cd
		Dab	2580a	171.67f	44.33abc	263.33f	5.85a	76.11f	5.28e
		Dab + Foliar	1150bc	421ab	44.62abc	580b	6.35a	84.55abc	10.7267a
		Foliar	2753.3a	281.83ced	46.667ab	388.33cd	6.96a	81.22cde	7.32cd
	WB	Control	1320b	435.83a	44.833abc	467.5c	6.72a	88.33a	11.20a
		Dab	2800.7a	284.67ced	47a	358.33ed	7.18a	83.77abc	7.42cd
		Dab + Foliar	900c	284.83ced	42.5bc	323.33def	6.63a	80.77cdef	10.02ab
		Foliar	2763.3a	227.33def	44abc	287.67ef	6a	79.55cdef	6.95cde

In Doggata location the control treatment was superior in grain yield, plant height, leaf area and recorded (435.89g), (88.33g) and (11.20 cm^2) respectively with White barley. While the Black barley gave the highest value for spike length (6.95 cm) with foliar Ecozink and (580.0) in number of head m^{-2} with Dap + foliar Ecozink. The White barley exhibited the maximum values in biomass (2800g) and 1000 seed weight (47g) with Dap fertilizer. From the data in table 8, the results was differ from Sharya and Doggata location and the control treatment was superior in the most studies characters with White barley specially in Doggata location. Similar findings related to high variability of to genotypes for most studies characters has reported by Lamiaa *et al*., 2019; Tolera *et al*., 2018; Asal *et al*., 2018 and Tariku, 2016.

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