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RELAY INTERCROPPING WHEAT AND COTTON STUDIES: I- EFFECT OF TIMES OF TWO LAST IRRIGATIONS AND RIDGE WIDTH ON GROWTH AND YIELD OF WHEAT

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ABSTRACT

Two field experiments were carried out at farm in Abo Hussein Village, Abo Kebeer district, Sharkia Governorate, during the two successive winter seasons of 2005/2006 and 2006/2007 to study the response of sole and relay intercropping wheat (*Triticum aestivum vulgare* L.) to the effect of the times of two last irrigations and ridge width as well as their interaction on yield and its attributes of wheat.

The obtained results could be summarized as follows:

1. The highest values of all studied characters were resulted from giving fourth and fifth irrigations of sole or relay intercropping wheat at 15th April and 1st May, respectively, excluding number of spikes/m^2 of sole wheat in the second season, number of spikelets/spike of relay intercropping wheat in the second season and straw yield/fed of sole wheat in both seasons.
2. Sowing both sole and relay intercropping wheat on wide ridges (100 cm) produced the highest values of plant height and grain yield of relay intercropping wheat in both seasons, number of spikes/m^2 and straw yield/fed of sole wheat in both seasons, spike length, number of spikelets/spike, number of grains/spike and 1000 – grain weight of sole and relay intercropping wheat in both seasons..
3. The highest values of land equivalent ratio (LER) and area time equivalent ratio (ATER) were resulted from performing fourth and fifth irrigations of wheat at 15th April and 1st May and sowing cotton on 15th April in both seasons. Sowing both wheat and cotton on ridges with width of 80 cm was the most favorable treatment that produced the highest average of LER and ATER in the first season. Whereas, in the second season sowing both wheat and cotton on ridges with width of 90 cm produced the highest average of LER and ATER.
4. The interaction between studied factors had insignificant effect on all studied characters in both growing season, except number of grains/spike of sole wheat in the first season only.

Results of this study show that yields and its attributes of sole or relay intercropping wheat grown under the environmental conditions of Sharkia district can be maximized due to carrying out fourth and fifth irrigations at 15th April and 1st May, respectively and sowing on ridges with width of 100 cm.

Keywords: Wheat, *Triticum aestivum vulgare* L., Relay intercropping, times of two last irrigations of wheat, water stress, water regime, ridge width.

INTRODUCTION

Intercropping cotton with wheat is a new farming system that has been founding in Egypt. Such intercropping helps in increasing the total production from the limited cultivation area. Cotton growers, during last decades suffered much from a rapidly increasing costs of production which

has not been matched by an equal increase in price policy. Moreover, predominant deterioration of cotton productivity was a cogent reason for farmers to avoid cotton planting. On this basic ground, farmers tried hardly to seek a new farming system which might allow them a new multiple cropping system in cotton rotation, with to achieve maximum land utilization with higher gross income. Hence, the inclusion of some long duration winter crops such as wheat become a hope to achieve this goal. This of course results in a drop in cotton yield due to delaying cotton planting, therefore it become necessary to use intercropping as one of the most suitable way for increasing cotton area without any shortage of wheat area to meet raising demands and to overcome the problem of delaying cotton planting (Mohamed *et al.*, 1999 and Hussein, Samira, 2005).

Water deficit is one of the most common environmental stresses that affects growth and development of plants (Frederick and Camberato, 1994 ; Palata *et al*., 1994 and Westage, 1994). Grain development of wheat is a function of rate and duration of grain growth, determined by photosynthates supply and is affected by a number of environmental factors including water. Drought during grain filling could be limit the rate and duration of filling processes, causing small grain size, earlier physiological maturity, reduce number of grains, low grain weight and grain yield of wheat (Gupta *et al*., 2001). Zhang *et al*. (2007) showed that heading stage was suggested to be the optimum limited single irrigation time for wheat in the semi-arid area. Pierre *et al*. (2008) pointed out that water stress especially during grain filling caused an increases in grain protein content of winter wheat. Li *et al*. (2011) concluded that irrigation at jointing and heading stages has higher grain yield, which will offer a measurement for developing deficit irrigation regimes in North China. Shahryari *et al*. (2011) showed that irrigation levels (normal irrigation and drought stress i.e. two times of irrigation were not carried after flowering) were meaningful differences for biological yield, grain yield, protein and gluten. Under drought stress conditions in the grain filling stage, number of grains per spike and grain yield had been decreased. Also, drought stress caused an increase in protein content.

Regarding response of wheat growth and yield as affected by planting on ridge with various width, there was not enough information documented on the benefit of ridge width in different planting systems. In this respect; Porter and Khalilian (1995) noted that in a relay cropping system with skipped row wheat, there was no significant yield loss from the flat system wheat. Sayre (1997) revealed that the yield of wheat increasing effect for 60 cm ridge width with two rows crops under ridge tillage was higher than those of 80 cm ridge width with three rows. Sayre and Ramos (1997) show that decreasing bed width to 75-80 cm can be used in rainfed conditions with two to three rows drilled 15-20 cm apart on top of those beds. Hussein, Samira (2005) found that there were no significant differences between conventional or terraces sole planting of wheat in growth characters, number of spikes/m^2, number of grains/spike, grains weight/spike, 1000-grain weight and grain yield.

Therefore, this investigation was established to study the response of sole and relay intercropping wheat to the effect of the times of two last

irrigations and ridge width as well as their interaction on wheat under the environmental conditions of Sharkia district.

MATERIALS AND METHODS

Two field experiments were carried out at a farm in Abo Hussein Village, Abo Kebeer district, Sharkia Governorate, during the two successive winter seasons of 2005/2006 and 2006/2007 to study the response of sole and relay intercropping wheat (Giza 168 cultivar) to the effect of the times of two last irrigations and ridge width as well as their interaction.

Treatments and experimental design:

The experiments were carried out in a strip plot design with four replications. The vertical plots were occupied with three times of the two last irrigations (fourth and fifth irrigations) of wheat as follows:

I_1- Times of fourth and fifth irrigation were 15th March and 1st April, respectively.

I_2- Times of fourth and fifth irrigation were 1st and 15th April, respectively.

I_1- Times of fourth and fifth irrigation were 15th April and 1st May, respectively.

The horizontal plots were assigned to three ridge width (80, 90 and 100 cm between ridges).

Each experimental basic unit included four ridges, width as previously mentioned and length was 4.0 m, resulted an area of 12.8, 14.4 and 16.0 m^2, respectively. The preceding summer crop in both sole and intercropping system was rice (*Oryza sativa* L.) in the first and second seasons. The experiments were carried out in a clay soil with medium fertility as shown in Table 1.

Agricultural practices:

The experimental field was well prepared through two ploughings, compaction and then divided into the experimental units with dimensions and area as previously mentioned. Calcium super phosphate (15.5 % P_2O_5) was applied during soil preparation (after ploughing and before division) at the rate of 150 kg/fed. Potassium sulphate (48 % K_2O) at the rate of 50 kg/fed was broadcasted in one dose before the second irrigation. The nitrogen fertilizer was applied in the form of ammonium nitrate (33.0 % N) at the rate of 75 kg N/fed in two equal doses prior the first and second irrigations and finished before heading. The cultivation took place on 15th November in both seasons. Wheat grains at the rate of 60 kg/fed were sown on top ridge (terrace) with width 40, 50 and 60 cm with left 20 cm from each edge of ridge to planting cotton by using broadcasting Afir method. The common agricultural practices for growing wheat according to the recommendations of Ministry of Agriculture were followed, except the factors under study.

Table 1: Mechanical and chemical soil characteristics at the experimental sites during first and second growing years.

Year	First year		Second year	
Preceding crop / Soil analysis	Rice	Wheat	Rice	Wheat
A: Mechanical analysis				
Sand (%)	27.32	26.33	30.62	28.56
Silt (%)	23.51	18.05	29.43	22.82
Clay (%)	49.17	55.62	39.95	48.62
Soil texture class	Clay	Clay	Clay	Clay
B: Chemical analysis				
Available N (ppm)	30.52	32.74	33.54	33.61
Available P (ppm)	8.48	7.93	7.97	7.82
Exchangeable K (mg/100 g)	108.00	107.00	118.00	106.00
Ca^{++} (meq/L)	20.00	27.00	25.00	24.00
Mg^{++} (meq/L)	15.00	13.00	16.00	11.00
Na^{+} (meq/L)	86.50	317.80	96.80	511.60
K^{+} (meq/L)	89.47	95.14	105.21	98.32
Cl^{-} (meq/L)	41.00	62.10	35.50	41.50
HCO_3^{-} (meq/L)	17.70	142.9	13.50	134.80
$SO4^{-}$ (meq/L)	42.20	162.10	54.00	364.20
E.C. (ds/m)	1.22	1.62	1.26	1.31
pH	7.10	7.14	7.03	7.05

Studied Characters:

Wheat:

At harvesting, the following characters were estimated:

1- Plant height (cm).
2- Number of spikes/m^2.
3- Spike length (cm).
4- Number of spikelets/spike.
5- Number of grains/spike.
6- 1000 – grain weight (g).
7- Grain yield (ardab/fed) calculated by harvesting 4 meter in each plot and air dried, then threshed and the grains at 13 % moisture were weighted in kg and converted to ardab per feddan (one ardab = 150 kg).
8- Straw yield (t/fed) the straw resulted from previous sample was weighted in kg/plot, then it was converted to tons per feddan.

Competitive Relationships:

In order to have knowledge about the nature and degree of competition between wheat and cotton the following parameters were calculated:

Land equivalent ratio (LER): Determined according to DeWit and Van Den Bergh (1965): $LER = L_{wheat} + L_{cotton}$

Where: L_{wheat} = Intercropping grain yield of wheat / Sole grain yield of wheat.

L_{cotton} = Intercropping seed cotton yield / Sole seed cotton yield.

2- Area time equivalent ratio (ATER): Determined according to Hiebsch and McCollum (1987): $ATER = \{(RY_w \times t_w) + (RY_c \times t_c)\} / T$

Where:

RY_w, RY_c = Relative yield of wheat and cotton, respectively *i.e.* (Yield of intercrop/fed) / (Yield of sole/fed) Intercropping grain yield of wheat / Sole grain yield of wheat. t_w, t_c = Duration (days) for wheat and cotton from sowing to harvesting, respectively. T = Duration (days) of intercropping pattern.

Statistical Analysis

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the strip plot design as published by Gomez and Gomez (1984), using "MSTAT-C " Computer software package. Least Significant Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Waller and Duncan (1969).

RESULTS AND DISCUSSION

Wheat:

Effect of times of two last irrigations:

From obtained data in Tables 2 and 3, plant height, number of spikes/m^2, spike length (cm), number of spikelets/spike, number of grains/spike, 1000 – grain weight (g), grain and straw yields/fed were significantly affected as a result of different times of two last irrigations of sole and relay intercropping wheat in the two seasons, with exception plant height of sole wheat, number of spikes/m^2 and spike length of sole wheat in the first season, number of spikelets/spike of sole wheat in the second season, number of grains/spike of relay intercropping wheat in the first season, 1000 – grain weight of sole and relay intercropping wheat in the first season, grain yield/fed of relay intercropping wheat in the first season and straw yield/fed of sole wheat in the second season and relay intercropping wheat in the first season. The highest values of all studied characters were resulted from carrying out fourth and fifth irrigations of sole or relay intercropping wheat at 15th April and 1st May, excluding number of spikes/m^2 of sole wheat in the second season, number of spikelets/spike of relay intercropping wheat in the second season and straw yield/fed of sole wheat in both seasons. On the other hand, giving fourth and fifth irrigations at 15th March and 1st April, respectively resulted in the lowest values of all studied characters of both sole and relay intercropping wheat, with exception number of spikes/m^2 of sole wheat in both seasons. The increase in wheat productivity because of delay times of two last irrigations of sole or relay intercropping wheat up to 15th April and 1st May, respectively can be easily ascribed to secure water during critical stages of plant growth, thereby enhancement vegetative growth, consequently enhancing yield attributes (number of spikes/m^2, number of grains/spike and 1000-grain weight). These findings are partially in line with those recorded by many workers including Gupta *et al*. (2001), Zhang *et al*. (2007), Li *et al*. (2011) and Shahryari *et al*. (2011).

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Effect of ridge width:

As shown from data in Tables 2 and 3, ridge width treatments under study *i.e.* planting sole or relay intercropping wheat on ridges with widths of 80, 90 and 100 cm exhibited significant effect on plant height of relay intercropping wheat in the second season, spike length of sole and relay intercropping wheat in both seasons, number of spikelets/spike of sole wheat in both seasons and relay intercropping wheat in the first season, number of grains/spike, 1000-grain weight, grain and straw yields/fed of sole wheat in both seasons, vice versa with respect another characters under study. It was evident that, sowing both sole and relay intercropping wheat on wide ridges (100 cm) produced the highest values of plant height and grain yield of relay intercropping wheat in both seasons, number of spikes/m^2 and straw yield/fed of sole wheat in both seasons, spike length, number of spikelets/spike, number of grains/spike and 1000 – grain weight of sole and relay intercropping wheat in both seasons. On the other hand, sowing both sole and relay intercropping wheat on narrow ridges (80 cm) resulted in the lowest values of all studied characters of both sole and relay intercropping wheat, with exception plant height of sole wheat and number of spikes/m^2 of relay intercropping wheat in both seasons. Such effects of sowing both sole and relay intercropping wheat on ridges with width of 100 cm might have been due to sow wheat with the same rate (60 kg seeds/fed) on top ridge with widths of 40, 50 and 60 cm with left 20 cm from each edge of ridge to sowing cotton as well as improvement in spike length, number of grains/spike and 1000-grain weight. Similar results were reported by several researchers such as Sayre (1997), Sayre and Ramos (1997) and Hussein, Samira (2005).

Effect of interaction:

The interaction between times of two last irrigations and ridge width had insignificant effect on all studied characters of both sole and relay intercropping wheat in both seasons, except number of grains/spike of sole wheat in the first season only (Tables 2 and 3). Significant differences in number of grains/spike were noticed due to the interaction between times of two last irrigations and ridge during of sole wheat in the first season as presented in Table 4. Results indicate that carriying out fourth and fifth irrigations at 15th April and 1st May, respectively and sowing sole wheat on ridges with width of 100 cm significantly increased number of grains/spike and gave maximum value (50.98). On the other hand, the minimum value of this trait (49.25) was yielded due performed fourth and fifth irrigations at 15th March and 1st April, respectively and sowing sole wheat on ridges with width of 80 cm.

Table 4: Number of grains/spike of sole wheat as affected by the interaction between times of two last irrigations and ridge width during 2005/2006 season.

Times of two last irrigations	Ridge width		
	80 cm	90 cm	100 cm
15th March &1st April	49.25	49.56	50.10
1st & 15th April	49.35	50.08	50.51
15th April & 1st May	49.41	50.36	50.98
F. test	*		
LSD at 5 %	0.23		

Competitive Relationships:

Times of two last irrigations of wheat and sowing dates of cotton:

There were significant differences between times of two last irrigations of wheat and sowing dates of cotton were detected on LER and ATER in the two growing seasons of study (Table 5). The highest values of LER and ATER resulted from performing fourth and fifth irrigations of wheat at 15th April and 1st May, respectively and sowing cotton on 15th April in both seasons. On the other side, the lowest means of LER and ATER were obtained from carrying out fourth and fifth irrigations of wheat at 15th March and 1st April, respectively and sowing cotton on 15th March in both seasons. These results are in partial accordance with those found by Hussein, Samira (2005)

Table 5: Land equivalent ratio (LER) and area time equivalent ratio (ATER) as affected by times of two last irrigations of wheat and sowing dates of cotton and ridge width of both wheat and cotton as well as their interaction during 2005/2006 and 2006/2007 growing seasons.

Characters / Treatments	Land equivalent ratio (LER)		Area time equivalent ratio (ATER)	
	2005/2006	2006/2007	2005/2006	2006/2007
A- Times of two last irrigations of wheat and sowing dates of cotton:				
A_1	1.776	1.669	0.882	0.826
A_2	2.030	2.043	1.015	1.022
A_3	2.081	2.075	1.039	1.038
F. test	*	*	*	*
LSD at 5 %	0.033	0.013	0.015	0.007
B- Ridge width of both wheat and cotton:				
80 cm	1.993	1.924	0.993	0.959
90 cm	1.987	1.947	0.992	0.971
100 cm	1.907	1.917	0.951	0.955
F. test	*	NS	*	NS
LSD at 5 %	0.074	-	0.035	-
C-Interaction:	NS	NS	NS	NS

Where: A_1: Time of fourth and fifth irrigation of wheat was 15th March and 1st April, respectively and sowing cotton on 15th March.

A_2: Time of fourth and fifth irrigation of wheat was 1st and 15th April, respectively and sowing cotton on 1st April.

A_3: Time of fourth and fifth irrigation of wheat was 15th April and 1st May, respectively and sowing cotton on 15th April.

Ridge width of both wheat and cotton:

Referring to the effect of ridge width treatments of both wheat and cotton on LER and ATER, it was significant in the first season and insignificant in the second season (Table 5). Sowing both wheat and cotton on ridges with width of 80 cm was the most favorable ridge width treatment that produced the highest average of LER and ATER in the first season. Whereas, in the second season sowing both wheat and cotton on ridges with width of 90 cm produced the highest average of LER and ATER.

Effect of interaction:

The interaction between times of two last irrigations of wheat and sowing dates of cotton X ridge width of wheat had insignificant effect on LER and ATER in both seasons (Table 5).

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دراسات على التحميل المناوب للقمح مع القطن:
١- تـأثير مواعيـد الـريتين الأخيـرتين وعـرض خطـوط زراعـة القمـح علـى نمـو ومحصول القمح

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**** مركز البحوث الزراعية.**

أجريت التجارب الحقلية بقرية أبو حسين - مركز أبو كبير – محافظة الشرقية خلال الموسمين الشتويين ٢٠٠٦/٢٠٠٥ و٢٠٠٧/٢٠٠٦ بهدف دراسة إستجابة القمح (صنف جيزة ١٦٨) المنفرد والمحمل تناوبياً مع القطن لمواعيد الريتين الأخيرتين وعرض خطوط الزراعة للقمح. نفذت التجارب فى تصميم الشرائح المتعامدة فى أربع مكررات.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

١- نتجت أعلى القيم لجميع الصفات تحت الدراسة عند تأخير ميعاد الريتين الأخيرتين للقمح المنفرد والمحمل حتى ١٥ أبريل و ١ مايو على الترتيب فى كلا الموسمين بإستثناء عدد السنابل/م٢ للقمح المنفرد ، عدد السنيبلات/سنبلة للقمح المحمل فى الموسم الثانى ومحصول القش للقمح المنفرد فى كلا الموسمين.

٢- إتضح أن زراعة القمح على الخطوط العريضة (١٠٠ سم) أدى للحصول على أعلى القيم لطول النبات ومحصول الحبوب للقمح المحمل فى كلا الموسمين ، عدد السنابل/م٢ ومحصول القش للقمح المنفرد فى كلا الموسمين ، طول السنبلة ، عدد السنيبلات/سنبلة ، عدد حبوب السنبلة ووزن ١٠٠٠ حبة لكل من القمح المنفرد والمحمل فى كلا الموسمين.

٣- تشير النتائج إلى أن أعلى القيم لصفتى العلاقات التنافسية تحت الدراسة نتجت عند تأخير ميعاد الريتين الأخيرتين للقمح حتى ١٥ أبريل و ١ مايو على الترتيب وزراعة القطن فى ١٥ أبريل فى كلا الموسمين. كما أدت زراعة القمح والقطن على الخطوط الضيقة (٨٠ سم) للحصول على أعلى القيم لصفات العلاقات التنافسية فى الموسم الأول. فى حين أن زراعة القمح والقطن على خطوط بعرض ٩٠ سم أدت للحصول على أعلى القيم لصفات العلاقات التنافسية فى الموسم الثانى.

٤- كان للتفاعل بين عاملى الدراسة تأثيراً غير معنوياً على جميع الصفات تحت الدراسة فى كلا موسمى الزراعة فيما عدا عدد حبوب السنبلة للقمح المنفرد فى الموسم الأول فقط.

من النتائج المتحصل عليها فى هذه الدراسة يمكن التوصية بإجراء الريتين الأخيرتين للقمح فى ١٥ أبريل و ١ مايو على الترتيب والزراعة على خطوط بعرض ١٠٠ سم للحصول على أعلى محصول للحبوب لكل من القمح المنفرد والمحمل تناوبياً مع القطن.

قام بتحكيم البحث

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Table 2: Plant height, number of spikes/m^2, spike length and number of spikelets/spike of sole and relay intercropping wheat as affected by times of two last irrigations and ridge width during 2005/2006 and 2006/2007 growing seasons.

Characters / Treatments	Plant height (cm)				Number of spikes/m^2				Spike length (cm)				Number of spikelets/spike			
	Sole		Relay intercropping		Sole		Relay intercropping		Sole		Relay intercropping		Sole		Relay intercropping	
Seasons	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007
A- Times of two last irrigations:																
15th March &1st April	100.2	97.6	100.5	97.8	381.8	377.9	380.7	381.3	11.57	11.51	11.55	11.37	18.74	21.60	18.71	21.88
1st & 15th April	100.3	97.9	101.0	98.2	381.1	375.8	386.3	386.3	11.60	11.52	11.94	11.52	19.01	21.68	19.05	22.18
15th April & 1st May	100.9	98.3	101.8	98.5	382.3	375.1	388.6	388.6	11.64	11.61	12.40	11.63	19.13	21.68	19.37	21.95
F. test	NS	NS	*	*	NS	*	*	*	NS	*	*	*	*	NS	*	*
LSD at 5 %	-	-	0.6	0.3	-	1.8	3.7	3.8	-	0.07	0.06	0.09	0.08	-	0.05	0.15
B- Ridge width:																
80 cm	100.4	98.1	101.0	97.8	381.4	375.7	385.8	386.4	11.47	11.39	11.84	11.45	18.72	21.33	18.76	21.88
90 cm	100.8	97.7	101.1	97.9	381.9	376.6	384.6	384.6	11.58	11.56	11.99	11.52	19.01	21.71	18.91	21.97
100 cm	100.2	97.9	101.2	98.8	382.0	376.6	385.1	385.1	11.76	11.68	12.06	11.54	19.16	21.91	19.47	22.16
F. test	NS	NS	NS	*	NS	NS	NS	NS	*	*	*	*	*	*	*	NS
LSD at 5 %	-	-	-	0.6	-	-	-	-	0.17	0.12	0.03	0.09	0.06	0.13	0.08	-
C-Interaction:	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3: Number of grains/spike, 1000 – grain weight, grain yield/fed and straw yield/fed of sole and relay intercropping wheat as affected by times of two last irrigations and ridge width during 2005/2006 and 2006/2007 growing seasons.

Characters / Seasons / Treatments	Number of grains/spike				1000 – grain weight (g)				Grain yield (ardab/fed)				Straw yield (t/fed)			
	Sole		Relay intercropping		Sole		Relay intercropping		Sole		Relay intercropping		Sole		Relay intercropping	
	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007	2005/2006	2006/2007
A- Times of two last irrigations:																
15th March &1st April	49.63	47.70	49.58	47.89	41.18	39.17	41.07	38.52	19.56	17.97	19.66	17.93	3.819	3.257	4.431	3.064
1st & 15th April	49.98	48.07	49.88	48.04	41.20	39.23	41.12	38.94	19.66	18.07	19.91	18.53	3.851	3.278	4.347	3.081
15th April & 1st May	50.25	48.13	51.01	48.20	41.20	39.34	41.45	39.18	19.72	18.12	21.03	18.73	3.847	3.259	4.454	3.476
F. test	*	*	NS	*	NS	*	NS	*	*	*	NS	*	*	NS	NS	*
LSD at 5 %	0.13	0.13	-	0.25	-	0.11	-	0.27	0.11	0.08	-	0.24	0.021	-	-	0.11
B- Ridge width:																
80 cm	49.34	47.49	49.96	47.96	41.06	39.06	41.14	38.80	19.38	17.85	20.08	18.28	3.795	3.214	4.364	3.200
90 cm	50.00	47.91	50.18	48.05	41.21	39.16	41.16	38.88	19.68	18.03	20.09	18.39	3.857	3.270	4.436	3.220
100 cm	50.53	48.51	50.34	48.11	41.31	39.52	41.34	38.97	19.89	18.28	20.43	18.51	3.866	3.309	4.433	3.201
F. test	*	*	NS	NS	*	*	NS	NS	*	*	NS	NS	*	*	NS	NS
LSD at 5 %	0.12	0.08	-	-	0.07	0.16	-	-	0.13	0.13	-	-	0.045	0.025	-	-
C-Interaction:	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

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