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Pea (*Pisum sativum* L.) Production as Affected by Differential Cultivars and some Weed Control Treatments

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ABSTRACT

A field experiment was done at Shandaweel Agricultural Res. Station, ARC, throughout 2015/16 and 2016/17 seasons, to investigate the performance of two pea cultivars (Master-B and Balmoral)receiving different weed control treatments (Amex 48% EC rate 1.25 l/fed pre-emergence, Stomp 45.5% CS at 1.7 L/fed pre-emergence, hand hoeing once at 20 days after sowing (DAS)+ Select super EC 12.5 at 500 cm^3/fed, hand weeding once at 20 DAS + Bazagran at 500 cm^3/fed at 40 DAS, Select super + Bazagran, hand weeding two times at 20 and 40 DAS and un-weeded) on weeds, yield and its components in pea. Results revealed that dry weight of grassy and broad-leaved weeds (g/m^2) was decreased in each cultivar when applying the different weeding treatments. Cultivars of pea considerably influenced each of growth traits, yield and its attributes in each season. Pea cultivar of Balmoral decreased dry weight of weeds (g/m^2) and significantly raised plant height, branches number per plant, pod dimension, number of ovules/pod, shell-out%, seed index, green pod yield (ton/fed) and dry seeds yield (kg/fed) relative to pea cultivar of Master-B in the first and second season. Using hand weeding two times at 20, 45 (DAS), hand weeding once at 20 DAS with any of Select or Bazagran at 500 cm^3/fed+Select super gave more decline of the dry weight of tested weeds (g/m^2) in each season. Hand weeding two times, hand hoeing once with any of Select super or Bazagran increased significantly all growth and yield attributes. The impact of interactions between cultivars of pea and weed control strategies were statistically significant effect, as by cultivating Balmoral cultivar using two times of hand hoeing or one time of hand-hoeing with spraying herbicide (select super) surpassed all other treatments in the first and second season.

Keywords: Crop sequence, weed control, Gesagard, Select super, Bazagran, hand hoeing, pea.

INTRODUCTION

Peas (*Pisum sativum* L.) are a legume with marked ably nutritional importance resulted from its high protein concentration, that has been served as an substitute protein source to soybean worldwide in special in countries where the former legume is not a native crop, or in situations where soybean cannot be used (Davidsson *et al*., 2001).

All cultivars available to farmers are extremely susceptible to weeds. So, there is a need for a cultivar of pea having good growth under the competition of weeds and more competitive than weeds. Gilliland and Johnston (1992) verified that fully leafed pea variteis are prone to lodging; suppress the development of the other sown species. So, suitable field pea verities should be selected with special care for intercropping due to this will influence the threat of lodging, that in turn will influence the likelihood of soil contamination of the harvested herbage or the degree of restraint of the undersown crop. Singh and Wright (2002) stated that shoot growth was negatively influenced by herbicides used in two pea cultivars, namely Rex and Guido, but Prometryn and bentazone had fewer injury impacts in two pea varieties Rex than Guido. Branko *et al* (2010) found that pea cultivars (Jezero and Javor) yields did not differ significantly. The Javor varity was more competitive than the associated weeds, with an average proportion of 9.71%, meanwhile the weed proportion in the cultivar Jezero was 11.9%. The weed proportion, as did the red clover proportion, declined as the number of associated crop plants raised.

The weed control strategies include cultural, biological, cultivars, chemical and integrated weed management practices. The farming community of Egypt, both resulted from small holdings prefers to use cultural and chemical practices, that are the most familiar, more effective and essential weed control methods. Dimitrova (1998) observed that weed competition decline the green pod yield of a pea by 44.6-55.6%. Blackshaw (1998) indicated that the hand-weeding method was good enough to control the weed growth in pea. Khan *et al* (2003) proved that pod length, No. of seeds pod^{-1} and pod yield of pea was the highest in hand-weeded, followed by post emergently Metribuzin treated. Blackshaw *et al*. (2006) indicated that reducing herbicide doses within competitive cropping systems have a multi-year approach for weed management. Wagner (2006) double rates of Stomp 330 and sencor 70 WG significantly declined height of shoots and roots of a green pea. Examined pre-emergence herbicides could affected growth characteristics to a varied extent. El-Metwally and Shalby (2007) revealed that number and dry weight of grassy-leaved weeds were considerably declined by fluazifop-p-butyl (3L/fed), cultivated and inoculated soil + fluazifop-p-butyl (2 L/fed.) + One hand weeding and cultivated and inoculated soil + fluazifop-p-butyl (2 L/fed.). Avola *et al*., (2008) found that for field peas, mechanical and weed control can limit herbicides, but they are unable to control weed infestation on their own. Gbor and Erzsbet (2009) proved that Bazagran declined the pea plant shoot dry weight and the yield. El-Dakkak *et al.* (2010) verified that Fusilade S + Bazagran and hand weeding (30-45 DAS) considerably declined the dry weight of studied weeds and raised plant length, number of seed/pod, seed set percentage and number of pods/plant as well as, the heaviest seed index, pod yield (ton/fed) and seed yield (kg/fed) of pea in the first and second seasons relative to un-weeded treatment.

Thus, the purpose of this study was to assess the performance of two pea cultivars receiving different weeding treatments.

MATERIALS AND METHODS

A field experiment was done throughout 2015/16 and 2016/17 winter seasons at Shandaweel Agric. Res. Station, Sohag governorate ARC, to determine the impact of weed control methods on weeds, growth and yield attributes in two cvs. (Master-B and Balmoral) of pea (*Pisum sativum* L.). These treatments were arranged in split–plot design, with four replications. The experiment included 14 treatments include two plant cvs. and seven weed control methods. Pea cultivars were arranged in the

main plots. The sub-plots occupied by seven weed control methods as follow:

1- Amex 48% EC (Butralin) at a rate of 1.25 L/fed pre-emergence.
2- Stomp 45.5% CS (Pendimethalin) at 1.7 L/fed pre-emergence.
3- Hand weeding once at 20 DAS + Select super EC 12.5% (Clethodim) at a rate of 500 cm^3/fed at 40 DAS.
4- Hand weeding once at 20 DAS + Bazagran (Bentazon) at a rate of 500 cm^3/fed at 40 DAS.
5- Select super + Bazagran.
6- Hand weeding two times at 20 and 40 DAS.
7- Unweeded.

Selected herbicides were sprayed by knapsack sprayer after adding tween 20 as wetting agents**.**

Table 1. Trade, common and chemical names of the herbicides used in the experiment.

Trade name	Common name	Chemical name
Stomp Extra 45.5% CS	Pendimethalin	[N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzene- amine]
Amex 48% EC	Butralin	(4-(1,1-dimethylethyl)-N-(1-methylpropyl)-2,6-dinitrobenzenamine)
Bazagran AS 48%	Bentazon	3-(1-methylethyl)-(1H)-2,1-3-Benzo-thiadiazin-4(3H)-one 2,2-(dioxide).
Select super 12.5% EC	Clethodim	[2-[1-[[(3-Chloro-2-propen-1-yl) oxy] amino] propyl]-5-[2-(ethylsulfonyl)propyl]-3, 5-dihydroxy-2-cyclohexen-1-one]

Pea seeds were sown on 10 and 15th of November in the two seasons respectively, 10 cm apart. The experimental plot area was 10.8 m^2, it contained 6 ridges 3 m long and 0.6 m wide. Calcium Superphosphate (15% P_2O_5) was added during soil preparation at 200 (kg/fed). Both potassium sulphate (48% K_2O) at 100 (kg/fed) and ammonium sulphate (20.6 % N) at 200 (kg/fed) were used in two equal portions during the 3rd and 5thweeks from sowing. All agricultural practices were done followed by the Ministry of Agriculture and land reclamation recommendations.

Data recorded

A-Weed : Weeds were hand pulled from one square meter of every plot at 60 DAS, identified, weighted and classified into the following groups: (1) grassy weeds (g/m^2). (2) Broad-leaved weeds (g/m^2). (3) Total grassy and of broad-leaved weeds (g/m^2).

B- Vegetative growth characteristics: plant height (cm) measured from the cotyledonary node to the top of the main stem and a number of branches/plant.

C-Yield and its components: Pod dimension in cm (length and width), number of seeds/pod, shell-out %, seed set %, the number of ovules /pod, pod filling %,seed index (100-green seed weight 'g') and green pod yield (ton/fed), as well as dry seed yield (kg/fed).

The data were statistically analyzed followed by the method delineated by Snedecor and Cochran (1981). Least Significant Differences (LSD-revised) test was applied for comparison among all treatment means.

RESULTS AND DISCUSSION

The foremost recorded weed species in the current investigation were *Avena* spp. (wild oats) and *Phalaris* sp. (canary grass) as annual grassy weeds; *Emex spinosus* (spiny emex), *Chenopodium* sp. (Lambs quarters), *Brassica* sp. (Kabar, black mustard), *Rumexdentatus* (curly dock) and *Sonchus oleraceus* (annual sowthistle) as annual broad-leaved weeds in each season.

A-Effect of pea cultivars on:

1-Dry weight of weeds (g/m^2)

The pea cultivars significantly affected the dry weight (g/m^2) of grassy, broad-leaved and total weeds in 2015/2016 and 2016/2017 seasons. Pea cultivar Balmoral gave a higher decline in the dry weight of studied weeds relative to pea cultivar Master-B in each season. Pea cultivar Balmoral declined the grassy weeds dry weight by 44.29 to 12.67% in both seasons, respectively, relative to pea cultivar Master-B. The broad-leaved weeds were declined with pea cultivars. Balmoral by 22.17 and 1.51% in both seasons, respectively, relative to pea cultivar Master-B. Pea cultivar Balmoral decreased the dry weight of total weeds by 12.96 and 6.02% in either the first or second season, respectively, relative to cultivar Master-B (Table 2). Our findings are in accordance with those indicated by Gilliland and Johnston (1992). Singh and Wright (2002) and Branko *et al* (2010).

Table 2. Effect of pea cultivar on the dry weight of annual weed (g/m^2) in 2015/16 and 2016/17 seasons.

Cultivar	Grassy weeds	Broad-leaved weeds	Total weeds
	2015/16 season		
Master-B	497.88	968.28	1466.16
Balmoral	351.87	946.11	1297.99
$F_{0.05}$	*	*	*
	2016/17 season		
Master-B	500.24	673.53	1173.77
Balmoral	443.62	663.50	1107.15
$F_{0.05}$	*	*	*

2-Vegetative growth

Data in Table 3 proved that there were considerable impacts due to pea cultivars on studied traits in both seasons except number of seeds/pod and number of branches/plant in the 1st and 2nd season, respectively, as well as 100-green seed weight in both seasons Peacultivar Balmoral gave higher effect on plant length (cm), branches number per plant in each season. Pea cultivar Balmoral increased plant height and number of branches/plant and seed index by 45.58, 48.52 and 3.99% and 45.21, 6.56 and 9.45% in each season, with cultivar of Master-B. Our finding could result from the competition of pea plants and associated weeds for nutrients, irrigation and light. The similar observation was introduced by Gilliland and Johnston (1992), Singh and Wright (2002) and Branko *et al* (2010)

Table 3. Effect of pea cultivars on vegetative growth and some yield attributes in 2015/16 and 2016/17 seasons.

Cultivar	Plant height (cm)	No. of branches / plant	Pod Length (cm)	No. of seeds /pod	No. ovules /pod	100 green seed wt. (g)
			2015/2016 season			
Master-B	41.77	1.69	9.68	8.87	9.81	27.81
Balmoral	60.81	2.51	7.27	8.79	7.54	28.92
$F_{0.05}$	*	*	*	NS	*	NS
			2016/2017 season			
Master-B	39.48	2.44	9.61	8.81	9.81	26.57
Balmoral	57.33	2.60	7.01	5.79	7.43	29.08
$F_{0.05}$	*	NS	*	*	*	NS

3- Yield and yield attributes of pea:

Data in Table 4 indicate that yield and yield attributes of pea were considerably influenced by pea cultivars except for shell out and pod filling % in both seasons. Pea cultivar Balmoral increased shell out l %, green yield/plant, green and dry seed yield/fed relative to pea cultivar Master-B in both seasons. Green yield/plant, green pod yield (ton/fed) and dry seed yield (kg/fed) raised through using of pea cultivar Balmoral by 3.72 and 29.28%, 69.09 and 85.56 % and 69.44 and 56.88% in both seasons respectively compared to cultivarMaster-B. The same finding was reported by Gilliland and Johnston (1992), Singh and Wright (2002) and Branko *et al* (2010)

Table 4. Effect of pea cultivars on yield and yield component in 2015/16 and 2016/17 seasons.

Cultivars	Shell-out %	Seed set %	Pod fill %	Green yield /plant(g)	Green yield (ton/fed)	Seed index (g)	Dry seed yield (kg/fed)
			2015/2016 season				
Master-B	44.08	90.45	91.79	20.43	1.10	17.77	0.445
Balmoral	45.35	76.52	79.21	24.31	1.86	15.62	0.754
$F_{0.05}$	NS	*	NS	*	*	*	*
			2016/2017 season				
Master-B	44.02	89.74	91.44	21.21	0.997	17.48	0.487
Balmoral	43.59	77.68	82.29	27.42	1.850	15.60	0.764
$F_{0.05}$	NS	*	NS	*	*	*	*

B- Effect of weed control methods on:

1- Dry weight of weeds (g/m^2):

Data presented in Table 5 indicate that all weed control methods caused considerably impacts on the dry weight of all studied weeds (m^2) in 2015/16 and 2016/17 seasons. Dry weight of grassy weeds/m^2 (*Avena spp.* and *Phalaris spp.*) declined under hand weeding two times at 20, 40 DAS**,** hand weeding once at 20 DAS + Select super at 500 cm^3/fed at 40 DAS and hand weeding once at 20 DAS + Bazagran at 500 cm^3/fed at 40 DAS in the first and second season. Broad-leaved weeds (*Brassica nigra*, *Ammi majus, Chenopodium spp, Sonchus oleraceus* and *Rumex dentatus*) (m^2) showed the great decline under hand weeding two times**,** hand weeding once + Select super and hand weeding once + Bazagran in both seasons. Hand weeding two times**,** hand weeding once + Select super and hand weeding once + Bazagran reduced the dry weight of grassy weeds by (90.35 - 94.22%), (78.79 - 84.23%) and (61.09 - 70.86%) , Broad-leaved weeds by (55.15 - 45.62%), (74.78 - 79.38%) and (60.85 - 66.27%) and total weeds by (89.19 - 90.94%), (75.94 - 81.54%) and (60.92 - 68.32%) compared with un-weeded treatment in 2015/2016 and 2016/2017 experimental seasons. Similar results were introduced by khan *et al*., (2003); Wagner (2006); Blackshaw *et al*., (2006); Avola *et al*., (2008); Gober and Erzsbet (2009) and El-Dakkak *et al*., (2010).

Table 5. Effect of weed control methods on the dry weight of annual weeds (g/m^2) in 2015/16 and 2016/17 seasons.

Weed control treatments	Grassy weeds		Broad-leaved weeds		Total weeds	
	2015/16	2016/17	2015/16	2016/17	2015/16	2016/17
Amex	570.07	603.80	1143.80	949.50	1713.87	1553.30
Stomp	648.74	762.53	1337.87	1150.37	1986.60	1912.90
Hand hoeing once + Select super	164.05	160.62	482.48	261.12	646.53	421.73
Hand hoeing once + Bazagran	300.92	296.82	749.10	427.03	1050.02	723.85
Select super + Bazagran	442.32	402.23	858.13	688.48	1300.45	1090.72
Hand hoeing twice	74.65	58.88	215.68	148.12	290.33	207.00
Unweeded	773.42	1018.67	1913.32	1266.17	2686.73	2284.83
LSD at $_{0.05}$	93.67	37.12	64.37	328.96	103.54	320.21

2-Vegetative growth seed development

Data presented in Table (6) revealed that plant height (cm) and branches number/plant, pod length, number of seeds/pod, number of ovules/pod and green seed index were considerably impacted by the use of weed control methods in the first and second seasons. The greatest values were obtained under the treatment of hand weeding two times, hand weeding once + Select super and hand weeding once + Bazagran compared with un-weeded treatment in both seasons. Hand weeding two times, hand weeding once + Select super and hand weeding once +Bazagran increased number of seeds/pod and seed index

by (53.40, 29.86 and 21.75%) and (78.93, 66.59 and 46.83%), respectively, in the 1st season as well as by (37.28, 28.85 and 24.31%) and (81.87, 69.22 and 53.67%), respectively in the 2nd season relative to un-weeded treatment. This finding leads to getting rid of the accompanied weeds with pea, that declined weeds growth and hence their competition to pea plants. On the other hand, the lowest values of each traits were observed in the un-weeded plots resulted from the high competition between weeds and pea crops. Our findings are in accordance with those introduced by Khan *et al*. (2003) Gbor and Erzsbet (2009) and El-Dakkak *et al*. (2010).

Table 6. Effect of weed control methods on vegetative growth and some yield components in 2015/16 and 2016/17 seasons.

Weed control treatments	Plant height (cm)	No. of branches / plant	Pod length (cm)	No. of seeds /pod	No. ovules /pod	100 green seed wt (g)
		2015/2016 season				
Amex	48.65	1.90	8.25	6.90	8.37	25.05
Stomp	45.77	1.65	7.85	6.47	8.12	23.32
Hand hoeing once + Select super	57.08	2.57	9.45	8.17	9.25	34.40
Hand hoeing once + Bazagran	54.48	2.35	8.75	7.67	9.00	30.32
Select super + Bazagran	51.25	2.12	8.52	7.27	8.70	27.90
Hand hoeing twice	60.50	2.77	9.45	8.53	9.27	36.95
Unweeded	41.28	1.38	7.53	6.30	8.02	20.65
LSD at $_{0.05}$	1.50	0.09	0.26	0.34	0.34	2.04
		2016/2017 season				
Amex	45.67	1.88	8.13	6.93	8.47	25.20
Stomp	43.17	1.67	7.83	6.60	8.08	22.50
Hand hoeing once + Select super	53.58	5.45	8.78	7.95	9.17	33.42
Hand hoeing once + Bazagran	50.92	2.35	8.60	7.67	8.80	30.35
Select super + Bazagran	48.00	2.10	8.32	7.32	5.58	27.63
Hand hoeing twice	57.17	2.83	9.07	8.47	9.25	35.92
Unweeded	40.33	1.37	7.47	6.17	8.00	19.75
LSD at $_{0.05}$	1.41	3.15	0.19	0.31	0.27	1.27

3- Yield and yield component of pea:

Weed control methods considerably raise pea yield and its attributes in 2015/2016 and 2016/2017 (Table 7).

Hand weeding two times, hand weeding once + Select super and hand weeding once + Bazagran gave the maximum values of the shell-out%, seed set%, pod fills %, green yield/plant, green yield/fed, 100-dry seed and dry seed yield/fed.

Table 7. Effect of weed control treatments on yield and yield component in 2015/16 and 2016/17 seasons.

Weed control treatments	Shel-out %	Seed set %	Pod fill %	Green yield/ plant(kg)	Green yield (ton/fed)	100-dry seed weight(g)	Dry seed yield (kg/fed)
			2015/2016				
Amex	41.82	81.34	82.68	17.85	1.25	15.92	0.533
Stomp	38.00	78.36	82.26	14.73	1.04	15.30	0.363
Hand hoeing once + Select super	51.48	88.14	90.72	27.28	1.94	18.07	0.844
Hand hoeing once+Bazagran	48.52	84.54	87.20	23.35	1.69	17.43	0.695
Select super+ Bazagran	45.05	82.75	84.80	20.48	1.46	16.67	0.602
Hand hoeing twice	93.97	91.94	89.77	31.18	2.19	18.80	0.952
Unweeded	34.17	77.31	81.05	10.78	0.78	14.68	0.242
LSD at $_{0.05}$	1.08	6.12	3.87	0.89	0.05	0.19	0.07
			2016/2017				
Amex	41.45	80.83	84.21	20.33	1.22	15.92	0.525
Stomp	39.25	80.75	83.60	17.13	0.995	15.32	0.405
Hand hoeing once + Select super	48.98	86.48	89.95	31.63	1.85	17.42	0.841
Hand hoeing once+Bazagran	46.15	86.43	88.43	28.10	1.61	17.23	0.755
Select super+ Bazagran	43.85	84.20	87.19	23.40	1.43	16.53	0.640
Hand hoeing twice	52.83	91.30	92.83	37.43	2.12	18.68	0.962
Unweeded	34.13	76.08	81.86	12.17	0.753	14.68	0.249
LSD at $_{0.05}$	1.57	4.40	4.36	1.98	0.07	0.55	0.06

The greatest values of yield attributes were obtained with the using of hand hoeing twice, hand hoeing once + Select Super and hand hoeing once + bazagran in all treatments in the first and second season. Hand hoeing twice, hand hoeing once + Select super and hand hoeing once + Bazagran increased the green yield/plant by (189.24, 153.06 and 116.60%) and by (207.56,159.60 and 130.90%), green yield/fed by (180.77, 148.72 and 116.76%) and by (181.54, 145.68 and 113.81%), 100-dry seed weight by (28.07, 23.09 and 18.73%) and by (27.25, 18.66 and 17.37%) and dry seed yield/fed by (293.39, 248.76 and 187.149%) and by (286.35, 237.75 and 203.21%) in 2015/16 and 2016/17 seasons, respectively, compared with un-weeded. These treatments can accelerate the vegetative growth and enhance the photosynthetic activity, increasing carbohydrates and subsequently, yield and its components. The findings are also in accordance with those shown by Khan *et al*. (2003); Wagner (2006); Blackshaw *et al*., (2006); Avola *et al*., (2008); Gbor and Erzsbet (2009) and El-Dakkak *et al*. (2010).

C- Effect of interactions between varieties and weed control treatment on:

1- Dry weight of weeds (g/m^2):

Table (8) proved that all combinations between pea cultivars and weed control method significantly influenced the dry weight of all studied weeds during the first and second season. Hand weeding two times, hand weeding once +Select super and hand weeding once + Bazagran gave the greatest decline in dry weight of studied weeds (g/m^2) when used pea cultivar Balmoral compared with pea cultivars Master-B and un-weeded treatments during the first and second season. Accordingly, the findings were reported by Morrison and Devine (1994) and Jukka *et al*. (2005).

Table 8. Effect of interactions between varieties and weed control treatments on the dry weight of weeds (g/m^2) in 2015/16 and 2016/17 seasons.

Varieties	Weed control treatments	2015/2016			2016/2017		
		Grassy weeds	Broad-leaved weeds	Total weeds	Grassy weeds	Broad-leaved weeds	Total weeds
Master-B	Amex	513.70	928.23	1441.93	413.10	693.97	1107.07
	Stomp	736.63	1336.63	2073.26	806.07	1084.70	1890.77
	Hand hoeing once+ Select super	195.73	498.70	694.43	186.47	268.43	454.9
	Hand hoeing once+ Bazagran	382.00	823.87	1205.87	230.57	373.33	603.9
	Select super+ Bazagran	292.33	1201.63	1493.96	634.07	915.70	1549.77
	Hand hoeing twice	80.53	255.73	336.26	52.83	181.63	234.46
	Unweeded	884.33	1733.17	2617.5	1088.64	1197.00	2285.64
Balmora	Amex	447.90	1085.97	1533.87	573.33	983.30	1556.63
	Stomp	560.83	1339.10	1899.93	719.00	1216.03	1935.03
	Hand hoeing once+ Select super	132.37	466.27	598.64	134.77	253..80	388.57
	Hand hoeing once+ Bazagran	219.83	674.33	894.16	273.07	480.73	753.8
	Select super+ Bazagran	370.93	788.03	1158.96	391.37	683.00	1074.37
	Hand hoeing twice	68.77	175.63	244.4	64.93	114.60	179.53
	Unweeded	662.50	2093.47	2755.97	948.70	1335.33	2284.03
LSD at $_{0.05}$		132.46	91.03	146.43	52.94	465.28	452.73

2-Vegetative growth traits

The interaction between pea cultivars and weed control methods significantly affected plant height (cm) and branches number per plant, pod length, number of seeds/pod, number of ovules /pod and seed index (g) in the 2015/2016 and 2016/2017 seasons (Table 9).

Table 9. Effect of interactions between varieties and weed control treatments on vegetative growth and some yield components traits in 2015/16 and 2016/17 seasons.

Varieties	Weed control treatments	Plant height (cm)	No. of branches / plant	Pod length	No. ovules /pod	No. of seeds /pod	100 G seed Wt(g)
		2015/16 season					
Master-B	Amex	38.63	1.50	9.50	9.33	8.53	24.03
	Stomp	36.53	1.33	8.97	9.00	8.27	22.70
	Hand hoeing once + Select super	47.17	2.10	10.30	10.67	9.53	34.63
	Hand hoeing once+Bazagran	44.63	1.90	10.03	10.17	9.10	28.67
	Select super+ Bazagran	41.17	1.70	9.80	9.83	8.70	26.73
	Hand hoeing twice	50.67	2.23	10.60	10.67	9.93	37.40
	Unweeded	33.57	1.10	8.57	9.00	8.03	20.53
Balmora	Amex	58.67	2.30	7.00	7.40	5.27	26.07
	Stomp	55.00	1.97	6.73	7.23	4.67	23.93
	Hand hoeing once + Select super	67.00	3.03	7.67	7.83	6.80	34.17
	Hand hoeing once+Bazagran	64.33	2.80	7.47	7.83	6.23	31.97
	Select super+ Bazagran	61.33	2.53	7.34	7.57	5.83	29.07
	Hand hoeing twice	70.33	3.30	8.30	7.87	7.13	36.50
	Unweeded	49.00	1.67	6.50	7.03	4.57	20.77
LSD at $_{0.05}$		2.13	0.13	0.37	0.48	0.48	2.04
		2016/17 season					
Master-B	Amex	36.33	1.47	9.43	9.67	8.53	26.40
	Stomp	34.00	1.33	9.26	9.00	8.10	23.67
	Hand hoeing once+Select super	45.17	2.63	10.00	10.67	9.40	34.83
	Hand hoeing once+Bazagran	41.50	1.77	9.87	10.00	9.20	31.70
	Select super+ Bazagran	38.00	1.63	9.70	9.67	8.93	28.93
	Hand hoeing twice	49.67	2.13	10.23	10.67	9.93	37.17
	Unweeded	31.67	1.13	8.80	9.00	7.57	20.83
Balmoral	Amex	55.00	2.30	6.83	7.27	5.33	24.00
	Stomp	52.33	2.00	6.40	7.13	5.10	21.33
	Hand hoeing once+Select super	62.00	3.27	7.57	7.67	6.50	32.00
	Hand hoeing once+Bazagran	60.33	2.93	7.33	7.60	6.13	29.00
	Select super+ Bazagran	58.00	2.57	6.93	7.50	5.70	26.33
	Hand hoeing twice	64.67	3.53	7.90	7.83	7.00	34.67
	Unweeded	49.00	1.60	6.13	7.00	4.77	18.67
LSD at $_{0.05}$		1.99	0.45	0.27	0.39	0.44	1.79

The interaction between Balmoral cultivar and each of hand weeding two times, hand weeding once + Select super and hand weeding once + Bazagran gave the highest values of plant height (cm) and a number of branches/plant. Whereas pod length, number of seeds/pod and number of ovules/pod showed the highest values for the interaction between each of hand weeding two times, hand weeding once +Select super and hand weeding once + Bazagran with Master-B cv throughout the experimental seasonss.

3-Pea yield and its components

The impact of combination between pea cultivars and weed control methods was considered significant on shell-out %, pod filling %, seed set%, seed index, green pod yield (ton/fed) and dry seed yield (kg/fed) in the first and second season (Table 10). Hand weeding two times, hand weeding once + Select super and hand weeding once + Bazagran gave the biggest values of green pod yield (ton/fed) and dry seed yield (kg/fed) for pea cultivars of Balmoral compared with pea cultivars Master-B and un-weeded treatments in each season.

Table 10. Effect of interactions between varieties and weed control treatments on yield and yield components in 2015/16 and 2016/17 seasons.

Varieties	Weed control treatments	Shell-out%	Seed set%	Pod filling %	Green yield /plant (kg)	Green yield (ton/fed	100-dry seed(g)	Dry seed yield (kg/Fed)
			2015/2016 season					
	Amex	40.10	91.48	90.10	17.77	0.910	16.90	0.359
	Stomp	36.70	91.85	92.41	14.60	0.783	16.20	0.264
	Hand hoeing once + Select super	51.80	89.45	92.68	26.07	1.461	19.33	0.671
Master-B	Hand hoeing once+Bazagran	48.00	89.52	90.90	23.43	1.257	18.63	0.531
	Select super+ Bazagran	43.80	88.44	88.85	20.17	1.078	17.80	0.474
	Hand hoeing twice	54.60	93.15	93.59	30.63	1.691	19.97	0.763
	Unweeded	33.57	89.26	94.00	10.37	0.553	15.57	0.138
	Amex	43.53	71.20	75.27	17.93	1.589	14.93	0.707
	Stomp	39.30	64.87	69.67	14.87	1.303	14.40	0.480
	Hand hoeing once + Select super	51.17	86.83	88.77	28.50	2.421	16.80	1.018
Balmoral	Hand hoeing once+Bazagran	49.03	79.56	83.50	23.27	2.123	16.23	0.858
	Select super+ Bazagran	46.30	77.03	80.75	20.80	1.849	15.53	0.729
	Hand hoeing twice	53.33	90.73	85.94	30.73	2.700	17.63	1.142
	Unweeded	34.67	65.36	70.53	11.20	1.016	13.80	0.347
LSD at $_{0.05}$		1.53	8.65	5.48	1.26	0.07	0.27	0.09
			2016/2017 season					
	Amex	41.23	88.30	90.41	17.93	0.820	16.80	0.414
	Stomp	38.43	90.00	87.37	14.87	0.673	16.13	0.304
	Hand hoeing once + Select super	49.97	88.18	94.00	28.50	1.326	18.87	0.629
Master-B	Hand hoeing once+Bazagran	46.37	92.00	93.25	23.27	1.139	18.10	0.602
	Select super+ Bazagran	44.03	92.44	92.07	20.80	0.995	17.40	0.502
	Hand hoeing twice	53.57	93.21	97.07	31.90	1.508	19.60	0.772
	Unweeded	34.57	84.07	85.94	11.20	0.522	15.47	0.185
	Amex	41.67	73.36	78.00	22.73	1.612	15.03	0.637
	Stomp	40.07	71.51	79.83	19.40	1.318	14.50	0.506
	Hand hoeing once + Select super	48.00	84.77	85.89	34.77	2.377	15.97	1.052
Balmoral	Hand hoeing once+Bazagran	45.93	80.67	83.61	32.93	2.074	16.37	0.908
	Select super+ Bazagran	43.67	75.96	82.31	26.00	1.857	15.67	0.779
	Hand hoeing twice	52.10	89.38	88.56	42.97	2.729	17.77	1.152
	Unweeded	33.70	68.10	77.77	13.13	0.984	13.90	0.313
LSD at $_{0.05}$		2.22	6.23	6.16	2.80	0.09	0.77	0.08

CONCLUSION

It could be concluded that peas productivity is greatly affected by competition with weeds. Farmers can enhance weed management strategies by using Balmoral pea cultivar with hand hoeing as a weed control method for sustainable production toward increasing yield and income.

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إنتاج البسلة وتأثره باختلافات الأصناف وبعض معاملات مكافحة الحشائش

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أجريت هذه التجربة بمحطة البحوث الزراعية بشندويل-محافظة سوهاج في الموسم الشتوي ٢٠١٥/٢٠١٦ و٢٠١٦/٢٠١٧م وذلك لدراسة تأثير صنفين من البسلة (بالمورال- ماستر_ B) وسبعة معاملات لمكافحة الحشائش (مبيد اميكس بمعدل ١ لتر/ف بعد الزراعة وقبل الري- مبيد ستومب بمعدل ١,٧٠٠ سم٣/ف بعد الزرعة وقبل الري- عزيق مرة واحدة بعد ٢٠ يوم من الزراعة+ سلكت سوبر بمعدل ٥٠٠سم٣/ف بعد ٤٠ يوم من الزراعة - عزيق مرة واحدة بعد ٢٠ يوم من الزراعة + مبيد بازجران بمعدل ٥٠٠ سم٣/ف بعد ٤٠ يوم من الزراعة - عزيق مرتين بعد ٢٠ و٤٠ يوم من الزراعة و معاملة المقارنة) علي محصول البسلة ومكوناته والحشائش المصاحبة له. وقد أتبع في هذه الدراسة نظام القطع منشقة مرة واحدة في أربعة مكررات حيث وضعت الاصناف في القطع الرئيسية ووزعت معاملات مكافحة الحشائش عشوائياً في القطع الشقية وكانت أهم النتائج المتحصل عليها كما يلي:١- أدت زراعة اصناف البسلة الي انخفاض معنوي في الوزن الجاف للحشائش العريضة والضيقة والكلية في الموسمين. ٢-أثرت أصناف البسلة معنوياً علي الصفات الخضرية ومحصول البسلة ومكوناته في الموسمين. فقد زاد طول النبات وطول وعرض القرن (سم) علاوة علي زيادة عدد البذور وعدد البويضات للقرن ونسبة التصافي ووزن الـ١٠٠ بذرة خضراء (جم) ومحصول القرون الخضراء (طن/ف) ومحصول البذور الجافة (كجم/ف) بزراعة الصنف بالمورال مقارنة بزراعة صنف البسلة ماستر_B. ٣- معاملات مكافحة الحشائش أثرت معنوياً علي الوزن الجاف للحشائش العريضة والنجيلية والكلية في الموسمين. انخفض وزن الحشائش الضيقة وعريضة الأوراق والحشائش الكلية باستخدام العزيق مرتين بعد ٢٠ و ٤٠ يوم من الزراعة او استخدام العزيق مرة واحدة بعد ٢٠ يوم من الزراعة+ سلكت سوبر بمعدل ٥٠٠ سم٣/ف أو العزيق مرة واحدة بعد ٢٠ يوم من الزراعة+ مبيد البازجران بمعدل ٥٠٠ سم/ف في الموسمين مقارنة بمعاملة الكنترول. ٤- أظهرت النتائج أن معاملات مكافحة الحشائش أثرت معنوياً علي الصفات الخضرية والمحصول ومكوناته للبسلة في الموسمين. وقد تم الحصول علي أفضل قياسات فى طول النباتات وطول وعرض القرن علاوة علي زيادة عدد البذور والبويضات/قرن ونسبة التصافي ووزن الـ ١٠٠ بذرة خضراء (جم) ومحصول القرون الخضراء (طن/فدان) والبذور الجافة (كجم/ف) من استخدام العزيق مرتين اواستخدام العزيق مرة واحدة + سلكت سوبر أو العزيق مرة واحدة + مبيد البازجران في الموسمين مقارنة بمعاملة الكنترول. ٥- أظهرت النتائج أن التفاعل بين اصناف البسلة ومعاملات مكافحة الحشائش أثر معنويا علي الوزن الجاف للحشائش الضيقة وعريضة الأوراق والحشائش الكلية وكذلك الصفات الخضرية والمحصول ومكوناته في الموسمين. تم الحصول علي أعلي انخفاض في عدد ووزن الحشائش الضيقة والعريضة والكلية واعلي وزن كل من ومحصول القرون الخضراء (طن/فدان) ومحصول البذور الجافة (كجم/ف) من زراعة صنف البسلة بالمورال واستخدام العزيق مرتين او العزيق مرة واحدة +سلكت سوبر. ٦- توصي هذه الدراسة للحصول علي محصول جيد من محصول القرون الخضراء والبذور الجافة للبسلة وأعلي نسبة نقص في عدد ووزن الحشائش بزراعة صنف البسلة بالمورال مع استخدام العزيق مرتين بعد ٢٠ و٤٥ يوم من الزراعة أوعزيق مرة واحدة +مبيد الحشائش سلكت سوبر بمعدل ٥٠٠سم٣/ف أوعزيق مرة واحدة + بازاجران بمعدل ٥٠٠ سم٣/ف+سلكت سوبر بمعدل ٥٠٠ سم٣/ف.