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Effect of Experimental Unit Border on Yield and Yield Components in Bread Wheat Experiments

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ABSTRACT

This investigation was carried out at Sids and Sakha Agricultural Research Station, Agricultural Research center (ARC.), Egypt, during the two successive growing seasons 2018/2019 and 2019/2020. The objective of this research was to assess the border effect in wheat cultivation for yield and yield components. The measurements were realized on border and inner rows in 12 bread wheat cultivars. The results indicated highly significant effects for treatments (Border and inner rows), cultivars and their interaction, the border rows treatment is higher than the inner rows treatment. For grain yield, the best cultivar was Misr 1 (0.315 Kg m-1) under the border rows. For number of spikes m-1, Sids 13 gave the highest value (103.67 spikes m-1) in the border rows while the cultivar Sids 12 gave the highest value (73.35 spikes m-1) under inner rows treatment. Regarding number of kernels per spike, the best cultivar is Sids 1 under both treatments (border and inner rows). Concerning the trait of 1000-kernel weight, Gemmiza 11 recorded the highest value for 1000-Kernel weight under both treatments border and inner rows stand treatments.

KEYWORDS: Experiment unit, Border effect, Grain yield, *Triticum aestivum, L.*

1. INTRODUCTION

Wheat (*Triticum aestivum*, L.) crop is considered as one of the essential strategic cereal crops not only in Egypt but also all over the world. In addition, wheat is the world's most important food crop in terms of tons of grain produced each year. Wheat trade represents a significant component of the trade balance of national economy. Wheat is utilized and processed for many products, reflecting its importance for large quantities produced by people of diverse cultures and social groups (Faridi & Faubion, 1995).

Sometimes the researchers when design the experiments and study some traits I.e. yield and yield components of wheat, they get a aberration values specially the yield and yield components, the researchers make decision based on mistake data because they don't remove the border from the designed plot in the experiment and some researcher design the wheat experiments using plot size 1-3 rows. The reduction of plot size to 1-3 rows is not feasible without introducing considerable bias into the estimation of the yield potential of the varieties" (Romani et al., 1993). many researchers suggested intercropping system Experiments recently in wheat crop (Alrijabo et al., 2021, Pankou et al., 2021 and Zou et al., 2021), .not suitable wheat cultivar may be used by some researchers in the field of intercropping system because some wheat cultivars have different responses for intercropping systems (Aziz et al., 2015), also weeds is big problem in wheat fields it is major constraint in some fields one of solutions for over-coming the weeds in the wheat fields is increasing seeding rate, some wheat cultivars are tolerant to plant competition and some of them are not tolerant.

The values of the wheat border effect presented in the literature and obtained at experimental fields fall within abroad range for bread wheat from 62 to 113% (Widdowson, 1973, Braun 1978, Austin & Blackwell, 1980 and Darwinkel, 1984), and 32-117% for durum wheat according to (Hadjichristodoulou, 1993) and for spring wheat about 83% according to (Galezewski et al., 2013).

Many researchers suggested the border effect study, (Romani et al., 1993, MAY & MORRISON, 1986, Hallestrom 1972, Bulinksi & Niemczyk, 2010, Bulinksi & Niemczyk, 2015 and Galezewski et al., 2013) The main objectives of this investigation are 1) To evaluate border and narrow stand systems 2) To identify the best Egyptian cultivar response to border and narrow -stand.

2. MATERIALS AND METHODS

This study was carried out during two successive seasons, of 2018/2019 and 2019/2020 in two locations at Sids and Sakha Agricultural Research Station, Agricultural Research Center, Egypt, to determine border effect on grain yield and its components for twelve bread wheat cultivars. Table 1 showed the name of the cultivars and their pedigree.

Table 1. Name and pedigree of twelve bread wheat cultivars used in the present study.

Ser #	Cultivar Name	Pedigree
1	**Misr 1**	OASIS / SKAUZ // 4*BCN /3/ 2*PASTOR
2	**Sids 1**	HD2172/Pavon “S”//1158.57/Maya 74”S”
3	**Sids 12**	BUC//7C/ALD/5/MAYA74/ON//1160.147/3/BB/GLL/4/CHAT"S"/6/MAYA/ VUL//CMH74A.630/4*SX
4	**Sids 13**	Kauz “s” // Tsi / Snb”s”
5	**Giza 168**	MIL/BUC//Seri
6	**Giza 171**	Sakha 93/ Gemmiza 9
7	**Sakha 93**	Sakha 92TR 810328
8	**Sakha 94**	Opata/Rayon//Kauz
9	**Shandweel 1**	Site / Mo /4/ Nac / Th.Ac // 3* Pvn /3/ Mirlo / Buc
10	**Gemmiza 9**	Ald”S”/Huac”S”//CMH74A.630/5x
11	**Gemmiza 10**	Maya 74 “S”/On//1160-147/3/Bb/4/Chat”S” /5/ctow
12	**Gemmiza 11**	Bow “s”/ Kvz “s”//7C/Seri 82 /3/ Giza 168 / Sakha 61

2.1. Treatments

Two treatments were designated in the field, (a) the inner rows of plot and (b) border rows of plot, the track width between plots was 50 cm. This experiment was carried out by plot seeder self-propelled from Wintersteiger Company.

2.2. Sowing date and seed rate

Bread wheat cultivars were seeded on November 25, 2018 in the first season and November 19, 2019 in the second season in two locations (Sids and Sakha station). A seed rate of 100 kg ha-1 was used in Flat method. Spacing details of plot at sowing were as follows: number of rows: 6; row length: 3.5m; row width: 20 cm. plot area: 4.2m2. and 30 cm between plots.

2.3. Fertilizers and irrigation

All recommended package was applied, recommended dose of NP was applied according to treatments as 70 Kg P2O5 ha^{-1} during preparation and 175 Kg Nitrogen ha-1 was applied Ammonia injection in soil after final land preparation and before sowing. Six irrigations were applied at 20 days intervals.

2.4. Weed control

The crop was maintained with weed free using chemical material. Broad leaf weeds were controlled by spraying of Derby 175% SC after 30 days from planting.

2.5. Harvesting and data collecting

Two border rows, 3.5m length each border per plot was harvested, also two inner rows was harvested for each plot and the average of all length are calculated for border and inner rows. Regarding studied characters, the study focused on yield and yield components in bread wheat, number of spikes m^{-1} length (No. S m^{-1}), number of kernels $spike^{-1}$ (No. K/S), 1000-kernel weight (1000-KW) and grain yield $meter^{-1}$ length (GY m^{-1}).

2.6. Experimental design and analysis

Randomized complete block design (RCBD) was applied with three replications, the homogeneity test according to (Bartlett, 1973) is used before combined analysis, all means were compared using least significant difference test at 1% probability level (Steel & Torrie, 1996). All values of studied traits were analyzed using GenStat soft program.

3. RESULTS

Data analysis of two successive seasons showed that the homogeneity between seasons according to Bartlett Test (1937) therefore, the results are showed by combined analysis. Highly significant difference was found for treatments (border and inner rows) and cultivars. Table 2 showed that the analysis of variance for studied characters using combined analysis.

Table 2. Combined analysis of variance for studied traits.

source of variance	Degrees of freedom	Grain yield	No. of spikes m^{-1}	No. of kernels/spike	1000- Kernel weigh
Years (Y)	1	0.0145076**	1131.2**	6.83	957.77**
Locations (L)	1	0.0491624**	1131.2**	335.35	151.80**
Y×L	1	0.0000040	1.4	9.54	38.80
Replication within years&locations	8	0.0062551	142.7	795.95	136.62
Treatments (T)	1	0.9060052**	69578.3**	9371.22**	209.55**
T×Y	1	0.0065414**	31000.4**	2366.51**	58.60
T×L	1	0.0010568	44.8	0.28	18.29
T×Y×L	1	0.0000026	32.8	0.23	7.76
Error (a)	8	0.00770	2818.5	2318.32	513.60
Cultivars (C)	11	0.0045662**	769.6**	641.63**	381.91**
C×Y	11	0.0019047**	660.7**	309.58**	116.27**
C×L	11	0.0002969	0.2	0.74	7.68
C×T	11	0.0025651**	206.9	213.43**	15.87
C×T×Y	11	0.0018250**	154.4	281.82**	22.83
C×T×L	11	0.0004427	7.5	0.27	7.26
C×Y×L	11	0.0001425	1.3	0.21	7.07
C×Y×L×T	11	0.0004427	6.1	0.33	9.88
Error (b)	176	0.000350	128.11	105.37	23.34
Total	287				

*, ** Significant and highly significant at 0.05 and 0.01 respectively.

3.1. Number of Spikes m^{-1} length:

The data shown in Tables 2 and 3 indicated that highly significant due to treatment, cultivars and significant due to interaction between treatments and cultivars for number of spike m^{-1} length, the maximum values of number of spikes m^{-1} length are obtained by border treatment at all locations and seasons, the maximum value as obtained by Sids 13 for treatments was 108.1 and 103.9 spikes m^{-1} obtained by border treatment at two location in the first season respectively, also, Misr 1 gave the maximum value with border treatment at the two locations in the second season, while Sids 12 gave the highest value obtained by inner rows treatment at Sids and Sakha stations in the two seasons. Regarding cultivars, the highest value is 103.675 m^{-1} obtained by Sids 13 over-all means for Border rows stand while the lowest value is 51.400 m^{-1} obtained by Gemmiza 11 over-all means from inner rows. Concerning interaction between treatments and cultivars, the highest value is 115.9 m^{-1} given by cultivar Misr 1 at Sids station in second season (table 3) while the lowest value is 44.9 m-1 given by cultivar Misr 2 at Sakha station in the second season. When we compared the number of spike m^{-1} length under the influence of the border stand and the inner rows stand, the border was higher than inner rows Increased 167.1% in Gemmiza 11, the lowest value with cultivar Sids 1 in the rate of 129.2% and in the overall average effect of border by 150.5% about inner rows stand. In general, border effect gave more number of spike m^{-1} length as compared with inner rows effect (Bulinksi and Hanna 2015). The results obtained allow for assuming that the preparation of objects used in the study was equivalent.

3.2. Number of kernels $spike^{-1}$:

The data presented in tables 2 and 4 indicated that highly significant due to treatments, cultivars and interaction between treatments and cultivars. Regarding treatments, the border rows treatments gave the highest values while the lowest values are given by inner rows treatments (table 4), the highest value is obtained by border treatment (82.27 kernel $spike^{-1}$) at Sids station in the first season while the lowest value is (40.77 kernel $spike^{-1}$) obtained by inner rows stand treatment at Sakha station in the first season. Regarding the cultivars effect over-all means, the cultivar Sids 1 gave the highest value (75.92 kernel $spike^{-1}$) under border treatment also the same cultivar gave the highest value under the inner rows stand treatment (57.95 kernel/spike). Concerning interaction between cultivars and treatments, the highest value (82.27 kernels $spike^{-1}$) is obtained by cultivar Sakha 94 while the lowest value (40.77) is obtained by the cultivar Misr 2. When we compared the number of

Table 3. Average of number of spikes m^{-1} for treatments and bread wheat cultivars

Cultivar	Season 2018/2019				Season 2019/2020				Combined		
	Sids		Sakha		Sids		Sakha				
	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	%
Misr 1	88.8	85.8	85.1	81.7	115.9	51	109.7	48.4	99.87	66.72	149.7
Misr 2	99.8	79.7	92.2	75.6	98.9	45.8	94.2	44.9	96.27	61.50	156.5
Sids 1	76.5	76.4	72.8	72.3	87.2	51	82.5	47.2	79.75	61.72	129.2
Sids 12	99.6	95.2	95.9	90.6	108.7	55	104	52.6	102.05	73.35	139.1
Sids 13	108.1	83.9	103.9	79.9	103.5	49.4	99.2	45.7	103.67	64.72	160.2
Giza 171	77.7	70.3	73.4	67.7	101.8	53.5	97.1	50.5	87.50	60.50	144.6
Sakha 93	88	76.8	84.3	72.8	93.7	50.3	89.2	47	88.80	61.72	143.9
Sakha 94	72.9	73.6	69.3	69.5	109.8	50.6	105.3	47.3	89.32	60.25	148.2
Shandaweel 1	88.6	76.3	84.9	72.3	112.6	51.7	108.1	48.4	98.55	62.17	158.5
Gemmiza 9	86.1	67	82.2	62.9	105.6	49.2	101.1	46.7	93.75	56.45	166.1
Gemmiza 10	91.9	83.8	87.9	79.7	100.5	51.6	96	48.3	94.07	65.85	142.9
Gemmiza 11	71.2	54.8	66.6	50.8	108.6	48	97.1	52	85.87	51.40	167.1
Maximum	108.1	95.2	103.9	90.6	115.9	55	109.7	52.6	103.67	73.35	167.1
Minimum	71.2	54.8	66.6	50.8	87.2	45.8	82.5	44.9	79.75	51.40	129.2
Mean	87.433	76.967	83.208	72.983	103.9	50.592	98.625	48.25	93.29	62.19	150.5
Range	36.9	40.4	37.3	39.8	28.7	9.2	27.2	7.7	23.92	21.95	37.9
CV%	12.7		13.5		15		15.3		20.3		
$LSD_{0.01}$ for treat.	6.62		6.68		7.32		7.14		3.341		
$LSD_{0.01}$ for cultivars	16.23		16.36		17.93		17.48		8.183		
$LSD_{0.01}$ for TxC	22.95		23.14		25.36		24.72		11.572		

Table 4. Average of number of Kernels spike^{-1} for treatments and bread wheat cultivars

Cultivar	Season 2018/2019				Season 2019/2020				Combined		
	Sids		Sakha		Sids		Sakha				
	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	%
Misr 1	73.13	45.93	70.67	43.23	61.5	65.6	59.3	63	66.15	54.44	121.5
Misr 2	52.6	43.47	50.37	40.77	57.9	58.5	55.8	56.7	54.17	49.86	108.6
Sids 1	78	57.6	74	54.9	76.9	60.9	74.8	58.4	75.92	57.95	131.0
Sids 12	77.13	48.67	74.83	45.27	65.7	63.1	63.6	61.3	70.31	54.58	128.8
Sids 13	62	50.8	59.6	48.1	59.7	50.6	57.5	48.5	59.70	49.50	120.6
Giza 171	69.67	52.73	67.27	50.03	50.2	56.7	48.6	54	58.93	53.36	110.4
Sakha 93	57.33	45.73	54.93	43.03	61.1	52.7	59.4	51	58.19	48.11	120.9
Sakha 94	82.27	52.87	79.87	50.17	50.2	53.5	48.5	52.1	65.21	52.16	125.0
Shandaweel 1	70.13	48.87	67.73	47.67	65.9	46.8	64.2	45.4	66.99	47.18	142.0
Gemmiza 9	70.13	55.33	68.03	52.63	56	51.9	54.5	50.5	62.16	52.59	118.2
Gemmiza 10	45.87	50.47	44.33	47.77	52.2	47.1	51	45.7	48.35	47.76	101.2
Gemmiza 11	69.93	51.47	67.73	48.67	74.8	56.5	73.3	55.8	71.44	53.11	134.5
Maximum	82.27	57.6	79.87	54.9	76.9	65.6	74.8	63	75.92	57.95	142.0
Minimum	45.87	43.47	44.33	40.77	50.2	46.8	48.5	45.4	48.35	47.18	101.2
Over all mean	67.349	50.328	64.947	47.687	61.008	55.325	59.208	53.533	63.13	51.72	121.9
Range	36.4	14.13	35.54	14.13	26.7	18.8	26.3	17.6	31.23	16.16	40.8
CV%	13.3		13.7		20.3		21.2		17.9		
$LSD_{0.01}$ for treat.	4.957		4.882		7.47		7.58		3.030		
$LSD_{0.01}$ for cultivars	12.142		11.959		18.29		18.56		2.852		
$LSD_{0.01}$ for TxC	17.172		16.913		25.86		26.24		4.033		

kernel/spike under the influence of the border stand and the inner rows stand, the border was higher than inner rows Increased 142.0% in Shandaweel 1, the lowest value with cultivar Gemmiza 10 in the rate of 101.2% and in the overall average effect of border by 121.9% about inner rows stand. The number of kernels/spike was shown by other researchers as a significant yield component that determines its value (Romani et al., 1993).

3.3. 1000-Kernel weight (grams):

The data presented in tables 2 and 5 indicated that highly significant due to treatments and cultivars while there is no significant for interaction between treatments and cultivars, regarding treatments, in general the border stand treatment was higher than inner rows stand treatment, the highest value (62.61g) is obtained by border stand treatment at Sids station in the first season while the lowest value (38.38g) is obtained by inner rows stand treatment at Sakha station in the second season. Regarding bread wheat cultivars, the highest value (62.61g) is obtained by the cultivar Gemmiza 11 under border stand treatment also the same cultivar gave the highest value under inner rows stand treatment (61.79g) in the first season. Concerning interaction between treatments and cultivars, the highest value (62.61 g) is obtained by the cultivar Gemmiza 11 under border stand treatment at Sids station in the first season. When we compared the thousand grain weight under the influence of the border stand and the inner rows stand, the border was higher than the dens one by 110.7% in Sids 1. The lowest value was with obtained cultivar Gemmiza 10 in the rate of 98.0% and in the overall average effect of border by 103.8% about inner rows stand. In general, border effect gave more thousand kernels weight as compared with inner rows stand.

3.4. Grain yield:

Data shown in tables 2 and 6 indicated that highly significant for grain yield (kg m^{-1}) due to treatments (Border rows and inner rows), this results harmony with (Sandler et al., 2015), regarding treatments the highest mean value (0.283 kg m^{-1}) is obtained by border (Border rows) at Sids location in the first season also the same treatment (Border rows) gave the highest value (0.266 kg m^{-1}) over-all means and The best cultivar over-all means is Misr 1 for Border rows but it's not superior for Inner rows in the two seasons at two locations except inner rows stand at Sids research station in first season was the highest value one, whereas the best cultivar over-all means for Inner rows is Shandaweel 1 (0.177 kg m^{-1}).

Concerning interaction between treatments and wheat cultivars, the highest value (0-351, 0.318, 0.312 and 0.279 kg m^{-1}) is obtained by cultivar number 1 (Misr 1) at Sids and Sakha stations respectively, while the lowest value (0121 kg m^{-1}) is obtained from cultivar number four and eight (Sids 12 and Sakha 94) respectively, at Sakha Research Station. The results indicated that the wheat cultivars have different responses for border and inner rows stand. The border was higher than inner rows stand by 195.65% in Misr 1. The lowest value was obtained with cultivar Shandaweel 1 in the rate of 151.98% and in the grand mean effect of border by 173.86% about inner rows stand. In general, border effect gave more grain yield as compared with inner rows effect (Bulinksi & Niemczyk, 2015, Karnam et al. 2015 and (Wang et al., 2017).

4. Conclusion

Through this study we can conclude that the researchers should remove the border out designed wheat experiments for avoiding aberration values, also the researchers who interested in wheat intercropping experiments they should know the wheat cultivars are different significantly for responding to space between wheat plants so they should chose the suitable cultivar for intercropping system. In addition to the farmers who suffer from weeds in their field they should plant wheat cultivars which tolerant for high inner rows stand. Also the researchers who interested in intercropping system can use the wheat cultivar which response positively to border.

5. REFERENCES

Alrijabo Abdulsattar Asmair I, Abed Khattab Al-Healy T (2021). The Effect of Intercropping system of Wheat and Lentil Crops , and sowing Methods on yield and its components under Rain Fed Area in Fayda location. International Journal of Engineering Science Invention (IJESI, 10(4), 44–51. https://doi.org/10.35629/6734-1004014451

Austin RB, Blackwell RD (1980). Edge and neighbour effects in cereal yield trials. The Journal of Agricultural Science, 94(3), 731–734. https://doi.org/10.1017/S0021859600028720

Aziz M, Mahmood A, Asif M, Ali A (2015). Wheat-based intercropping A review. In Journal of Animal and Plant Sciences (Vol. 25, Issue 4).

Bartlett MS (1973). Properties of sufficiency and statistical tests. Proceedings of the Royal Society of London. Series A - Mathematical and Physical Sciences, 160(901), 268–282. https://doi.org/10.1098/rspa.1937.0109

Table 5. Average 1000-Kernels weight (g) for treatments and bread wheat cultivars

Cultivar	Season 2018/2019				Season 2019/2020				Combined		
	Sids 2018-19		Sakha 2018-19		Sids 2019-20		Sakha 2019-20				
	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	%
Misr 1	55.04	50.67	52.82	47.9	48.67	46.5	47.05	44.98	50.89	47.51	107.1
Misr 2	50.35	47.98	48.13	45.21	43.4	43.47	41.78	42.62	45.91	44.82	102.4
Sids 1	51.7	44.81	50.89	42.05	47.37	43.73	45.75	46.19	48.93	44.19	110.7
Sids 12	41.68	40.51	39.46	38.49	42.1	40.77	39.75	39.27	40.75	39.76	102.5
Sids 13	43.23	42.61	42.41	39.84	43	43.33	43.08	41.82	42.93	41.90	102.5
Giza 171	54.23	51.96	53.41	49.19	49.77	48.13	48.95	46.62	51.59	48.97	105.4
Sakha 93	48.47	51.1	47.66	48.34	46.77	45.6	44.23	44.08	46.78	47.28	98.9
Sakha 94	47.83	45.31	46.39	42.54	43.27	40.17	41.1	38.65	44.65	41.67	107.2
Shandaweel 1	44.15	46.97	42.71	44.2	46.73	42.83	44.2	41.92	44.45	43.98	101.1
Gemmiza 9	47.78	45.86	46.35	43.09	48.23	45.07	45.7	43.92	47.02	44.48	105.7
Gemmiza 10	44.46	40.66	42.76	38.38	27.47	40.03	40.12	38.88	38.70	39.49	98.0
Gemmiza 11	62.61	61.79	62.31	54.77	45.3	44.9	43.85	44.86	53.52	51.58	103.8
Maximum	62.61	61.79	62.31	54.77	49.77	48.13	48.95	46.62	53.52	51.58	110.7
Minimum	41.68	40.51	39.46	38.38	27.47	40.03	39.75	38.65	38.70	39.49	98.0
Over all mean	49.294	47.519	47.942	44.5	44.34	43.711	43.797	42.818	46.34	44.64	103.8
Range	20.93	21.28	22.85	16.39	22.3	8.1	9.2	7.97	18.82	13.43	12.7
CV%	6.1		8		15.1		10.6		11.5		
$LSD_{0.01}$ for treat.	1.882		2.353		1.564		2.896		1.426		
$LSD_{0.01}$ for cultivars	4.611		5.764		3.831		7.093		3.493		
$LSD_{0.01}$ for TxC	6.52		8.151		5.418		10.031		4.940		

Table 6. Average of grain yield kg m-1 for treatments and bread wheat cultivars.

Cultivar	Season 2018/2019				Season 2019/2020				Combined		
	Sids		Sakha		Sids		Sakha				
	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	Border rows	Inner rows	%
Misr 1	0.351	0.197	0.318	0.164	0.312	0.159	0.279	0.125	0.315	0.161	195.65
Misr 2	0.291	0.167	0.258	0.142	0.296	0.150	0.262	0.122	0.277	0.145	191.03
Sids 1	0.304	0.188	0.274	0.158	0.273	0.162	0.243	0.132	0.273	0.160	170.63
Sids 12	0.294	0.191	0.261	0.158	0.301	0.154	0.267	0.121	0.281	0.156	180.13
Sids 13	0.307	0.180	0.262	0.150	0.293	0.153	0.263	0.123	0.281	0.152	184.87
Giza 171	0.291	0.162	0.261	0.132	0.261	0.146	0.231	0.129	0.261	0.142	183.80
Sakha 93	0.237	0.178	0.213	0.154	0.295	0.154	0.272	0.130	0.254	0.154	164.94
Sakha 94	0.271	0.175	0.248	0.152	0.235	0.144	0.212	0.121	0.241	0.148	162.84
Shandaweel 1	0.274	0.172	0.247	0.211	0.303	0.159	0.251	0.164	0.269	0.177	151.98
Gemmiza 9	0.285	0.169	0.258	0.142	0.243	0.139	0.216	0.134	0.251	0.146	171.92
Gemmiza 10	0.217	0.172	0.190	0.146	0.267	0.152	0.240	0.125	0.229	0.149	153.69
Gemmiza 11	0.270	0.164	0.247	0.140	0.263	0.161	0.239	0.138	0.255	0.151	168.87
Maximum	0.351	0.197	0.318	0.211	0.312	0.162	0.279	0.164	0.315	0.177	195.65
Minimum	0.217	0.162	0.190	0.132	0.235	0.139	0.212	0.121	0.214	0.142	151.98
Mean	0.283	0.176	0.253	0.154	0.278	0.153	0.248	0.130	0.266	0.153	173.36
Range	0.134	0.035	0.128	0.078	0.077	0.023	0.067	0.043	0.102	0.045	27.27
CV%	7		7.4		8.1		11.4		12.7		
$LSD_{0.01}$ for treat.	0.01011		0.00957		0.01111		0.01372		0.00552		
$LSD_{0.01}$ for cultivars	0.02475		0.02343		0.02721		0.0336		0.01353		
$LSD_{0.01}$ for TxC	0.03501		0.03314		0.03849		0.04751		0.01913		

Bulinksi J, Niemczyk H (2010). Edge effect in winter rape cultivation technology with traf fic paths. Annals of Warsaw University of Life Sciences, 56(56), 5–12.

Bulinksi J, Niemczyk H (2015). Assessment of border effect in wheat cultivation with tramlines. Annals of Warsaw University of Life Sciences, 65(65), 21–30.

Darwinkel A (1984). Yield responses of winter wheat to plant removal and to wheelings. Netherlands Journal of Agricultural Science, 32(4). https://doi.org/10.18174/njas.v32i4.16886

Faridi, H, Faubion JM (1995). Wheat End Uses Arround the World. In American Association of Cereal Chemists. https://sci-hub.ren/https://agris.fao.org/agris-search/search.do?recordID=XF2016042674

Galezewski L, Piekarczyk M, Jaskulska I, Wasilewski P (2013). Border effects in the growth of chosen cultivated plant species. Acta Scientiarum Polonorum. Agricultura, 12(3).

Hadjichristodoulou A (1993). Edge effects on yield, yield components and other physiological characteristics in cereals and oilseed crops. The Journal of Agricultural Science, 120(1). https://doi.org/10.1017/S0021859600073536

MAY KW, MORRISON RJ (1986). Effect of Different Plot Borders on Grain Yields in Barley and Wheat. Canadian Journal of Plant Science, 66(1), 45–51. https://doi.org/10.4141/cjps86-006

Pankou C, Lithourgidis A, Dordas C (2021). Effect of irrigation on intercropping systems of wheat (Triticum aestivum L.) with Pea (Pisum sativum L.). Agronomy, 11(2). https://doi.org/10.3390/agronomy11020283

Romani M, Borghi B, Alberici R, Delogu G, Hesselbach J, Salamini F (1993). Intergenotypic competition and border effect in bread wheat and barley. Euphytica, 69(1–2). https://doi.org/10.1007/BF00021722

Sandler L, Nelson KA, Dudenhoeffer C (2015). Winter Wheat Row Spacing and Alternative Crop Effects on Relay-Intercrop, Double-Crop, and Wheat Yields. International Journal of Agronomy, 2015, 369243. https://doi.org/10.1155/2015/369243

Steel RGD, Torrie JH (1996). Principles and procedures of statistics A biometrical approach 3rd ed McGraw Hill Book Company Inc. New York, USA.

Wang Z, Zhao X, Wu P, Gao Y, Yang Q, Shen Y (2017). Border row effects on light interception in wheat/maize strip intercropping systems. Field Crops Research, 214(November), 1–13. https://doi.org/10.1016/j.fcr.2017.08.017

Widdowson, F. V. (1973). Results from experiments with wheat and barley measuring the effects of paths on yield. Experimental Husbandry, 23, 16–20.

Zou, J., Song, F., Lu, Y., Zhuge, Y., Niu, Y., Lou, Y., Pan, H., Zhang, P., & Pang, L. (2021). Phytoremediation potential of wheat intercropped with different densities of Sedum plumbizincicola in soil contaminated with cadmium and zinc. Chemosphere, 276. https://doi.org/10.1016/j.chemosphere.2021.130223.

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الملخص العربي

تأثير أطراف الوحدة التجريبية على المحصول ومكوناته فى تجارب قمح الخبز

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تم إجراء هذا البحث في موقعين (محطة البحوث الزراعية بسدس ومحطة البحوث الزراعية بسخا) خلال موسمي الزراعة المتعاقبين ٢٠١٨/٢٠١٩ و ٢٠١٩/٢٠٢٠. و كان هدف البحث هو تقيم تأثير السطور الخارجية (الأطراف) للوحدة التجريبية لبعض أصناف قمح الخبز المنتشرة فى جمهورية مصر العربية على المحصول ومكوناتة. بالنسبة للمحصول كان الصنف مصر ١ هو أفضل الأصناف وذلك تحت تاثير أطراف الوحدة التجريبية بينما كان الصنف شندويل ١ هو أعلى الأصناف فى حالة المنافسة بين النباتات فى الصفوف الداخلية وبالنسبة لصفة عدد الحبوب بالسنبلة أعطى الصنف سدس ١ متوسط ٧٥,٩٢ حبة فى السنبلة فى بالنسبة للسطور الخارجية للوحدة التجريبية وأيضا أعطى الصنف سدس ١ أعلى قيمة لعدد الحبوب بالسنبلة تحت ظروف المنافسة للسطور الداخلية (٥٧,٩٥ حبة فى السنبلة) أما بالنسبة لعدد السنابل في المتر الطولي كان الصنف سدس ١٣ أفضل الأصناف تحت تأثير السطور الخارجية (الأطراف) للوحدة التجريبية (١٠٣,٦٧ فرع فى المتر الطولى) بينما أعطى الصنف سدس ١٢ أعلى قيمة تحت ظروف المنافسة للسطور الداخلية (٧٣,٣٥ فرع فى المتر الطولى) بينما كان الصنف جميزة ١١ افضل الاصناف في صفة وزن الالف حبة في كلا من المعاملتين ، يمكننا أن نستنتج أنه يجب على الباحثين إزالة السطور الخارجية لتجارب القمح المصممة لتجنب القيم المنحرفة وكذلك لابد من أخذ العينات الخاصة بمكونات المحصول من السطور الداخلية للوحدة التجريبية وليس من السطور الخارجية ، بالإضافة إلى المزارعين الذين يعانون من الحشائش في حقولهم ، يجب عليهم زراعة أصناف القمح التي تتحمل المنافسة العالية وكذلك يمكن للباحثين فى مجال التحميل المحصولى إختيار الأصناف التى تتأثر إيجابيا بالمسافات بين السطور والنباتات.