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Performance of Two Bread Wheat Varieties Under Different Planting Methods

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Abstract

Two field experiments were carried out in the Research Farm at Al-Kawthar, Faculty of Agriculture, Sohag University, in two successive seasons of 2014/2015 and 2015/2016 to compare productivity of Giza 168 and Sids 12 wheat varieties under different planting methods (Afir broadcast, Afir drill and Afir in furrows) on yield and its components. A randomized complete block design (RCBD) in split- plot with four replications was used. Data indicated that the planting methods and varieties had significantly effect on the all studied traits; plant height (cm), spike length (cm), number of spikes/m^2, 1000-grain weight (g), grain yield (ard./fed.), Protein (%) in the both seasons. The biological yield (ton/fed.) had non-significant effect in the second season. Sids 12 variety produced the highest values of spike length, spikes/m^2, 1000-grain weight, grain yield/fed., biological yield/fed. and Protein (%), while Giza 168 produced the tallest plants. Afir drill method increased significantly number of spikes/m^2, 1000-grain weight, grain yield (ardab/fed.) and biological yield (ton/fed.), while Afir broadcast method increased plant height (cm) and Protein (%). The highest grain yield (20.16 ard./fed.) was obtained by Sids 12 variety under Afir drill method.

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Keywords:

Wheat,

Planting methods

Afir broadcast,

Afir drill and Afir in furrows

INTRODUCTION

Wheat (***Triticum aestivum*** **L**.) is one of the most important food grain crop grown in the world. It ranks the first in the world cereal crops accounting for 30% of all cereal food worldwide. It provides about 20% of the total food calories for the human race **(Reddy 2004**). In Egypt,

wheat is the main winter cereal crop and it is widely distributed all over the country. The cultivated area* (3.47 million feddans in 2014/2015 season with an average grain yield of 18.46 ard./fed). Although, there was a good progress towards increasing the total wheat yield in Egypt in last years, still there is a big gab between the consumption and local production (32 %). The local production is about 9.61 million tons. Planting method plays an important role in the wheat plants competition with the weed species, which ultimately affects crop growth. The suitable planting method for wheat is dependant upon the time of planting, availability of soil water at planting time, amount of residue in the field and availability of planting machine (**Sikander *et al*., 2003**). **Abbas *et al*. (2009)** revealed that the best plant height was obtained in drill planting with 30 and 22.5 cm rows. However, number of spikelets and number of grains/ spike were statistically similar in broadcasting and drilling at 22.5 cm apart rows. Similar 1000-grain weight was recorded in drill sowing at 30, 22.5 cm and broadcasting. **Bashir *et al*. (2014)** reported that the wheat sown by drilling method showed remarkably superior performance with 17.08 spikelets spike^{-1}, 39.25 grains spike^{-1}, 16.16 g grain weight spike^{-1}, 8653.40 kg ha^{-1} biological yield and 4232.90 kg ha^{-1} grain yield.

The yield potential of wheat can be defined as the total biomass produced or the agricultural important part of the wheat (i.e. grain yield). The total biomass is a result of the integration of metabolic reaction of plant. Consequently, any factor influencing the metabolic activity of the plant at any period of the growth can affect the yield. Metabolic processes in wheat plant are greatly governed by both internal, i.e. genetic make up of the plant and external conditions which involve two main factors namely climatic and environmental factors. So, this present study aimed to

investigate the effects of three planting methods (Afir broadcast, Afir drill and Afir in furrows) on yield and its component of Giza 168 and Sids 12 wheat varieties.

Materials and Methods

Two field experiments were carried out in the Research Farm at Al-Kawthar, Faculty of Agriculture, Sohag University, in two successive seasons of 2014/215 and 2015/2016 to investigate the effect of planting methods on two bread wheat productivity varieties. A randomized complete block design (RCBD) in split-plot with four replications was used. The treatments were arranged as following: 1) three planting methods were placed in the main plots: Afir broadcast: Soil was plowed twice then grains were broadcasting and compacting was done before irrigation, Afir drill: Soil was plowed twice then wheat grains were hand drilled in rows 20 cm apart, then irrigation was followed and Afir in furrows method with 60 cm apart ridges planting on double row sloping bed and the top of the ridge, 2) two varieties (Giza 168 and Sids 12) were fixed in the sub-plots with plot area 10.5 m^2 (3.5 m length x 3.0 m width).

Seeding rate was used as recommended (60 kg/fed.). In this study, sowing date was on 29th November and 1st December in the first and second seasons, respectively.

Soil of the experiment was sandy-clay texture, with pH 7.6, electrical conductivity 0.60 dS m^{-1}, total nitrogen 1.68 gm/kg and organic matter 2.61%. The other agriculture practices were carried out as recommended.

Data recorded:

At harvest: a sample of ten plants was randomly chosen from each plot in three replicates to measure plant height and spike length, as well as number of spikes/m^2 were recorded from one square meter. Biological and grain yields per feddan were recorded by weighing all above ground dry mater of each plot, then grain separating and weighing in kilograms and

converted into ton and ard. per fed., respectively.

Protein percentage: Protein determination as carried out by the improved Kjeldhal method of **A.O.A.C (1990)** which modified by distilling the ammonia into sataroted boric solution and titration was carried out by using standard acid (hydrocloric acid). Protein percentage was calculated by multiplying the total nitrogen in wheat meal × 5.75.

Statistical analysis:-

The data was statistically analyzed each season separately by Proc GLM procedure (**SAS** version 9.1, SAS Institute 2003) as well as the least significant differences (LSD) among the factor means and their interactions at probability level at 5% .

Results and discussion

Main effect:

Data in Table (1) revealed that the planting methods and varieties had significantly effect on the all studied traits i.e. plant height (cm), spike length (cm), number of spikes/m^2, 1000-grain weight (g), grain yield (ard./fed.), protein (%) except biological yield (ton/fed.) had non-significant effect in the second season only.

1- Effect of planting methods:

The results in Table (1) indicated that the tallest plants (85.49 and 85.82 cm) were obtained by Afir broadcast method, while the longest spikes (11.84 and 12.29 cm) were resulted from Afir in furrows method in the 1st and 2nd seasons, respectively. Moreover, the maximum values of number of spikes/m^2 (369.88 and 413.25), 1000-grain weight (45.20 and 46.70 g), grain yield (19.03 and 20.02 ardab/fed.) and biological yield (5.90 and 6.22 ton/fed.) were obtained by drill method in the 1st and 2nd seasons, respectively. As well as protein (%) (11.83 and 12.31) were obtained by Afir broadcast method in the 1st seasons and the 2nd seasons, respectively. Here the results indicated that the drill method is the best planting method, since it had

superior over the other two planting methods (broadcast and in furrows). **Partley (1980)** noticed that broadcasting is generally inferior to placement of the seed in the soil, largely, because the conditions are less conductive to good germinations and establishment, with seedlings at greater risk of desiccation. The same conclusion was reported by **Anaam (2003), Abd El-Hamid (2004), El-Afandy (2006)**, **Seadh, and Badawi (2006), Ismail *et al*. (2008), Abbas *et al*.(2009) and Bashir *et al*.(2014)**.

2- Effect of varieties:

The results in Table (1) showed that the tallest plants (83.68 and 85.23 cm) were achieved by Giza 168 variety in the 1st and 2nd seasons, respectively. Moreover, the longest spikes (11.41and 11.90 cm), the maximum values of number of spikes/m^2 (361.75 and 405.00), 1000-grain weight (44.31and 45.82 g), grain yield (18.18 and 19.16 ard./fed.) and biological yield (5.34 and 6.12 ton/fed) were exhibited by Sids 12 variety in the 1st and 2nd seasons, respectively. The results mean that the Sids 12 variety was the effective variety for achieving the maximum values of the all studied traits except the plant height. The difference between varieties could be attributed to the genetic make up. These results are in harmony with those obtained by **Abouziena *et al*. (2008) and Mason *et al*., (2008).**

Interaction effect:

Planting methods x Varieties (PxV) interaction:

Data in Table (2) showed that the all studied traits had a highly significantly affected by PxV interaction in the both seasons, except spike length (cm) and biological yield (ton/fed.) in both seasons and 1000-grain weight (g) in the 2nd season.

The results decleared that the tallest plants (86.03 and 86.60 cm) were achieved by P_1xV_1 in the both seasons (Table 2 and Fig. & 2) as well as the longest spikes (12.05 and 12.53 cm) were obtained by P_3xV_2 interaction treatments in the 1st and 2nd seasons, respectively. Moreover,

the maximum values of number of spikes/m^2 (373.75 and 416.75), 1000 grain weight (45.45 and 46.90 g) and grain yield/fed. (19.88 and 20.16 ard.) were realized by P_2 xV_2 and P_2 xV_1 in the both seasons (Table 1 and Figs. 1 & 2). As well as, the maximum values of protein % (12.13**,** 12.70) were achieved by P_1xV_2 in the both seasons. On the other hand, the shortest plants and spikes (76.50 and 78.55 cm) and (10.38 and 11.05 cm) were obtained by P_3xV_2 and P_1xV_1 interaction treatments in the 1st and 2nd seasons, respectively. This results mean that the Sids 12 variety under drill method gave the highest values, while the Giza 168 variety under broadcast method gave the lowest values. Hence, the results may be due to the genetic variation between varieties under various planting methods, reflecting weather climatic conditions. Similar findings are stated by **Soomro *et al*. (2009), Rahman *et al*. (2010) and Alam (2012)**.

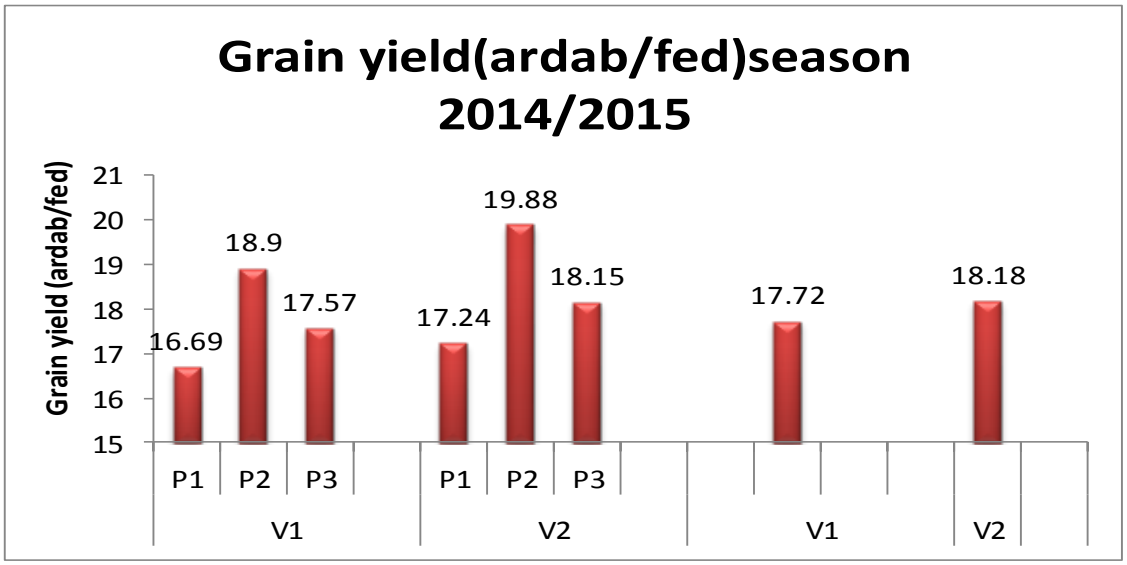

Figure (1): Grain yield (ardab/fed) for Giza 168 and sids 12 varieties under three planting methods in 2014/2015.

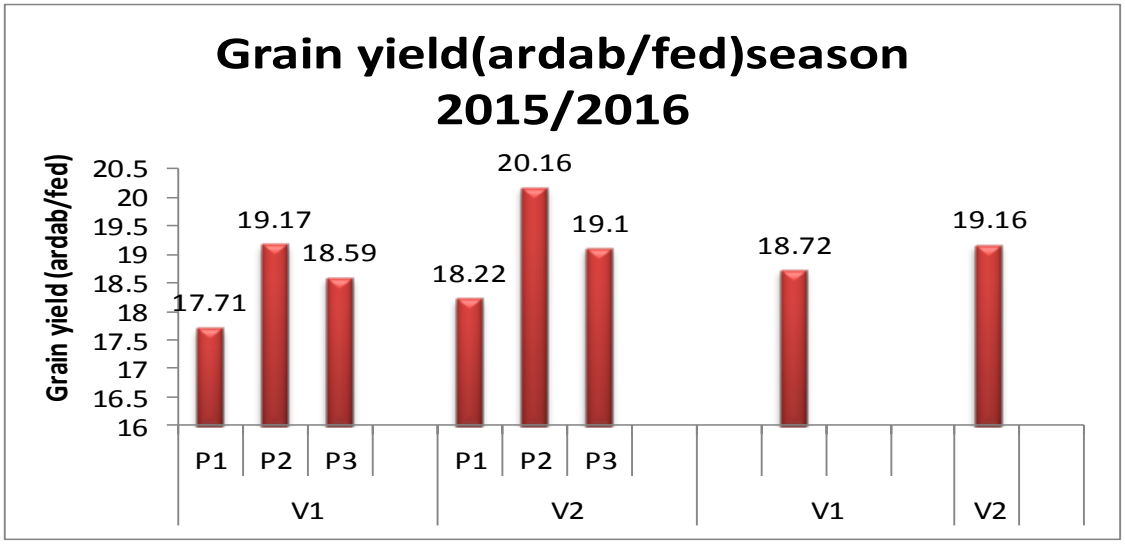

Figure (2): Grain yield (ardab/fed) for Giza 168 and sids 12 varieties under three planting methods in 2015/2016.

Table (1): The main effects of planting methods and varieties on plant height (cm), yield and its components in 2014/2015 and 2015/2016 seasons.

Characters / Treatments		Plant height (cm)		Spike length (cm)		Number of spikes/m^2		1000-grain weight (g)		Grain yield (ard./fed)		Biological yield (ton/fed)		Protein (%)	
		2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016
Planting methods	**p_1**	85.49	85.82	10.68	11.25	342.75	386.00	42.93	44.64	16.96	17.96	5.18	5.46	11.83	12.31
	p_2	81.20	84.23	10.88	11.41	369.88	413.25	45.20	46.70	19.03	20.02	5.90	6.22	11.06	11.54
	p_3	80.03	82.04	11.84	12.29	360.75	404.13	43.92	45.39	17.86	18.84	5.33	6.20	11.04	11.26
F-test		**	**	**	**	**	**	**	**	**	**	**	**	**	**
LSD 5%		0.46	1.33	0.09	0.09	1.52	0.52	0.07	0.07	0.05	0.04	0.01	0.21	0.25	0.23
Varieties	**V_1**	83.68	85.23	10.87	11.39	353.83	397.25	43.73	45.33	17.72	18.72	5.30	6.10	11.03	11.32
	V_2	80.79	82.84	11.41	11.90	361.75	405.00	44.31	45.82	18.18	19.16	5.34	6.12	11.59	12.10
F-test		**	**	**	**	**	**	**	**	**	**	**	NS	**	**

P_1 = Afir broadcast. **P_2** = Afir drill. **P_3** = Afir in furrows.
V_1 = Giza 68. **V_2** = Sids 12
*,**,indicated to significantly and highly significantly at 5% and 1% levels of probability.
NS = Non-significant. **LSD** = Least significant difference.

Table (2): Interaction effect of planting methods x varieties (PxV) on the plant height (cm), yield and its components in 2014/2015 and 2015/2016 seasons.

Characters / Treatments		Plant height (cm)		Spike length (cm)		Number of spikes/m^2		1000-grain weight (g)		Grain yield (ard./fed.)		Biological yield (ton/fed.)		Protein (%)	
		2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016	2014/ 2015	2015/ 2016
PxV	P_1xV_1	86.03	86.60	10.38	11.05	338.25	381.25	42.70	44.35	16.69	17.71	5.16	5.88	11.53	11.92
	P_1xV_2	84.95	85.05	10.98	11.45	347.25	390.75	43.18	44.93	17.24	18.22	5.20	5.93	12.13	12.70
	P_2xV_1	81.48	83.55	10.60	11.12	366.00	409.75	44.95	46.50	18.90	19.17	5.44	6.17	11.09	11.36
	P_2xV_2	80.93	84.93	11.15	11.71	373.75	416.75	45.45	46.90	19.88	20.16	5.48	6.24	11.02	11.73
	P_3xV_1	83.55	85.53	11.63	12.05	357.25	400.75	43.55	45.15	17.57	18.59	5.32	6.30	10.47	10.68
	P_3xV_2	76.50	78.55	12.05	12.53	364.25	407.50	44.30	45.63	18.15	19.10	5.35	6.14	11.62	11.85
F-test		**	**	NS	NS	**	**	**	NS	**	**	NS	NS	**	**
LSD 5%		0.71	1.53	-	-	0.81	0.73	0.07	-	0.003	0.07	-	-	0.39	0.50

P_1 = Afir broadcast. **P_2** = Afir drill**.** **P_3** = Afir in furrows.

V_1 = Giza 68**.** **V_2** = Sids 12.

**,indicated to significantly and highly significantly at 5% and 1% levels of probability.

NS = Non-significant. **LSD** = Least significant difference.

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