

**EVALUATION OF FOUR NEW BARLEY CULTIVARS PRODUCTIVITY INTERCROPPED WITH BERSEEM CLOVER AT DIFFERENT SEEDING RATES IN NEW LANDS IN EGYPT**

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**ABSTRACT**

A field experiment was conducted at the Experimental Farm of Ismailia Agricultural Research Center, during the two successive growing seasons of 2012/2013 and 2013/2014. The treatments were arranged in a split-split plot in a randomized complete block design with three replications. Results showed the cutting treatments (without and one cut) had a significant effect on the number of spikes  $m^{-2}$ , 1000-kernel weight(g),the number of kernels/spike, spike kernel weight (g),straw yield (t  $fed^{-1}$ ) grain yield (t  $fed^{-1}$ ) and protein content (%).Except spike kernels weight and straw yield, the cultivar Giza136 (hull-less barley) gave the highest grain yield, yield components and protein content %. On the other hand, cultivars G134 and G 133 showed the highest value for spike kernels weight and straw yield, respectively under the both treatments ( without cutting and one cut). The best intercropping system was obtained from intercropping barley cultivar G136 (37.5 kg seeds/fed.) and berseem Helaly cultivar (6.25 kg seeds/fed.). Moreover, the maximums value for spike kernel weight and straw yield were obtained under intercropping system of 75% of barley cultivars (G134 or G133) with berseem 25% of cultivar Helaly. The hull-less barley cultivars outyielded the hulled barley cultivars under the both treatments (without cutting and one cut).

**Keywords:** *barley, berseem clover, intercropping, seeding rate.*

**1. INTRODUCTION**

Intercropping cereals with legumes for forage or food production is used in many parts of the world for soil conservation. Intercrops including legumes is known to enhance forage crude protein concentration compared with cereal sole cropping, and to use resources more efficiently (Anil *et al.*, 1998; Papastylianou, 2004). Monocultures of legumes or cereals do not provide in some cases, satisfactory results for forage production (Osman and Nersoyan, 1986). In particular, forage quality of small grain between cereals proveds, high yields in terms of DM but they produce forage with low crude protein (Lawes and Jones, 1971). In intercropping, competition cereals provide structural support for legume growth, improve light interception, and facilitates mechanical harvest, while legumes generally increase the protein and mineral content of forage (Robinson, 1969). Crop species, seeding rates, and competition between mixture components may affect yield

and quality of forage produced by intercrops (Caballero *et al.* 1995). The main use of barley in Egypt is animal feeding. Recently, a new interest was born by using barley grains as human food especially the hull-less cultivars. Barley growers grow barley in Egypt to produce the crop as dual purposes, i. e. for feed and food. The traditional, if the season comes rainy, the farmers leave the sheep and goats to graze the plants lightly as green forage at the beginning of tillering stage, and the plants will grow again to produce heads, in turn grain yield. If the season comes droughty (low precipitation), the farmers leave their animals to graze the barley plants sharply. Barley biomass (straw and grains) used as dry forage in the desert during summer. Intercropping, which is defined as the growing of two or more crop species simultaneously in the same field during a growing season (Ofori and Stem 1987), is important for the development of sustainable food production system, particularly in cropping systems with

limited external inputs. Adesogan *et al.* (2000), found that all mixtures of vetch and barley had significantly higher digestible dry matter. The effects of seeding rates on yield and yield components of this intercrop are also limited in the literature. Different cultivars of spring barley react differently to increasing sowing rate (Jedel, and Helm, 1995). A good malting quality of the cultivars is related to a low protein content of the grain, while the reverse is true of fodder quality.

The objective of this study was to evaluate yield and yield components of new four cultivars of barley when intercropped with berseem clover under different seeding rates in new lands of Egypt

## 2. MATERIALS AND METHODS

Two field experiments were conducted at Ismailia Experimental Station Farm, ARC, in 2012/2013 and 2013/2014 winter seasons without cutting. To evaluate yield and yield components of barley four early maturing, cultivars (Giza 133, Giza 134 (hulled barley) and Giza 136, Giza 135 (hull-less barley)) and Helaly (berseem clover) were planted under 4 seeding rates and two cutting treatments (without cutting and one cut after 45 days from planting. Soil physical and chemical analyses of the experimental site was conducted in 2012/2013 and 2013/2014 seasons (Table 1).

Barley and berseem clover were planted in alternative rows at the same row spacing. Plot size was 4.80 m<sup>2</sup>. Each plot contained 8 rows spaced 20 cm apart within 3.0 m wide X 2.0 m long. All plots received 30 P<sub>2</sub>O<sub>5</sub> kg fed<sup>-1</sup>. Potassium Sulphate (48% K<sub>2</sub>O) added at the rate of 50 kg/fad<sup>-1</sup> before sowing. Nitrogen fertilizer was added as Ammonium Nitrate (33.5% N) at the rate of 60 kg N fed<sup>-1</sup> The amount of nitrogen fertilizer was added as three equal doses, *i.e.*, the first at sowing, the second at shooting, *i. e.*, 35 days after planting and the third at booting, *i.e.* 70 days after planting. Cutting started when plants reached 50cm tall and the stubble height was about 5 cm. The experimental units arranged in a randomized complete block in split-split-plot design with three replicates. The main plot, sub-plot and sub-sub plot were occupied by the factors cutting treatments, cultivars and seeding rates, respectively. The sub-sub plot included four seeding rates, solid barley 100% barley (50 kg of seeds fed<sup>-1</sup>), 75% barley (37.5 kg seeds fed<sup>-1</sup>) + 25% berseem (6.25 Kg seeds fed<sup>-1</sup>), 50% barley (25 kg seeds fed<sup>-1</sup>) + 50% berseem (12.5

kg seeds fed<sup>-1</sup>) and 25% barley (12.5 kg seeds fed<sup>-1</sup>) + 75% berseem (18.75 kg seeds fed<sup>-1</sup>). Statistical analysis was conducted according to the procedure outlined by (Snedecor and Cochran 1980) using MSTAT-C computer program ver.4 (1986). Four early maturing, six rows barley cultivars Giza 133, Giza 134 (hulled barley) Giza 136, Giza 135 (hull-less barley) and Helaly (berseem clover) were planted under 4 seedling rates and two cutting treatments (without cutting and one cut after 45 days from planting. Yield and yield components, *i.e.*, the number of spikes m<sup>2</sup>, 1000-kernel weight (g), the number of kernels/spike, spike kernel weight (g), straw yield (t fed<sup>-1</sup>), and grain yield (t fed<sup>-1</sup>). Once harvested, the barley crop was evaluated for grain yield, grain yield components, protein content (Kjeldahl method; N X 6.25), fiber and ash percentage. Chemical analysis followed the conventional methods outlined by the Association of Official Chemists (A. O. A. C., 1990). Seed samples were analyzed in the Seed Technology Research Dept., Field Crops Research Institute ARC, Giza. Egypt.

## 3. RESULTS AND DISCUSSION

### 3.1. Yield and yield components

#### 3.1.1. Number of spikes m<sup>-2</sup>

Significant differences for the number of spikes m<sup>-2</sup> were observed between all treatments, except for cut x cultivar and intercropping x cut in both two seasons. Giza 136 had the highest number of spikes m<sup>-2</sup> of solid barley at no cut and one cut (688.91 and 456.30), respectively Table (2). Number of spikes m<sup>-2</sup> of solid barley cultivar Giza 136 at no cut and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 18.37, 15.29 and 6.53% at no cutting, 17.60, 11.88 and 16.66% at one cut, respectively. Number of spikes m<sup>2</sup> of Giza 136 at no cut exceeded that one cut 19.66%. The highest number of spikes m<sup>-2</sup> was given in intercropping 75% barley C V Giza 136 with 25 % berseem at the first season exceeded that of one cut by 26.89%. In the second seasons Giza 136 had the highest number of spikes m<sup>-2</sup> of solid barley at seeding rate of at no cut (675.31) and one cut (571.33) Table (2). The number of spikes m<sup>-2</sup> of solid barley cultivar Giza 136 at no cut and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 18.05, 12.57 and 2.69% at no cut, 17.65, 15.21 and 12.56% at one cut, respectively. The highest intercropping 75% barley cv Giza 136 with 25 % berseem cv Helaly in both no and one cut exceeded that of

**Table(1): Soil physical and chemical analysis of the experimental site at Ismailia in 2012-2013 and 2013-2014 seasons.**

Season	Available (ppm)			Ph	Ec,mm b/cm	CaCo <sub>3</sub>	Clay%	Site%	Fine%	Soil texture*
	N	P	K							
2012/2013	19	8.2	70.20	7.4	0.06	21.0	5.08	1.30	93.4	Sandy Soil
2013/2014	1.91	8.4	71.0	7.7	0.06	20.8	5.10	1.28	93.5	

\*Textural classes according to the triangular diagram.

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**Table( 2): Means of the number of spike /m<sup>2</sup> and 1000 -kernels weight (g) of barley cultivars as affected by cutting treatments and seeding rates in 2012/2013 and 2013/2014 seasons.**

	Varieties	Seedling rats*	Number of spike/ m <sup>2</sup>		1000 kernel weight (g)	
			Season 1	Season 2	Season 1	Season 2
			<b>No cut</b>			
<b>No cut</b>	<b>Giza 133</b>	1	562.23	553.22	59.30	62.33
		2	368.13	383.14	47.03	49.19
		3	335.03	326.40	36.55	41.06
		4	262.19	265.34	31.81	34.49
	<b>Giza 134</b>	1	583.51	590.36	63.21	66.23
		2	422.72	432.45	46.65	45.18
		3	375.83	371.27	39.04	40.24
		4	333.43	300.40	33.15	34.57
	<b>Giza 136</b>	1	688.91	675.31	69.71	71.20
		2	448.23	435.88	54.92	55.32
		3	395.51	407.64	48.84	49.64
		4	352.99	366.15	42.35	45.27
	<b>Giza 135</b>	1	643.87	657.10	64.30	68.31
		2	425.46	430.45	54.83	52.53
		3	386.19	379.89	46.22	46.35
		4	334.95	330.47	35.12	40.54
<b>One cut</b>	<b>Giza 133</b>	1	456.30	470.48	43.21	50.11
		2	322.92	333.09	33.23	34.73
		3	267.52	295.03	27.11	27.95
		4	214.07	189.33	20.30	22.30
	<b>Giza 134</b>	1	487.63	493.27	45.30	47.68
		2	265.35	321.00	38.23	34.31
		3	243.37	259.56	29.99	26.91
		4	203.03	209.29	24.22	21.49
	<b>Giza 136</b>	1	553.41	571.33	49.53	56.23
		2	327.63	329.34	38.36	36.32
		3	271.73	252.13	31.81	31.55
		4	210.68	213.41	25.89	26.68
	<b>Giza 135</b>	1	461.20	430.25	42.77	49.17
		2	286.68	336.41	33.98	33.94
		3	230.10	222.18	26.95	27.44
		4	200.12	208.98	20.67	22.07
<b>C V%</b>			12.33	6.14	3.70	4.05
L. S. D at 0.05 for Cut (C)			59.63	22.61	4.23	3.26
L. S. D at 0.05 for Varieties (V)			32.72	20.63	2.01	2.90
L. S. D at 0.05 for C x V			N.S	29.18	N.S	4.11
L. S. D at 0.05 for Seeding rate (S)			48.84	12.24	0.791	0.872
L. S. D at 0.05 for Sx C			23.42	N.S	N.S	N. S
L. S. D at 0.05 for S x V			46.84	24.48	1.58	1.74
L. S. D at 0.05 for S x V x C			66.24	34.62	2.24	2.46

1-100% barley (50 kg/fed). 2-\*75% barley – 25% berseem (37.5 barley + 6.25 berseem kg/fed)

3-\*50% barley-50% berseem ( 25 barley + 12.5 berseem kg/fed)

4-\*25% barley-75% berseem ( 12.5 barley + 18.75 berseem kg/fed).

one cut 24.44% (Table 2) at the second season.

### **3.1.2. 1000-kernel weight**

The data for 1000-kernel weight in Table (2) shows significant differences among, cutting, cultivars, intercropping and their interactions except for cut x cultivar and intercropping x cut in both seasons. Giza 136 had the highest 1000-kernel weight of 69.71g<sup>-1</sup> solid barley at no cut and one cut (49.53 g<sup>-1</sup>) Table (2). 1000-kernel weight of solid barley cultivar Giza 136 at no cut and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 14.93, 9.32 and 7.76% at no cut, 12.76, 8.54 and 13.64% at one cut, respectively. 1000-kernel weight of Giza 136 at no cut exceeded that in one cut by 23.69%. The highest 1000-kernel weight was found in intercropping 75% barley cv Giza 136 with 25 % berseem cv in at no and one cut exceeded that of one cut 24.55% at the first season. At the second season Giza136 had the highest number of 1000-kernel weight of solid barley at no cut (675.31g<sup>-1</sup>) and one cut (571.33g<sup>-1</sup>) Table (2). 1000-kernel weight of solid barley cultivar Giza 136 at no cutting and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 12.45, 6.98and 4.06% at no cutting, 12.21, 15.20 and 12.56% at one cut, respectively. The highest 1000-kernel weight was found in intercropping 75% barley cv Giza 136 with 25 % berseem in both no and one cut exceeded that of one cut34.71% at the second season The results of 1000-kernel weight are in harmony with those obtained by Sara *et al.* (2014).

### **3.1.3. Number of kernels/spike**

Results in Table 3 shows that, the number of kernels/spike was highly significantly affected by cut, cultivars, seeding rate and their interactions in both seasons. Data in Table (3) indicate that, the number of kernels/spike of (68.54) solid barley cultivar barley Giza 136 gave the highest value at no cut and one cut (65.84) in the first season. The number of kernels/spike of solid barley cultivar Giza 136 at no cut and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 5.41, 1.55 and 2.07% at no cut, 8.44, 6.80 and 2.28% at one cut, respectively. The number of kernels/spike of Giza 136 at no cut exceeded that of one cut by 3.93%. The highest number of kernels/spike was found in intercropping of no cut and one cut were 75% barley Giza 136 + 25% cultivar berseem, in the first season (66.15 and 62.49), respectively (Table 3). The number of kernels/spike of intercropping barley 75%

barley cv Giza 136 with 25 % berseem cv at no cut exceeded that of one cut 5.85% in the first season. In the second season data in Table (3) indicate that, the number of kernels/spike of solid barley 50 kg/fed<sup>-1</sup> cultivar barley Giza 136 gave the highest value at no cut (68.91) and one cut (64.95) in the second season. The number of kernels/spike of solid barley cultivar Giza 136 at no cut and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 3.60, 3.63 and 3.98% at no cut, 6.54, 6.98 and 4.34% at one cut, respectively. The number of kernels/spike of Giza 136 at no cutting exceeded that one cut by 5.75%. The highest number of kernels/spike was given in intercropping of no cut and one cut barley Giza 136 75% + 25% cultivar berseem in the second season (67.22 and 62.76, respectively) Table (3). The number of kernels/spike of intercropping barley cv Giza 136 75% with 25 % berseem cv at no cut exceeded that of one cut 6.63% in the second season. These results are in harmony with those obtained by Martiniello (1999).

### **3. 1. 4. Spike kernels weight**

The data in Table (3) shows, for spike kernels weight of the first and second seasons that there were highly significant effects for cutting, cultivars, seeding rate, and their interactions on spike kernels weight in both season. The data in Table (3) shows that, spike kernels weight of solid barley cultivar barley Giza 134 gave the highest value at no cut (2.93 g) and one cut (2.10 g) in the first season. Spike kernels weight of solid barley cultivar Giza 134 at no cut and one cut exceeded that of cultivars Giza 133, Giza 136 and Giza 135 by 37.20, 19.13 and 31.75% at no cut, 22.85, 7.14 and 8.33% at one cut, respectively. Spike kernels weight of Giza 134 at no cut exceeded that one cut by 28.32%. The highest spike kernels weight was given in intercropping of no cut and one cut of barley Giza 134 (75%) + berseem (25%) in the first season (1.92 and 1.88 g), respectively,as in (Table 3). Spike kernels weight of intercropping barley cv Giza 134 75% with 25 % berseem, showed that, spike kernels weight of solid barley cultivar barley Giza 134 gave the highest value at no cut (2.96 g) and one cut (2.00 g) in the second season. Spike kernels weight of solid barley cultivar Giza 134 at no cutting and one cut exceeded that of cultivars Giza 133, Giza 136 and Giza 135 by 32.47, 9.45 and 29.73% at no cut, 1.05, 1.00 and 8.50% at one cut, respectively. Spike kernels weight of Giza 134 at no cut exceeded that one cut 28.32%. The

**Table( 3): Means of number of the kernels / spike and spike kernel weight (g) of barley cultivars as affected by cutting treatments and seeding rates in 2012/2013 and 2013/2014 seasons.**

	Varieties	Seeding rate*	Number of kernels / spike		Spike kernel weight (g)	
			Season 1	Season 2	Season 1	Season 2
No cut	Giza 133	1	64.83	66.43	1.84	1.98
		2	63.04	62.33	1.62	1.60
		3	61.71	60.44	1.49	1.7
		4	59.60	57.33	1.34	1.86
	Giza 134	1	67.48	66.41	2.93	2.96
		2	64.81	64.63	1.92	1.99
		3	63.31	56.46	1.89	1.82
		4	60.31	52.44	1.69	1.73
	Giza 136	1	68.54	68.91	2.37	2.68
		2	66.15	67.22	1.83	1.97
		3	64.54	65.02	1.76	1.68
		4	61.89	62.55	1.65	1.49
Giza 135	1	67.12	66.27	2.00	2.08	
	2	65.18	64.33	1.77	1.78	
	3	62.47	60.12	1.68	1.76	
	4	61.18	60.23	1.44	1.40	
One cut	Giza 133	1	60.28	60.70	1.62	1.98
		2	57.63	57.31	1.52	1.60
		3	46.47	51.22	1.42	1.7
		4	43.48	46.39	1.35	1.86
	Giza 136	1	65.84	64.95	1.95	1.98
		2	62.49	62.76	1.78	1.73
		3	56.96	58.23	1.50	1.49
		4	54.39	51.30	1.46	1.41
	Giza 135	1	64.34	62.13	1.80	1.83
		2	59.90	60.11	1.63	1.75
		3	58.15	58.71	1.52	1.78
		4	56.30	57.33	1.42	1.76
C V%			2.11	1.24	2.38	3.15
L. S. D at 0.05 for Cut (C)			5.33	4.52	2.38	3.15
L. S. D at 0.05 for Varieties (V)			3.54	7.63	1.14	1.11
L. S. D at 0.05 for C x V			5.31	6.10	4.88	5.10
L. S. D at 0.05 for Seeding rate (S)			3.10	4.11	7.10	7.33
L. S. D at 0.05 for S x C			6.22	5.87	4.66	5.40
L. S. D at 0.05 for S x V			5.40	4.22	7.20	8.11
L. S. D at 0.05 for S x V x C			7.12	6.14	5.66	6.66

1-100% barley (50 kg/fed). 2-\*75% barley – 25% berseem (37.5 barley + 6.25 berseem kg/fed)

3-\*50% barley-50% berseem ( 25 barley + 12.5 berseem kg/fed)

4-\*25% barley-75% berseem ( 12.5 barley + 18.75 berseem kg/fed)

highest spike kernels weight was given in intercropping of no cut and one cut barley Giza 134 (75%) + 25% berseem in the second season (1.99 and 1.90 g), respectively (Table 3). Spike kernels weight in intercropping barley cv Giza 134 (75%) with 25 % berseem at no cut exceeded that of one cut 4.53% in the second season. These results are in harmony with those obtained by Sara *et al.* (2014).

### 3. 1. 5. Straw yield

Data in Table (4) shows highly significant effect for cutting, cultivars, seeding rate, and their interactions in both seasons. The data in

Table (4) shows that, straw yield of solid barley 50 kg/fed<sup>-1</sup> cultivar barley Giza 133 gave the highest value at no cut (5.20 t fed<sup>-1</sup>) and one cut (2.85 t fed<sup>-1</sup>) in the first season. For straw yield of solid barley cultivar Giza 133 at no cutting and one cut exceeded that of cultivars Giza 134, Giza 136 and Giza 135 by 20.96, 30.77 and 25% at no cutting, 11.22, 6.67 and 12.98% at one cut, respectively. Straw yield of Giza 133 at no cutting exceeded that of one cut 51.53%. The highest straw yield was given by intercropping of no cut and one cut barley Giza 133 (75%) + 25% berseem in the first season (3.85 and 2.62 t

**Table (4): Means of straw yield (t fed<sup>-1</sup>) and grain yield (t fed<sup>-1</sup>) of barley cultivars as affected by cutting treatments and seeding rates in 2012/2013 and 2013/2014 seasons.**

	Varieties	Seeding rate*	Straw yield (t fed <sup>-1</sup> )		Grain yield (t fed <sup>-1</sup> )	
			Season 1	Season 2	Season 1	Season 2
No cut	Giza 133	1	4.20	5.88	1.96	1.51
		2	3.45	3.24	1.88	1.90
		3	2.62	2.66	1.79	1.71
		4	2.16	2.22	1.47	1.47
	Giza 134	1	4.11	4.96	2.07	2.08
		2	2.48	2.58	1.85	1.91
		3	2.30	2.48	1.75	1.70
		4	1.92	2.10	1.61	1.56
	Giza 136	1	3.60	4.55	2.36	2.39
		2	3.26	3.25	2.02	1.99
		3	3.18	3.21	1.87	1.82
		4	2.67	2.79	1.64	1.65
	Giza 135	1	3.90	3.82	2.23	2.24
		2	3.47	3.54	1.81	1.90
		3	2.66	3.07	1.63	1.59
		4	2.22	2.36	1.46	1.49
One cut	Giza 133	1	2.85	3.09	1.51	1.34
		2	2.32	2.67	1.51	1.48
		3	1.71	2.05	1.37	1.32
		4	1.33	1.88	0.98	1.01
	Giza 134	1	2.53	2.67	1.71	1.63
		2	2.42	2.69	1.56	1.62
		3	1.94	2.17	1.32	1.24
		4	1.28	1.74	1.12	1.17
	Giza 136	1	2.66	2.77	1.83	1.79
		2	1.97	1.87	1.76	1.63
		3	2.08	2.41	1.53	1.47
		4	1.73	2.00	1.25	1.26
	Giza 135	1	1.86	2.45	1.72	1.63
		2	2.48	2.58	1.67	1.56
		3	2.04	2.08	1.41	1.39
		4	1.43	1.74	1.23	1.23
C V%			6.51	5.15	4.90	3.86
L. S. D at 0.05 for Cut (C)			0.064	0.084	0.882	0.924
L. S. D at 0.05 for Varieties (V)			0.269	0.133	0.785	0.506
L. S. D at 0.05 for C x V			N.S	0.189	N.S	0.717
L. S. D at 0.05 for Seeding rate (S)			0.091	0.108	0.318	0.278
L. S. D at 0.05 for S x C			0.129	0.153	0.450	0.394
L. S. D at 0.05 for Sx V			0.182	0.216	0.637	0.557
L. S. D at 0.05 for S x V x C			0.258	0.306	0.900	0.964

1-100% barley (50 kg/fed).

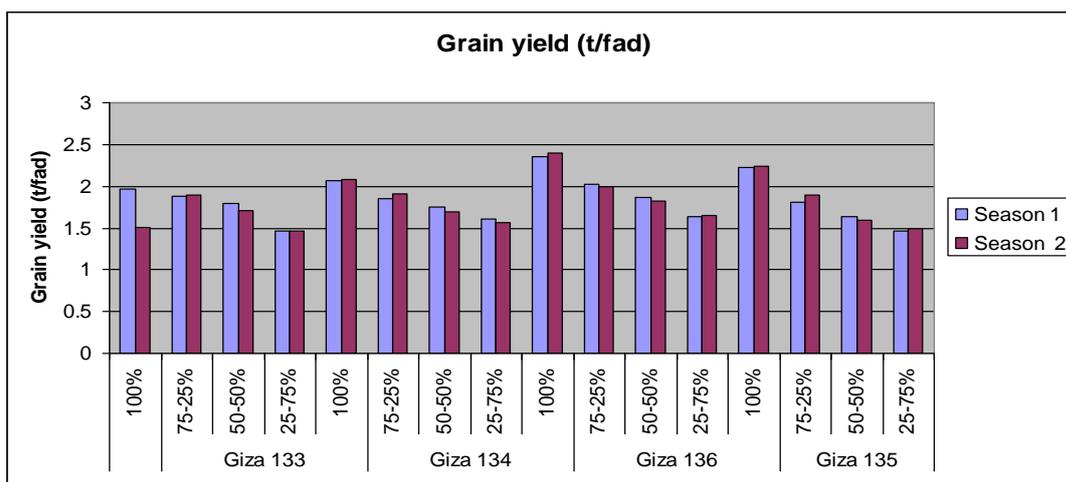
2-\*75% barley – 25% berseem (37.5 barley + 6.25 berseem kg/fed)

3-\*50% barley-50% berseem ( 25 barley + 12.5 berseem kg/fed)

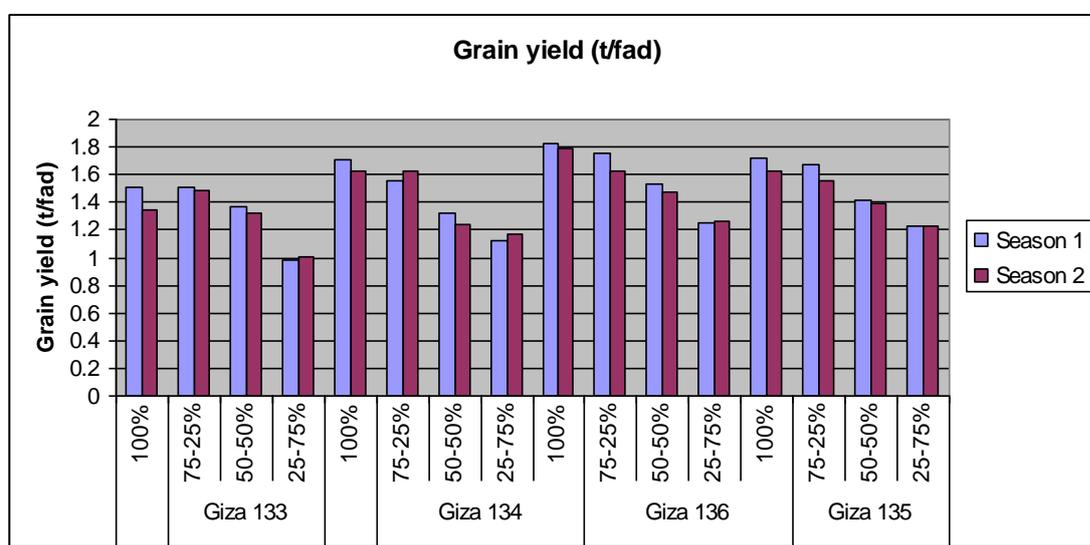
4-\*25% barley-75% berseem ( 12.5 barley + 18.75 berseem kg/fed)

fed<sup>-1</sup>), respectively (Table 4). Straw yield of intercropping barley C V Giza 133 (75%) with 25 % berseem cv at no cut exceeded that of one cut 31.95% in the first season. The data in Table (4) showed that in the second season, straw yield of solid barley cultivar barley Giza 133 gave the highest value at no cut (5.88 t fed<sup>-1</sup>) and one cut

(3.09 t fed<sup>-1</sup>) in the second season. Straw yield of solid barley cultivar Giza 133 at no cut and one cut exceeded that of cultivars Giza 134, Giza 136 and Giza 135 by 15.64, 22.62 and 35.03% at no cutting, 13.60, 10.36 and 20.71% at one cut, respectively. The highest straw yield was given by intercropping of no cut and one cut were



**Fig. (1): Means of grain yield (t fad<sup>-1</sup>) of barley cultivars as affected by no cutting treatments seeding rats in 2012/2013 and 2013/2014 seasons.**



**Fig. (2): Means of grain yield (t fad<sup>-1</sup>) of barley cultivars as affected by one cutting treatments seeding rats in 2012/2013 and 2013/2014 seasons.**

barley Giza 133(75%) + 25% berseem in the second season (66.15 and 67.22 t fed<sup>-1</sup>), respectively (Table 4). Straw yield of intercropping barley cv Giza 133(75%) with 25 % berseem at no cut exceeded that of one cut 32.23% in the second season.

**3. 1. 6. Grain yield**

The data in Table (4) shows highly significant effects for cutting, cultivars, seeding rate, and their interactions in both seasons. The data in Table (4) shows that, grain yield of solid barley Giza 136 (100%) gave the highest value at no cut (2.36 T fed<sup>-1</sup>) and one cut (1.83 T fed<sup>-1</sup>) in the first season. For grain yield of solid barley cultivar Giza 136 at no cutting and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 16.80, 12.27 and 5.50% at no

cutting, 17.14, 6.56 and 5.98% at one cut, respectively. Grain yield of Giza 136 at no cutting exceeded that of one cut 22.45%. The highest grain yield was given by intercropping of no cut and one cut barley Giza 136 (75%) + 25% cultivar berseem C V in the first season 2.02 and 1.76 T fed<sup>-1</sup>), respectively (Table 4). Grain yield of intercropping barley cv Giza 136 (75%) with 25 % berseem cv at no cut exceeded that of one cut 12.50% in the first season. Data in table (4) shows that, grain yield of solid barley (100% barley) cultivar barley Giza 136 gave the highest value at no cut (2.39 T fed<sup>-1</sup>) and one cut (1.79 T fed<sup>-1</sup>) in the second season. Grain yield of solid barley cultivar Giza 136 at no cut and one cut exceeded that of cultivars Giza 133, Giza 134 and Giza 135 by 37.09, 13.13 and 6.62% at no

cutting, 24.73, 8.74 and 8.67% at one cut, respectively. The highest grain yield was by intercropping of no cut and one cut were 75% barley Giza 136 + 25% cultivar berseem in the second season (1.99 and 1.63 T fed<sup>-1</sup>), respectively (Table 4). Grain yield was given of intercropping barley cv Giza 136 (75%) with 25 % berseem cv at no cut exceeded that of one cut 18.25% in the second season. Ross *et al.* (2004 a and b) reported that at intercropping of barley and vetch maximum grain yield was belong to sole barley culture. These results are in harmony with those obtained by Holland and Brummer (1999) and Sara *et al.* (2014).

### 3. 2. Chemical composition of barley seeds

The data in Table (5) shows a significant effect of cutting, cultivars, seeding rate, and their interactions on protein, ash and fiber% in barley grains in 2012/2013 and 2013/2014 seasons.

#### 3.2.1. Crude protein %

Protein content in grains averaged across cultivar was recorded for the cultivars Giza 136 at both seasons. Whereas, an increase of this value was observed at seeding rate of solid barley(100% barley) cultivar barley Giza 136 at no and one cut 12.85 and11.54% in the first season 12.79 and 11.40% in the second season, respectively in Table (5), Fig (3 and 4). In both seasons, the highest protein % were given by intercropping (75% cv. 136 barley +25% berseem) at no and one cut in the first and second seasons which recorded 12.66 and 11.19% 12.30 and 11.15%, in the first and

second seasons respectively (Table 5, Fig 3 and 4). McAndrews, *et al.*,(2004) reported that berseem fixed about 188 kg N ha<sup>-1</sup> when measured with N<sup>15</sup>. In addition, legumes have greater leaves to stem ratio which is a primary sites of photosynthesis and enzymes activity.

#### 3. 2. 2. Crude ash%

High crude ash content in the grains was recorded for cultivar Giza 134 at the both seasons. Whereas an increase of this value was observed at seeding rate of (100% barley) solid barley at no and one cut 17.32 and15.79% in the first season 17.56 and 14.29% in the second season, respectively in Table (5). In the first and second season the highest ash % was given by intercropping (75% cv. 134 barley +25% berseem) at no and one cut in the first and second seasons, which recorded 17.00 and 15.63% in the first season, 17.11 and 14.01% in the second one, respectively (Table 5). The decline in crude fiber of barley may be explained by thinned stem and /or better leaf / stem ratio in successive cutting. These results can be supported by those of crude protein in the same table. These results are in agreement with those obtained by Helmy *et al.*, (2011).

#### 3. 2. 3. Fiber%

Barley cultivars Giza 136 in (100%) solids gave the highest percentages of fiber% among cultivars at no and one cut 39.93 and 26.36% in the first season 30.11 and 26.54% by the second season, respectively, in Table (5). In the first and second seasons the highest fiber% was given in

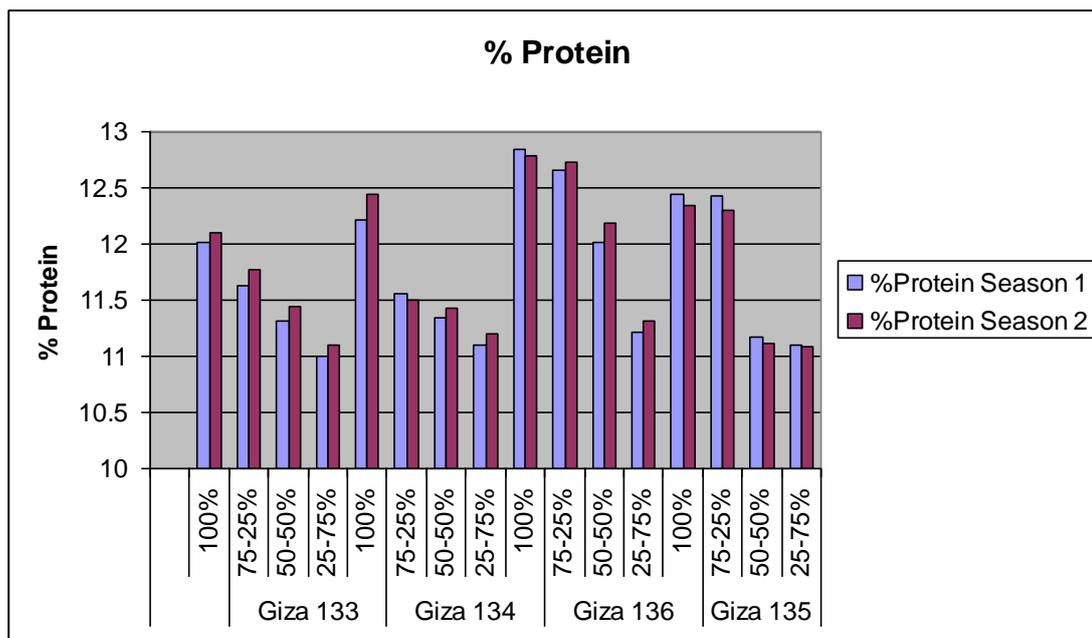


Fig. (3): Mean of protein (%) of seeds of barley cultivars as affected by no cutting treatments seeding rats in 2012/2013 and 2013/2014 seasons.

**Table (5): Mean of protein, ash and fiber (%) of seeds of barley cultivars as affected by cutting treatments and seeding rates in 2012/2013 and 2013/2014 seasons.**

	Varieties	Seeding rates*	% Protein		% Ash		% Fiber	
			Season 1	Season 2	Season 1	Season 2	Season 1	Season 2
No cut	Giza 133	1	12.01	12.10	17.24	17.36	30.47	31.20
		2	11.63	11.77	16.73	16.80	29.09	30.20
		3	11.32	11.45	16.53	16.20	28.47	27.71
		4	11.00	11.10	15.98	15.98	26.84	27.66
	Giza 134	1	12.21	12.44	17.32	17.56	29.86	31.55
		2	11.55	11.50	17.00	17.11	29.63	31.21
		3	11.35	11.43	16.46	17.03	28.84	29.95
		4	11.10	11.20	16.04	16.86	26.47	28.08
	Giza 136	1	12.85	12.79	17.03	17.57	39.93	30.11
		2	12.66	12.73	16.48	16.54	29.36	29.96
		3	12.01	12.19	15.59	16.40	28.16	28.80
		4	11.22	11.32	15.41	14.97	24.23	24.63
Giza 135	1	12.45	12.35	17.17	17.09	29.05	29.78	
	2	12.43	12.30	16.08	16.17	28.15	28.69	
	3	11.17	11.11	15.79	15.90	27.25	27.92	
	4	11.10	11.08	15.50	15.67	24.11	26.73	
One cut	Giza 133	1	10.44	10.66	14.64	14.95	25.36	25.71
		2	10.23	10.29	14.27	14.89	25.08	25.18
		3	10.01	10.17	14.00	14.20	23.44	24.00
		4	9.88	9.70	13.11	13.09	21.09	21.15
	Giza 134	1	10.58	10.71	15.79	14.88	24.70	24.80
		2	10.25	10.32	15.63	24.68	24.52	24.63
		3	10.10	10.11	14.46	14.30	23.12	23.40
		4	9.70	9.60	13.11	14.10	22.14	22.56
	Giza 136	1	11.54	11.40	14.94	14.29	26.33	26.54
		2	11.19	11.15	14.74	14.01	25.12	25.47
		3	11.07	10.93	14.42	13.57	24.01	24.20
		4	10.78	10.68	14.15	13.20	23.11	23.17
	Giza 135	1	11.40	11.02	15.75	15.81	25.07	25.43
		2	11.03	10.88	15.43	15.40	24.08	24.55
		3	10.44	10.45	14.35	14.33	23.44	23.56
		4	10.06	10.00	14.18	14.16	21.09	21.16
C V%			5.21	6.30	4.10	7.11	6.20	5.30
L. S. D at 0.05 for Cut (C)			5.72	0.339	1.07	4.57	8.001	4.361
L. S. D at 0.05 for Varieties (V)			0.386	0.345	0.985	1.063	0.859	1.061
L. S. D at 0.05 for C x V			0.44	1.02	1.392	1.14	1.22	1.502
L. S. D at 0.05 for seeding rate (S)			0.162	0.112	0.252	0.245	0.951	0.589
L. S. D at 0.05 for S x C			0.229	0.336	0.357	0.534	0.837	0.834
L. S. D at 0.05 for S x V			0.324	0.338	0.505	0.424	1.183	0.838
L. S. D at 0.05 for S x V x C			0.459	0.478	0.713	0.759	1.670	1.190

1-100% barley (50 kg/fed). 2-\*75% barley – 25% berseem (37.5 barley + 6.25 berseem kg/fed)

3-\*50% barley-50% berseem ( 25 barley + 12.5 berseem kg/fed)

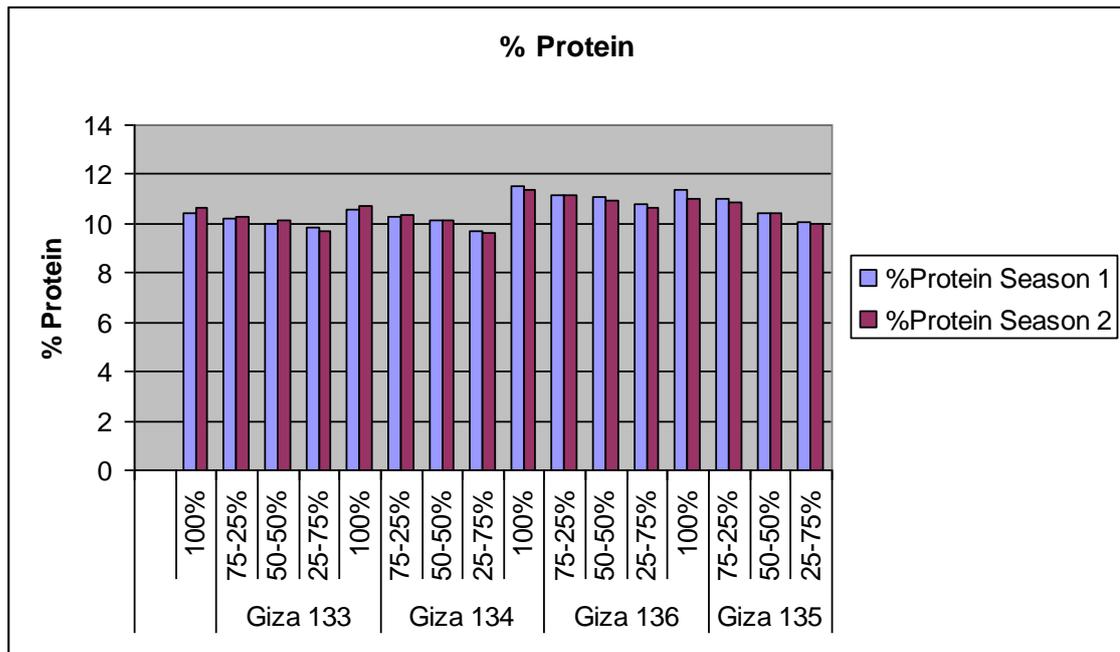
4-\*25% barley-75% berseem ( 12.5 barley + 18.75 berseem kg/fed)

intercropping 75% barley cv 136 with 25% berseem in no and one cut in the first and second seasons which recorded 29.36 and 25.12% in the first season 29.96 and 25.47% in the second season respectively. These results confirmed the finding of Abdel-Aziz *et al.* (2007).

#### 4. CONCLUSIONS

The results of this study indicated that

intercropping barley with berseem clover at the seeding rate of Giza 136 C V 37.5–Helally C V 6.25 seeds kg/fad<sup>-1</sup> (75-25%) in both no and one cut provided the highest advantage in all characters of this study. Also the data showed that the highest cultivar was Giza 136 (Hull-less barley) for soled barley (100%) at no and one cut in most characters of this study.



**Fig.(4): Mean of protein (%) of seeds of barley cultivars as affected by one cutting treatments seeding rats in 2012/2013 and 2013/2014 seasons.**

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تقييم إنتاجية أربع أصناف جديدة من الشعير عند تحميلها مع البرسيم المصري  
تحت معدلات تقاوى مختلفة في الأراضي الجديدة بمصر

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ملخص

أقيمت تجربتان في محطة بحوث الإسماعيلية التابعة لمركز البحوث الزراعية خلال الموسمين الزراعيين 2013/2012 و 2014/2013. استخدم تحليل تصميم القطع المنشقة مرتين في ثلاث مكررات. اوضحت النتائج وجود تأثير معنوي لمعاملتى الحش على صفات عدد السنابل / م<sup>2</sup>، وزن الـ1000 حبة (جم)، عدد حبوب السنبل، وزن حبوب السنبل، محصول القش (طن/ فدان)، محصول الحبوب (اردب / فدان)، نسبة البروتين في الحبوب. أعطى صنف الشعير العارى جيزة (136) اعلى قيم لمعظم صفات المحصول و مكوناته وكذلك نسبة البروتين في الحبوب ماعدا صفتى وزن حبوب السنبل و محصول القش. اعطى صنفى الشعير المغطى جيزة 134 و جيزة 133 على التوالى اعلى القيم وذلك بدون حش وبعد حشة واحدة و ذلك لصفتى وزن حبوب السنبل و محصول القش . و عموماً أشارت النتائج الى ان افضل نظام تحميل هو تحميل صنف الشعير العارى جيزة 136 بنسبة 75% ( بمعدل تقاوى 37.5) مع صنف البرسيم الهلالى بنسبة 25% ( بمعدل تقاوى 6.25 كجم/ف). حيث حققت صفتى وزن حبوب السنبل و محصول القش اعلى القيم مع نظام التحميل 75% صنف الشعير العارى جيزة 136 و صنف جيزة 134 أو جيزة 133 - 25% مع صنف البرسيم الهلالى بمعدل تقاوى 6.25 كجم/ف التوالى .

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