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Response of Bread Wheat Yield and Quality to Source of N Fertilizers

Abdalkader B.S. Al-Fahdawi and Ahmed R.M. Al-Rawi

Department of Field Crops, College of Agriculture, University of Anbar, Iraq
E-mail: abdalqaderbasim@gmail.com

Abstract: An experiment was carried out through 2019.-2020 on farmer field in Eastern Husaiba, near Habaniya, Anbar governorate. The objectives were, to test field performance, and quality of five bread wheat (Sham6, Ibaa99, Bora, Buhooth22 and Abu-Gharib3) in response to source of nitrogen fertilizers. These cultivars were fertilized by three sources of N (glutamic acid, humic acid, and urea). Results showed significant differences among cultivars in most traits studied, Sham6 recorded higher grain/spike (52.2), grain yield (6.46 t/ha), and total dry biomass (18.2t/ha). Buhooth22 gave better wet protein (35.78%) and gluten (15.45%). Bora cv. gave higher gluten index (74.7%). Humic acid gave higher grain/spark (45.6), yield (6.7 t/ha), biologically biomass (17.7t/ha), wet gluten (35.8%) and gluten (14.35%). Interactions between cultivars and N source were significant. Sham6 were gave higher values of grain yield and total biological masses.

Keywords: *Triticum aestivum* L., Urea, Glutamic acid, Humic acid

Bread wheat (*Triticum aestivum* L.) belongs to poaceae, and it is the most important staple crop in the world. Wheat is one of the important crops which grown in world. More than 3 million hectares are cultivated with wheat in 2019 (Central Statistics Iraq 2019). Most of wheat cultivars developed and released in Iraq in last years are of low quality. Iraqi bread counts mainly on gluten quality and percent (Al-Gilawi 2017). Besides that, soil and crop management practices are also very important to have good quality bread wheat. There should be a complete package on cultivars, fertilizers, seed seeding, water management and weed management to have good quality and higher grain yields. Nitrogen is the most important element for wheat productivity and quality, but it should be added in adequate quantities and time through growth stages. Urea is the most used sources of N fertilizer used in Iraq. Humic matter is also important role in wheat growth and nutrition, beside its union with some minerals, and that improves soil fertility, enzymatic activity and cell division. Amino acids use hare been more common on crop production such as glutamic acid. It is being sprayed on plants at different growth stages. Amino acids found improve growth, biological activities, and keep pH of cells stable and enhance photosynthesis, which leads to higher growth and grain yield. Amino acids are a good source of N that plants can. Objective the study is identifying the response of wheat varieties to sources of nitrogen fertilizers and their reflection on growth, productivity and quality characteristics.

MATERIAL AND METHODS

A field experiment was undertaken during 2019-2020 on a farmer field in Eastern Husaiba, near Habaniya, Anbar governorate situated at Euphrates River. The location is of 43º longitudes and 33º latitude of a silty clay loam soil (Table 1). The objectives were of evaluate the response of five bread wheat cultivars; Sham6, Iba99, Bora, Buhooth22, and Abu-Gharib 3 grown under three sources of N, glutamic and humid acids, and urea. A split- plot arrangement with RCBD with three replicate. N source were the main plots and cultivars the subplots. Soil management practices were done, and the area divided into plots 2×2 m. Each plot contains 9 rows of 20cm. One meter was left between plots. Sowing was done on November 23, 2019 with seed rate of 120kg/ha.

Soil of experiment was fertilizers with 100kg/ha of triple superphosphate (19% P) mixed with soil before planting. Urea (46%N) was used in a rate of 200kg/ha which is equivalent to about one fourth of recommended N for this crop, added after 20 day of planting. Glutamic acid (1g/l) for each plot was added two times. Humic acid (99% humic acid and 1% folaphic acid) was sprayed with an average of 6.4g per plot. Granules of humic acid were dissolved in distilled water and sprayed one day after sowing. The solutions added to irrigation water, each time with half the recommended dose twice, 60g/each plot, 40g first application, and 20g is second application. The yield of Abu-Gharib and Buhooth22 were harvested in April 24, while shame 6 and Iba 99 in March 30, and Bora in May10.

At time of harvest, one square mater from each plot was harvest from cultivars rows. Traits studied were: Grain/spike: 10 spikes were hand threshed and counted. Grain yields (t/ha): grain weight of one sparred matter was matter lied by and area to have grain yield (kg/ha). Dry biological yield: obtained from total weight of grains and straw in one squared meter then converted to t/ha. Grain obtained on all cultivars is tested for humidity, water added to make grains reach 14% moisture, then left for 24 hrs. Grain then milled by an Erkaya mill in Baghdad. Flour obtained with 80% extracted flour to have the following tests: Wet gluten%: determined according to AACC (2000), by using Glutamic gluten index (gms) then converted into percentages as follow: wet gluten%= sample weight/10 flour wheat ×100. Dry gluten%: calculated by drying wet gluten in Glutork (2020), for 4 minutes of 105 ̊c, weighed and multiplied ×100: Dry gluten %= dry gluten weight /wet gluten weight ×100. Gluten index %: Gluten index centrifuges was used to separate gluten into poor gluten and strong gluten, both weighed and the following calculations was undertaken: Gluten index %= (wet gluten weight – poor gluten weight)/wet gluten weight×100. All obtained results were collected, tabulated, and statistically analyzed according to doing used. Means of treatment were compared by using LSD at =5%.

Table 1. Some physical and chemical properties of experiment soil

Character		Value	Unit
pH	Soil	7.5	---
(EC)	Soil	3.85	ds/m
	Water	1.5	
Available N		28	PPM
Available P		14	PPM
Available K		121	PPM
Organic matter		1.42	%
Texture		Silt clay soil	--
Sand		6.3	%
Silt		52.4	%
Clay		41.3	%

RESULTS AND DISCUSSION

Grain spike: Shame 6 cv. gave the higher grain number per spike (52.50 grain/spike), whereas, Bora cv., gave the lower value (36.87 grain/spike). This could be attributed to the genetic make-up ability of sham6 CV. It is also clear that sources of N were also different (Table 2). Humic acid gave the higher value (45.56 grain/spike), while glutamic acid treatment gave the lower (40.30 grain/spike). This could be explained by the role of organic fertilizer to enhance photosynthesis efficiency, the high fertility in the spike. Besides that, humic acid has ability in raise nutrients absorption that will raise fertility (Khalaf et al 2017). On the other hand, interactions were also significant. Shame6 fertilizer with humic acid gave higher value (54.27 grain/spike), while Bora cv. treat with glutamic gave the lover (33.83 grain/spike).

Grain yield (t/ha): The cultivars Sham6 significantly produced higher grain yields (6.86 t/ha) than other cultivars (Table 3), while Buhooth22 produced the least (5.54 t/ha). The higher grain of Shame6 was due to higher grain number/spike. Besides that, efficiency of photosynthesis and conversion metabolites to the grain is a traits related to spike grain number. On the other hand, N source were also different in grain yields of unit area. Urea fertilization gave higher grain yield (6.795 t/ha) while glutamic gave the least (5.854 t/ha). This result is in agreement with those of Salam et al (2019) and Souissi et al (2020). The significant indexation reported in lading higher value of Shame6 when fertilized by urea (7.183 t/ha). Other values were less than that of Shame6.

Biological yield: Shame6 gave the higher value (18.2 t/ha) with an increase of 82.4% than that of Buhooth22 which gave (1487 t/ha). The good growth of Shame6 plants and its efficiency in photosynthesis and converting metabolites into grain was the reason behind that (Al-Azawi et al 2018). Meanwhile, N sources were different in biological biomass and Shame6 fertilizers with user produced the higher values (19.49 t/ha), while user source gave higher value (17.7 t/ha)

Table 2. Grain number / spike of breed wheat cultivars as affected by sources of N

N sources	Cultivars (cv.)					Mean
	Abu-Gharib3	Buhooth22	Bora	Sham6	Ibaa99	
Glutamic	39.90	35.87	33.83	50.87	41.17	40.33
Humic	46.40	44.00	40.00	54.27	43.13	45.56
Urea	41.97	45.43	36.77	52.43	39.30	43.18
Mean	42.76	41.77	36.87	52.52	41.20	
LSD (p=0.05)	cv.	N	cv. × N			
	1.73	2.77	3.42			

as compared to other two sources.

Wet gluten (%): Buhooth22 in this traits gave 35.78% with an increase of 13.04% as compared to Bora cv. which gave the least value. Urea gave higher value as compared to other two sources (35.82 %). This could be explained by the high content of N which increased amino acids in the plants which head to higher protein. This is in agreement with that obtained by Siddique et al (2017) and Litke et al (2018).

Dry gluten (%): Buhooth22 gave the higher percent of dry gluten (15.45%). This high values looks like negatively correlated with total grain yields of cultivars. It is different to have a bread wheat cultivar of high grain yields coincided

Table 3. Grain yield (t/ha) of breed wheat cultivars as affected by sources of N

N sources	Cultivars (cv.)					Mean
	Abu-Gharib3	Buhooth22	Bora	Sham6	Ibaa99	
Glutamic	5.632	5.065	6.347	6.422	5.801	5.854
Humic	5.494	5.571	6.913	6.781	6.816	6.315
Urea	7.183	5.989	6.478	7.391	6.936	6.795
Mean	6.10	5.54	6.58	6.86	6.51	
LSD (p=0.05)	cv.	N		cv. × N		
	0.40	0.45		0.71		

Table 4. Biological yield (t/ha) of breed wheat cultivars as affected by sources of N

N sources	Cultivars (cv.)					Mean
	Abu-Gharib3	Buhooth22	Bora	Sham6	Ibaa99	
Glutamic	15.17	13.82	14.84	17.22	15.82	15.38
Humic	14.62	15.09	17.29	17.89	17.17	16.41
Urea	18.62	15.69	16.34	19.49	18.37	17.70
Mean	16.14	14.87	16.16	18.20	17.12	
LSD (p=0.05)	cv.	N		cv. × N		
	1.17	1.82		2.29		

Table 6. Dry gluten (%) as influenced by breed wheat cultivars and N sources

N sources	Cultivars (cv.)					Mean
	Abu-Gharib3	Buhooth22	Bora	Sham6	Ibaa99	
Glutamic	13.66	14.23	10.37	12.48	11.65	12.48
Humic	14.34	14.78	11.03	12.97	12.44	13.11
Urea	16.09	17.33	11.70	13.81	12.72	14.33
Mean	14.70	15.45	11.03	13.09	12.27	
LSD (p=0.05)	cv.	N		cv. × N		
	0.32	0.69		0.75		

Table 5. Wet gluten (%) as influenced by breed wheat cultivars and N sources

N sources	Cultivars (cv.)					Mean
	Abu-Gharib3	Buhooth22	Bora	Sham6	Ibaa99	
Glutamic	32.77	33.41	29.81	32.03	31.56	31.92
Humic	35.06	34.8	31.21	33.05	31.8	33.18
Urea	36.97	39.11	33.93	35.24	33.82	35.82
Mean	34.93	35.78	31.65	33.44	32.39	
LSD (p=0.05)	cv.	N		cv. x N		
	0.75	1.09		NS		

Table 7. Gluten index as influenced by breed wheat cultivars and N sources

N sources	Cultivars (cv.)					Mean
	Abu-Gharib3	Buhooth22	Bora	Sham6	Ibaa99	
Glutamic	60.37	50.45	78.6	64.74	49.51	60.74
Humic	57.66	47.94	73.59	62.88	47.08	57.83
Urea	53.69	45.43	71.89	60.41	42.55	54.79
Mean	57.24	47.94	74.70	62.68	46.38	
LSD (p=0.05)	cv.	N		cv. × N		
	2.58	3.98		N.S		

with high gluten percent for the negative correlation. The high results of dry gluten are counting on wet gluten. This is in agreement with results obtained by Siddiq et al (2017). Urea fertilization gave higher value of dry gluten and this could be related with wet gluten as reported by Siddiq et al (2017). The significant interactions of genotype × N sources showed significant value of dry gluten % of Buhooth22 fertilized with urea (17.33%).

Gluten index: The bread wheat cultivars treated with three sources of N fertilizers in the trait of gluten index. Bora cv. gave the best higher value of this trait. The gluten in negative correlated with high grain yield. However, breeders tried to break this linkage. There are many high yield and high gluten bread wheat cultivars grown in the world. Gluten indices are positively related with high values of each of wet-and-dry gluten percentage. This results has been reported also by El-Bassiomy (2005). The gluten acid gave higher value of gluten index (60.74%) compared to lower value of each of urea and humic acid (Table 7). Spraying or adding amino acids on plants at time of antigens increases the percent of protein and gluten (Mokalef 2019).

CONCLUSION

The most cultivars of many crops differ in many metabolism pathways, leading to significant differences in growth, yield and quality. Bread wheat cultivars used in the study showed significant differences in growth, grain yield biological dry yield, and grain gluten (%). The results showed a clear negative correlation between grain yields cultivars and gluten percent. Nitrogen sources showed significant effects on cultivars studied traits, including growth, yield and grain quality. This implies that crop management practices can enhance some important traits so will.

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