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EFFECT OF WEED COMPETITION PERIODS AND PLANTING SYSTEMS ON FABA BEAN (*Vicia faba* L.)

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ABSTRACT

Two field experiments were conducted at the Experimental station, Faculty of Agriculture, Cairo University, Giza, Egypt in 2005/2006 and 2006/2007 to study the effect of critical periods of weed competition on Faba bean (*Vicia faba* L). The experiment consisted of two planting systems one side and both of sides on the ridge with ten treatments: weed-free and weedy periods for three weeks, six, nine, and twelve and the all season.

Dominant weed species were weed beet (*Beta vulgaris L.),* Black mustard *(Brassica nigra L.)*, chicory (*cichorium pumilum L.*), spring sowthistle *(Sonchus olereacus L.*), and wild oat *(Avena fatua L.*) Results indicated that weed removal even once after faba bean emergence substantially reduced the growth of annual broadleaf and grassy weeds after 60 days from sowing and at harvest as compared to weedy throughout all the growing season. But , the most effective treatments were when broadleaved or grassy weeds allowed to grow for 3 or 6 weeks after sowing, recording the highest weed depression values (>70%).

In the second order, the allowing weeds to grow for whole growing season markedly decreased seed yield per plant and feddan than when weeds were removed after 6 or more. Also, seed yield was improved by shortening the period of crop-weed interference through keeping the field free from weeds for the whole season or for 9-12 weeks. (75-78 % in seed yield /feddan over the unweeded and 97.2-98.6% during the first and second seasons respectively). However, sowing faba bean on both sides of the ridge produced higher seed yield per feddan, but the differences did not reach the significance level. Sowing on both side of the ridge reduced fresh weight of both of broadleaves and grasses weeds. However, there were different effects of periods of weed removal importance of based on when it was initiated, being more effective if it was early. Thus, demonstrating that weed interference against faba bean in the early growth periods. Seed yield was reduced from 1.5T/fed. for weed free to 0.5 T/fed. for the weedy treatments. There was a slight difference in the yield between 3 and 6 weeks weed-free periods. However there were insignificant differences between weeds free periods. The critical weed-free period was defined as to prevent yield losses greater than 5% and the critical weed free period was estimated by 40 to 50 days.

Keywords: faba bean, weed competition, critical period, yield losses.

INTRODUCTION

Seed legumes are a major source of protein in human and animal nutrition. They play a key role in crop rotations in most parts of the world. Cultivated faba bean is used as human food in developing countries and as animal feed. It can be used as a vegetable, green or dried, fresh or canned. It is one of the most important winter crops for human consumption in the Middle East (Bond et al., 1985). When grown in rotation, they can improve soil fertility. Weeds are a major problem in bean production; Weeds can reduce yields through direct competition for environmental resources

available in limited supply (light, moisture and nutrients) as well as harbor insects and diseases that attack these crops. The critical period of weed competition has been defined as the period during which weeds must be controlled to prevent yield losses. Since the concept of critical period was introduced, it has been used to determine the period when control operations should be carried out to minimize yield losses for many crops. The length of the critical period of weed control may vary depending on the acceptable yield loss.

Early season competition of weed is extremely critical and a major emphasis on control should be made during that period. Weeds present at harvest reduced harvest efficiency and increased mechanical damage to the pods (Stall, 2006). Competition had been defined as " the tendency of neighboring plants to utilize the same quantum of light, ions of mineral nutrient, molecules of water, or volume of space". As a consequence, weeds may significantly reduce yield and impair crop quality, resulting in financial loss to the grower. Thus, it has been estimated that on global basis weeds are considered to be responsible for competition 10% reduction of the crop yield (Froud-Williams, 2002). The critical period of weed control is a concept that to describe the effect of the length and timing of weed competition on crop yield. Understanding of critical period of weed control is one of the most important tools in integrated weed management (Swanton & Weise, 1991). Critical periods have been calculated by mean separations in experiments that evaluated the impact of time of weed competition and time of removal on crop yields. Using the classical approach, it was possible to identify a period within which no statistically detectable yield losses occurred. It had also been concluded that for most field crops it was unnecessary to control weeds in the first few weeks after crop and weed emergence (Zimdahl, 1988). The competitive effect of a given density of weeds emerging with the crop depended strongly on the length of the period they remain in the field (i.e. the time of weed removal). The relationship between the duration of competition and crop yield reduction was approximately sigmoidal: weeds competing for a short period had little effect on crop yield; however allowing weeds to compete for a longer time, the yield reduction increased, until a plateau was reached corresponding to the yield loss caused by weeds competing over the entire growing cycle. Several researchers (Kropff et al., 1993; Frantik, 1994) established the importance of time of emergence of the weeds. Generally, weeds that emerge simultaneously with the crop or shortly after caused severe yields losses at very low densities. Although, when the period of emergence was postponed the magnitude of yield loss decreased. Ford & Pleasant (1994) established that competition from weeds may be reduced when crop germinated quickly and formed a canopy that shaded emerging weed seedlings.

The critical period of weed control is the interval when control is required to provide maximum yield. Weed competition before that period would not affect yield if weeds were controlled by the start of the critical period. Weed competition after the critical period would not affect yield. The beginning of the critical period was defined as the crop stage or days after crop emergence when weed interference reduces yields by a predetermined level.

The end of the critical period was defined as the crop stage or days after emergence until the crop must be free of weeds in order to prevent a predetermined level of yield loss (Hall et al., 1992).

The success of weed control operations depends on the time of weed seedling emergence, weed species and stage of crop growth. If the operation (mechanical or chemical) was too early, there could be a lot of 'weed escapes' because of a loss in the effectiveness of the pre-emergence control, or very few weeds may have emerged for either post-emergence control or mechanical control to be successful. If the operation was too late, weeds may be too mature to be susceptible to herbicides or mechanical control, the crop may be too big for mechanical control to be feasible, or the crop may be at a very sensitive stage to chemicals. Therefore, the strategy should be to control early emerging weeds and not wait for late weed flushes. Weeds that emerge later in the season will have minimal impact on crop yield and their seed production will also be reduced by crop competition. (Shrestha, 2007). However, Hall et al., (1992) pointed out that the critical period of weed competition was not necessarily the time of the most intense interference. Therefore, it might be better to use the term critical period for weed control instead of critical period of weed competition. This concept was closely related to the use of period thresholds defined by Dawson (1986) as the length of time that a crop can tolerate weed competition before yield loss exceeded the cost of control.

Rajender and Singh (1991) indicated that plants grown at 30 cm row spacing showed better performance than 45 and 60 cm row spacing. Increased number of pods / plant in 60 cm row spacing failed to compensate the loss in yield occurring due to reduced plant stand / unit area, in that spacing. Therefore, higher seed yield with 30 cm row spacing was attributed to significantly more number of plants. Abdrabou (1992) reported that seed yield of faba bean was highest with planting two plants in hill spaced 20 cm on both sides of the ridge. But, the lowest seed yield was obtained with the same spacing by planting two plants in hills spaced at 20 cm apart on one side of the ridge. Salih (1992) indicated that seed yield was highest at 3 seed / hill compared with 2 or 4 seed / hill. Increasing the plants from 3 to 4 seed / hill decreased seed yield but increased the number of seeds / pod.

The Objectives of this work are:

1. To define the critical period of weed control.
2. To test the significance between different weed-free periods.
3. To explore the weed communities in Faba bean field.
4. To evaluate the relationship between the periods of weed control and yield losses.
5. To determine the effects of planting systems on weed control and crop yield.

MATERIALS AND METHODS

Two field experiments were conducted at the Experimental station, Faculty of Agriculture, Cairo University, Giza, Egypt through 2005/2006 and 2006/2007winter seasons the aim of this research to study the effect of

critical periods and planting systems on faba bean. Each experiment include 10 treatments for weed competition periods and two planting systems arranged in split plots with randomized complete block design with 4 replicates, weed competition periods in main plots and planting systems in sub plots.

Periods of weed-crop competition

No.	Weed free (weeks after sowing).	No.	Weedy periods (weeks after sowing).
1	3	6	3
2	6	7	6
3	9	8	9
4	12	9	12
5	all season	10	all season

The experimental plot area was 4X5 m contained 5 ridges. Faba bean seeds of ("c.v. Masr1") were sown on 16 and 14 November in the 1st and 2nd seasons, respectively, on one ridge side (the first planting system) and two ridge side (the second planting system), and the hills were spaced at 20 cm apart. Recommended cultural practices for growing faba bean, except the treated weed management.

Data recorded:

a- Weed flora and growth: Two samples were taken at 55 days after sowing and at harvest, from each plot gm/m^2. Weed species were identified and classified into broadleaf and grassy groups, then fresh weight of each group were determined.

B-Faba bean characters: At harvest, ten guarded plants were randomly chosen from each plot to measure seed yield per plant. Seed yield was determined per plot and transformed to feddan.

L.S.D. at 0.05 level of probability was used to compare treatments means.

RESULTS AND DISCUSSION

1-Weed flora and growth:

Dominant annual broad leave and grassy weed species in faba bean experimental plots throughout both seasons were identified. Scientific, family, common and local names of dominant weed species in faba bean at the experimental site in establishment year of 2005/2006 and 2006/2007 seasons are listed in table 1(Weed science, 1984).

a) First sample:

Data presented in table (2) showed that the best broadleaf weed suppression in faba bean field through both seasons. Was in plots kept free from weeds all the season which gave control efficiency about 88.5% and significantly reduced broadleaf –weeds it contrast to other treatments. Weed free for 12 weeks came in the second order by 84.5 % control efficiency. Treatments that left weedy for 3 or 6 weeks and then become weed free reduced fresh weight of broadleaf weeds by 80.5 - 81.4 % through both seasons. The heaviest weed fresh weight was shown in weedy or left without weed removal for 12 or 9 weeks.

Table (3) revealed that weed free periods for all the season ,12 or 9 weeks produced significant narrow leaf weeds suppression (96.9 – 91.0 % control efficiency through both up to all season). seasons). Whereas, worst weed results were shown with weedy treatments (from 9 weeks

Table (1): Dominant weed species in faba bean during 2005/2006 and 2007/2007 seasons.

Weed group	Scientific name	English name	local name
Broadleaved weeds	*Beta vulgaris*	weed beet	Salk
	Emex spinosus	Prickly dock	Dirs EL-'Agouz
	Rumex dentatus	Dentated dock	Hommeid
	Coronopus niloticus	Swinecress	Rashad
	Plantago major	Round-heared plantalin	Lisan ELHamal
	Brassica nigra	Black mustard	Kabbar
	Cichorium pumilum	Chicory	sires
	Ammi majus	Tooth-pick	Khilla
Grasses	*Avena fatua*	Wild oat	Zommer
	Setaria sp.	Yellow fox tail	Del EL-Far.
	Lolium temulemtum	Rye grass	Samma
	Poa annua	Annual blue grass	Poa
	Phalaris minor Retz	Littleseed canarygrass	Shier EL-Far

Table (2) Effect of weed competition periods and planting systems on fresh weight of broadleaf weeds (g /m^2) (at 55 days after planting), during 2005/2006 and 2006/2007 seasons.

Treatments		1st Season				2nd season			
		One side	Two sides	Mean	Control%	One side	Two sides	Mean	Control%
Weed free periods	3 weeks	860.0	543.0	701.6	56	864.5	545.0	704.7	55.5
	6 weeks	541.2	343.5	442.3	72.2	540.5	335.0	437.7	72.3
	9 weeks	535.2	328.7	432.0	72.9	530.0	330.0	430.7	72.7
	12 weeks	295.0	195.0	245.1	84.6	290.0	193.0	244.0	84.5
	All season	188.0	180.0	184.0	88.0	180.0	175.0	177.5	88.5
Weedy periods	3 weeks	309.7	283.0	296.3	81.4	320.5	283.5	302.0	80.9
	6 weeks	317.5	285.0	301.2	81.0	333.0	285.0	309.0	80.5
	9 weeks	1570.0	852.7	1211.3	23.8	1585.0	854.0	1219.5	22.9
	12 weeks	1712.0	1223.5	1467.7	7.8	1764.0	1215.0	1480.7	6.4
	All season	1770.0	1413.7	1591.0	0.0	1755.0	1410.0	1582.5	0.0
Mean		8o9.9	564.8			816.2	562.5		
$LSD_{0.05}$									
Treatments (A)		25.3				16.4			
Systems (B)		NS.				NS.			
Interaction (AB)		40.1				23.1			

b) Second sample:

Excellent broadleaf weed control efficiency through both seasons was achieved with plots either kept weed free all season or (12 weeks) or removed broadleaf weeds after 3 or 6 weeks.(75.5 – 82.4 % control) both of two seasons tables (4) and (5) . While the least reduction of broadleaves fresh weights of was achieved when weeds were removed for 3 weeks after sowing faba bean (28.6 -26.4 % control).

Keeping the crop free from grassy weeds for all season or 12 weeks, or weedy periods for 3 or 6 weeks, gave remarkable control of grassy weeds (80.7 – 92.3 %) as compared to unweeded plots (Table 5).

Generally, planting faba bean on both sides of ridges (heavy plant density) produced more suppression than that planting on one side only (light density). However, their differences were insignificant. Plant coverage by planting on both ridge sides permitted faba bean plants to be better competitors with weeds. Also, short periods of weed-crop competition improved the control of both broad and grassy leaf weeds. Similar results were previously found (Menotti, 1993 and El-Wekil et al, 1992).

Table (3) Effect of weed competition periods and planting systems on fresh weight of grassy weeds (g /m^2) (at 55 days after planting) during 2005/2006 and 2006/2007 seasons.

Treatments		1st Season				2nd season			
		One side	Two sides	Mean	Control%	One side	Two sides	Mean	Control%
Weed free periods	3 weeks	187.2	105.0	146.1	87.1	282.0	155.0	218.5	81.5
	6 weeks	166.0	82.2	124.1	89.1	217.5	117.0	167.2	85.8
	9 weeks	108.0	84.0	96.0	91.5	115.0	94.0	104.7	91.1
	12 weeks	86.5	78.7	82.6	92.7	85.0	80.5	82.7	93.0
	All season	40.0	35.5	37.7	96.6	37.5	34.0	35.7	96.9
Weedy periods	3 weeks	130.2	95.5	112.8	90.1	155.0	115.0	135.0	88.5
	6 weeks	141.5	108.5	125.0	89.0	210.0	190.0	200.0	83.0
	9 weeks	1145.5	967.7	1056.6	7.0	1177.0	988.0	1082.5	8.41
	12 weeks	1194.5	983.5	1089.0	4.1	1210.0	1025.0	1117.5	5.45
	All season	1197.5	1074.5	1136.0	0.0	1214.0	1150.0	1182.0	0.0
Mean		439.7	361.5			463.7	394.9		
LSD 0.05									
Treatments (A)		47.2				15.7			
Systems (B)		NS.				NS.			
Interaction (AB)		72.6				22.2			

Table (4): Effect of weed competition periods and planting systems on fresh weight of broadleaf weeds (g / m$^{2)}$ at harvest through 2005/2006 and 2006/2007 seasons.

Treatments		1st Season				2nd season			
		One side	Two sides	Mean	Control%	One side	Two sides	Mean	Control%
Weed free periods	3 weeks	1320.5	889.0	1104.7	28.6	1409.0	889.0	1149.0	26.4
	6 weeks	844.0	415.0	629.5	59.3	1155.2	805.5	986.0	37.2
	9 weeks	546.0	397.0	471.5	69.5	546.0	420.0	483.0	69.0
	12 weeks	328.2	281.2	304.7	80.3	328.2	297.5	312.8	79.9
	All season	283.7	262.5	273.1	82.4	293.7	262.5	278.1	82.2
Weedy periods	3 weeks	297.5	426.7	362.1	76.6	297.5	433.0	365.2	76.6
	6 weeks	299.7	431.7	365.7	76.4	314.7	450.5	382.6	75.5
	9 weeks	294.7	689.7	492.2	68.2	312.5	814.7	563.6	63.9
	12 weeks	295.0	834.7	564.8	63.5	295.0	819.7	557.3	64.3
	All season	1562.0	1535.5	1548.7	0.0	1577.5	1545.5	1561.5	0.0
Mean		607.1	616.3			652.9	673.8		
LSD 0.05									
Treatments (A)		64.2				37.6			
Systems (B)		NS.				NS.			
Interaction (AB)		91.4				53.2			

2- Faba bean yield:

Allowing weeds to grow for the whole season or 12 weeks after sowing markedly decreased faba bean seed yield per plant or feddan. An addition, both treatments produced significant increase in seed yield per plant and feddan as compared to other treatments table (6). Controlling weeds may improve growth and yield of the crop. Meanwhile, long periods of weed competition for growth requirements (nutrients, water and light) may reduce plant growth and yield. Similar findings were previously mentioned (El-Bially, 1990; Rao, 1992 and Zimdahl, 1993) clearing that a reduction in crop yields had a direct correlation with weed competition periods.

Table (5): **Effect of weed competition periods and planting systems on fresh weight of grassy weeds (g / $m^{2)}$ at harvest, through 2005/2006 and 2006/2007seasons.**

Treatments		1st Season				2nd season			
		One side	Two sides	Mean	Control%	One side	Two sides	Mean	Control%
Weed free periods	3 week	182.50	137.50	160.00	86.8	832.50	487.00	659.75	60.4
	6 week	181.00	120.50	150.75	87.6	532.50	304.00	418.25	74.9
	9 week	170.00	113.25	141.62	88.3	351.00	279.00	315.25	81.1
	12 wee	164.75	91.25	128.00	89.4	194.00	176.00	185.00	88.9
	All season	128.25	92.50	110.37	90.9	135.00	122.50	128.75	92.2
Weedy periods	3 week	138.50	125.25	131.87	89.2	307.00	335.00	321.00	80.7
	6 week	137.75	141.75	139.75	88.5	295.00	313.00	304.00	81.7
	9 week	215.00	149.00	182.00	85.0	315.00	325.00	320.00	80.8
	12 wee	224.50	179.25	201.87	83.4	290.00	335.00	312.50	81.3
	All season	1211.25	1221.25	1216.25	0.0	1888.00	1447.50	1667.75	0.0
Mean		237.15	275.35			514.00	412.40		
$LSD_{0.05}$									
Treatments		11.15				43.35			
Systems (B		NS.				NS.			
Interaction (AB)		15.78				61.31			

Sowing systems did not differ significantly in their plant seed yield values. However, sowing faba bean on both sides of the ridge produced higher seed yield per feddan, but the differences did not reach the significance level. Several researches pointed out that higher crop density reduced weed competition and produced better seed yield (Rajender and Singh, 1991; Abdrabou, 1992 and Salih, 1992).Keeping faba bean free from weeds for the whole season or 12 weeks after sowing resulted in superiority in seed productivity through both seasons. Moreover, plots which were kept weed free for 9 weeks came in the second rank. On the other hand, removing weeds after 3 weeks from sowing produced higher yield significantly than after 6 or more weeks table (7).

Table (6): Seeds weight per plant (gm.) as affected by sowing systems and weed competition periods treatments, during 2005/2006and 2006/2007.

Treatments		1st Season			2nd season		
		One side	Two sides	Mean	One side	Two sides	Mean
Weed free periods	3 weeks	26.1	27.0	26.6	31.2	30.2	30.7
	6 weeks	28.9	28.1	28.5	32.5	30.5	31.5
	9 weeks	23.4	29.2	26.3	35.5	33.0	34.2
	12 weeks	26.9	33.6	30.3	33.2	32.0	32.6
	All season	30.7	33.8	32.2	36.5	31.7	34.1
weedy periods	3 weeks	28.1	24.8	26.4	31.2	30.2	30.7
	6 weeks	23.8	20.5	22.1	30.2	29.5	29.8
	9 weeks	22.5	19.7	21.1	25.2	26.7	26.0
	12 weeks	22.5	16.8	19.6	23.5	20.5	22.0
	All season	18.2	16.4	17.3	19.5	19.2	19.3
Mean		25.0	25.1		28.3	29.8	
$LSD_{0.05}$							
Treatments (A)				5.7		1.7	
Systems (B)				N.S.		S.	
Interaction (AB)				8.0		2.4	

Table (7): Yield k. /fed^{-1} of faba bean as affected by sowing systems and weed competition periods during 2005/2006 and 2006/2007.

Treatments		1st Season				2nd season			
		One side	Two sides	Mean	Yield%	One side	Two sides	Mean	Yield%
Weed free periods	3 weeks	900	960	930.0	69.3	1000	1100	1050.0	89.8
	6 weeks	936	980	958.0	74.5	1040	1120	1080.0	95.3
	9 weeks	942	1000	971.0	76.8	1052	1129	1090.5	97.2
	12 weeks	950	1015	982.5	78.8	1060	1132	1096.0	98.2
	All season	955	1017	986.0	79.6	1062	1135	1098.5	98.6
Weedy periods	3 weeks	710	811	760.5	38.4	680	847	763.5	38.0
	6 weeks	500	760	630.0	14.7	475	780	627.5	13.5
	9 weeks	480	658	569.0	3.64	470	710	590.0	6.7
	12 weeks	460	650	555.0	1.0	454	664	559.0	1.1
	All season	450	648	555.0	0.0	452	654	553.0	0.0
Mean		728.3	849.9			674.5	927.1		
$LSD_{0.05}$									
Treatments (A)				14.0				17.0	
Systems (B)				S.				S.	
Interaction (AB)				41.1				37.6	

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تأثير فترات منافسة الحشائش ونظم الزراعة على محصول الفول البلدى.

عز الدين عمر ابوستيت - محمود حسين الديك و رجب عبسى ابراهيم .
قسم المحاصيل , كلية الزراعة, جامعة القاهرة, الجيزة, جمهورية مصر العربية .

نفذت تجربتين حقليتين فى محطة التجارب الزراعية ,كلية الزراعة, جامعة القاهرة خلال الموسمين ٢٠٠٥/ ٢٠٠٦و ٢٠٠٦/٢٠٠٧ على التوالى. وذلك لدراسة تأثير الفترات الحرجة لمنافسة الحشائش على محصول الفول البلدى.

وقد اشتملت كل تجربة على ١٠ معاملات منها ٥ معاملات خالية من الحشائش لمدة ٣و٦و٩و١٢ اسبوع وخالية من الحشائش طول الموسم و ٥ معاملات اخرى تركت فيها الجشائش دون مقاومة لمدة ٣و٦و٩و١٢ اسبوع وطول الموسم وكانت نظم الزراعة المستحدمة فى كلا التجربتين على ريشة واحدة على الخط والزراعة على ريشتى الخط .وكانت الحشائش السائدة هى السلق والكبروالسريس والجعضيض والزمير.

وقد دلت النتائج على ان إزالة الحشائش ولو لمرة واحدة بعد تكشف نباتات الفول ثبط نمو كل من الحشائش عريضة الاوراق و ضيقة الاوراق بعد ٦٠ يوم من الزراعة و عند الحصاد وذلك بالمقارنة بالقطع التى تركت بدون مقاومة للحشائش طول الموسم. ولكن أظهرت النتائج أن افضل المعاملات كانت عندما سمح للحشائش بالنمو فقط ٣ او ٦ اسابيع بعد الزراعة مسجلة اكثر قيم تثبيط للحشائش وفى المرتبة الثانية فان السماح للحشائش بالنمو طول الموسم خفض محصول البذور معنويا بالنسبة للنبات الواحد و بالنسبة للفدان عن المعاملات التى ازيلت فيها الحشائش بعد ٦ أسابيع من الزراعة او أكثر. كما ظهر من النتائج ان محصول البذور قد تحسن بتقصير مدة منافسة الحشائش لنباتات الفول و ذلك بالمحافظة على الحقل خاليا من الحشائش طول الموسم او لمدة ٩ او ١٢ اسبوع بعد الزراعة (٧٥% – ٧٨ % زيادة فى محصول الفدان بالمقارنة بالقطع التى تركت دون مقاومة فى الموسم الاول ٩٧,٢% –٩٨,٦ % خلال الموسم التجريبى الثانى).

و ظهر من النتائج ان الزراعة على ريشتى الخط أعطت زيادة فى متوسط انتاج البذور للفدان اكثر من الزراعة على الريشة الواحدة. وكذلك الزراعة على ريشتى الخط خفضت من الوزن الاخضر للحشائش العريضة و الرفيعة الاوراق.

كما وجدت تاثيرات مختلفة لفترات إزالة الحشائش إنها اكثر أهمية عند اجرائها مبكراً فى بداية الموسم عنه لو اجريت قى اى وقت اخر, وذلك بسبب مناقسة الحشائش لمخصول الفول فى فترات نموه الاولى .

وانحفض محصول البذور من ١,٥ طن للفدان فى القطع الخالية من الحشائش طول الموسم الى ٠,٥ طن للفدان فى القطع التى تركت دون مقاومة. كما وجدت اختلافات طفيفة فى محصول البذرة بين معاملتى القطع الخالية من الحشائش لفترات ٣ و ٦ اسابيع بعد الزراعة.

كما ظهر من النتائج اختلافات غير معنوية فى المحصول بين باقى المعاملات الخالية من الحشائش لفترات مختلفة و كانت الفترة الحرجة للمحافظة على محصول البذور للفول دون خسائر تزيد عن ٥ % هى بقاء المحصول خالياً من الحشائش لفترة ٤٠- ٥٠ يوم بعد الزراعة .