

EFFECT OF SOME MULCHING METHODS AS POSSIBLE ALTERNATIVE MEASURES ON BROOMRAPE, ANNUAL WEEDS CONTROL AND PRODUCTIVITY OF TWO FABA BEAN CULTIVARS

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ABSTRACT

Two field experiments were conducted in a naturally infested field with annual weeds and broomrape (*Orobanche crenata* Forsk.) at Sakha Agricultural Research Station, Kafr El-Sheikh, Egypt, during 2018/19 and 2019/20 winter seasons. The aims of this work were (1) investigate the performance of two cultivars of faba bean (Giza 843 and Sakha 3) under some weed control treatments [mulching with the rice straw, mulching with the sorghum straw, mulching with the black plastic, mulching with the white plastic, mulching with the blue plastic, stomp extra at rate 1.5 L/fed + Round up at rate 75 cm³ /fed, (hand hoeing + hand pulling) twice and untreated check) (2) Effect of some weed control treatments on annual weeds and broomrape, faba bean yield and its components. The results indicated that the cultivar Giza 843 decreased exhibited the lowest dry weight of broad-leaved, grassy and total annual weeds by 27.2, 20.8 and 20.9 %, respectively as compared to Sakha 3. It also, decreased broomrape spike length, number of spikes/ plant and dry weight of spikes/m² by 30.9, 38.5 and 38.3 %, respectively. In addition, it scored the highest values of yield and its components, compared to the cultivar Sakha 3. Moreover, all weed control treatments significantly decreased dry weight of total annual weeds and broomrape, and increased yield components in both seasons. The highest values obtained for faba bean yield (ardab./fed.) yield were detected for mulching with sorghum straw and mulching with black plastic for nine weeks, followed by stomp extra + Round up, mulching with rice straw, mulching with blue plastic and mulching with white by 71.8, 68.9, 67.9, 66.1, 64.2 and 60.9 %, respectively compared to the control treatment. The interaction between faba bean cultivars and weed control treatments exerted a significantly integrated impact on annual weeds and broomrape characters which was reflected on increases in yield faba bean and its components. From the results of correlation analysis, the dry weight of total annual weeds and broomrape biomass negatively correlated with faba bean yield and its components. These results indicated that in soil infested with annual weeds and broomrape, it is better to grow the cultivar Giza 843 with the application of weed control treatments such as mulching with the sorghum straw, or mulching with black plastic for nine weeks or stomp extra at rate 1.5 L/fed + Round up at rate 75cm³/fed. These practices gave the highest reduction in annual weeds and broomrape density and increased faba bean yield and its components and improved faba bean productivity.

Key words: Cultivars, mulching, roundup, pendimthalin, Broomrape, faba bean.

1. INTRODUCTION

Faba bean (*Vicia faba* L.) is one of the economically important leguminous crops, with high nutritional value. It is estimated that the seeds have protein content of 25-40% (Al-Taey *et al.*, 2018), and 56% carbohydrate, dietary elements, fiber, vitamins, and Fetic acid. Broomrape, a parasitic weed, is a detrimental pest for the cultivation of faba bean in Egypt, which causes significant

losses, up to 80%, in the yield of faba bean, and in some cases make farmers stop growing faba bean under heavy infestation conditions. Until now, no single control measure is sufficient by itself to control this parasite in this crop. Thus, a successful strategy for broomrape management, which depends on adoption of integral effects of combination of tolerant faba bean varieties, rationale chemical control measures and suitable cultural

practices, is very necessary. In Egypt, Gadalla *et al.* (2010) proved that the cultivar Giza 3 was susceptible and Giza 843 was tolerant to *Orobanche* infestation, which had the lowest *Orobanche* spikes/plant. Amer *et al.* (2012) found significant differences among cultivars in growth, plant height, number branches plant⁻¹, pod length and number of seed pod⁻¹. Ismail (2013) revealed that faba bean cultivar Misr1 decreased the number and dry weight of *Orobanche* spikes by 17.3 and 17.0 %, respectively, compared with the cultivar Giza 40. On the other hand, many researchers reported that glyphosate application twice at the rate of 178.7 cc/ha controlled broomrape by 96 - 99.1 % and increased faba bean seed yield/fed. by 100-149.5 than untreated infested check (El-Metwally *et al.*,2013; Ismail, 2013 and Eid *et al.*, 2017).

The use of plastic mulching is very popular in many vegetable-growing areas. A non-transparent plastic is used to impede the transmission of photosynthetic radiation through the plastic to the weeds so that the development of weeds is then arrested. The advantages also include better moisture conservation as a reduction in irrigation needs means a reduction in nitrogen leaching, a better soil structure conservation, and an increase in the vegetable yield. Ebaid (1990) found that mulching with polyethylene lowered the number of weeds in faba bean by 54.2-61.4

highest seed yield of faba bean were achieved by application of Stomp (Saad El-Din, 2003 and Hameed and Shahwany, 2017). The effects of Round up on broomrape tubercle is attributable to its selective accumulation in the young parasite plant up to a level of three times as high as that in faba bean host root three days after spraying (Hassanein and Kholosy, 1997).

The aims of this work was to estimate faba bean yield losses, due to broomrape and annual weeds infestation, and to study the effect of mulching methods by plastic (black, white and blue) and plants (rice and sorghum) straw and herbicides on broomrape, annual weeds and productivity of two faba bean cultivars under Kafr El-Sheikh Governorate conditions.

2. MATERIALS AND METHODS

Two field experiments were conducted in a field with heavily, naturally infested with broomrape in Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during 2018/2019 and 2019/2020 winter seasons to investigate the performance of two faba bean (*Vicia faba* L.) cultivars under numerous broomrape (*Orobanche crenata*, Forsk.) control treatments. Faba bean cultivars (Giza 843 and Sakha 3) were planted on October 25th in both seasons. The mechanical and chemical analyses of the experimental site soil are presented in Table (a) according to Jackson (1967).

Table (a): Some physical and chemical properties of the soils (0-30 cm), used in two seasons of study.

Seasons	Organic matter (%)	pH soil	Sand (%)	Silt (%)	Clay (%)	Texture Class	N Ppm	P ppm	K ppm
2018/2019	1.30	7.5	20.7	30.5	48.8	Clay	32.0	2.42	244
2019/2020	1.65	7.7	21.54	28.16	50.3	Clay	33.0	2.64	246

plants/m², respectively, compared to untreated control (134.0-152.0 plants/m²) and increased crop seed yields by 9.5-9.8 ard./ fed., respectively, compared to untreated control (6.8-7.0 ard./fed.). Although hand-pulling of broomrape weeds is one of the most used techniques by farmers to control *Orobanche*, this method is inefficient in highly infested faba bean fields. Indeed, continuous hand pulling of broomrape had slightly increased faba bean yield but not significantly, compared to the control in infested fields sown with a susceptible cultivar at Beja (Kharrat and Halila 1996). Herbicides are the most important available method for annual weeds and *Orobanche sp.* control. The best control and

A split-plot design in a randomized complete block arrangement was used with four replications. The main plots were allotted to two cultivars and the eight weed control treatments were devoted to sub plots. Each sub plot consists of five ridges of 0.6 m in width and 3.5 m length, i.e. the experimental plot area was 10.5 m². The treatments were as follow:

2.1. Main plots: (Faba bean cultivars)

- 1- Giza 843 (tolerant to broomrape infection).
- 2- Sakha 3 (susceptible to broomrape infection).

2.2. Sub plots: (mulching methods and herbicides)

1. Mulching with the rice (*Oryza sativa*) straw (mulches layer was about 5 cm).
2. Mulching with the sorghum (*Sorghum ssp.*)

straw (mulches layer was about 5 cm).

3. Mulching with black plastic (polyethaline 80 μm thickness).
4. Mulching with white plastic (polyethaline 80 μm thickness).
5. Mulching with blue plastic (polyethaline 80 μm thickness).
6. Stomp extra 45.5% (pendimthalin) N-(1-ethylpropyl) -3,4 diethyl- 2,6-dinitrobenzenamine] at the rate of 1.5 l/fed applied after sowing and before irrigation plus hand hoeing at 30 days after sowing and Roundup 48% WSC (glyphosate) N-(phosphonomethyl) glycine, isopropyl ammonium salt at 75cm³/fed (twice) applied at 45 and 60 days after sowing.
7. Hand hoeing twice to annuals weeds at 30 and 50 days after sowing with broomrape hand pulling at 70 and 90 days from sowing.
8. Untreated check (control).

Mulches treatments were carried out by covering with plastic (black, white and blue) and plants rice and sorghum straw were applied before irrigation and after planting faba bean. Plastic mulch was left for 9 weeks after planting and removed carefully after that. Herbicides were sprayed by knapsack sprayer CP3 with water volume of 200 l/fed. In both seasons, calcium super phosphate (15.5% P₂O₅) at the rate of 100 kg/fed was added before sowing and ammonium nitrate (33.5% N) at the rate of 50 kg/fed was added before the 1st irrigation.

2.3. Data recorded

2.3.1. On annuals weeds

Weeds were hand pulled at random from one square meter for each plot after 70 and 90 days from sowing and classified into three categories (broadleaved, grassy and total weeds). The dry weight of each group was estimated as (g/m²). Dry weight was determined after drying weeds in a forced draft oven at 70°C for 48 hours.

2.3.2. On broomrape

Prior faba bean harvesting, broomrape spike length (cm), number of broomrape spikes/plant, number of broomrape spikes/m², broomrape dry weight (g/m²), and number of capsules/broomrape spike were recorded.

2.3.3. On faba bean yield and its components

At harvest, samples of ten faba bean plants were collected at random from the central rows of each plot to assess the following criteria: plant height (cm), number of branches/plant, number of pods/plant, weight of pods per plant (g), weight of seeds per plant (g) and 100-seed weight (g). Seed yield per plot was weighed and adjusted to ardeb per feddan.

2.4. Statistical analysis

The data were subjected to statistical analysis of split plot design in a randomized complete block arrangement according to procedure outlined by Snedecor and Cochran (1990) and the least significant differences (LSD) value were then computed at 5% level probability for comparison of the differences between means. Simple correlation matrix was carried out for the two seasons to investigate the relationship between dry weight of broomrape, total weeds and faba bean seed yield and its components according to Steel and Torrie (1980).

3. RESULTS AND DISCUSSION

3.1. Effect of cultivars

3.1.1. On annuals weeds

The dominant weed species in the experimental fields were *Chenopodium* sp, *Sonchus oleraceus* L., *Ammi majus*, *Emex spinosus* L., *Rumex dentatus* L., *Brassica* sp. and *Melilotus indica* L. as broad-leaved weeds, *Avena* spp., and *Phalaris* spp. as grassy weeds and broomrape. The data in Table (1) showed that Giza 843 cultivar reduced significantly the

Table (1): Effect of faba bean cultivars on dry weight of annual weeds (g/m²) at 70 and 90 days from sowing in 2018/19 and 2019/20 seasons.

Cultivars	Dry weight of annual weeds (g/m ²) at 70 days from sowing			Dry weight of annual weeds (g/m ²) at 90 days from sowing		
	Grassy weed	Broad - leaved weed	Total weed	Grassy weed	Broad-leaved weed	Total weed
2018/19 season						
Giza 843	57.32	53.61	110.93	99.89	52.81	152.7
Sakha 3	72.32	81.68	154.00	126.1	78.93	205.0
LSD_{0.05}	13.54	13.53	26.79	23.61	21.83	44.07
2019/20 season						
Giza 843	56.60	42.63	99.23	58.68	64.00	122.7
Sakha 3	71.47	53.83	125.3	75.36	79.91	155.3
LSD_{0.05}	13.37	10.07	23.44	14.11	14.96	29.06

dry weight of grassy, broad-leaved and total weeds (g/m²) in both seasons. These results indicated that Giza 843 was more effective than Sakha 3 in reducing the dry weight of grassy, broad-leaved and total weeds by 20.7, 34.4 and 27.9 % after 70 days from sowing and 20.8, 33.1 and 25.5%, respectively, after 90 days from sowing in the first season.

In the second season, the same cultivar Giza 843 reduced dry grassy, broad-leaved and total weeds by 20.8, 20.7 and 20.8 %, after 1st survey, and 22.1, 19.9 and 21.0 %, respectively, in second survey compared with Sakha3 cultivar. This result may be due to the strong competition on growth factors such as water, light and nutrients and hence, decreased weeds dry weight. These results were in agreement with those obtained by Gadalla *et al.* (2010), Amer *et al.* (2012) and Ismail (2013).

3.1.2. On broomrape

Data in Table (2) indicated clearly that the differences between the two studied faba bean cultivars in *Orobanche* infestation characters reached significance at 5% level in both 2018/2019 and 2019/2020 seasons. It can be noticed that faba bean cultivar Giza 843 scored the highest reduction percentage in both numbers of broomrape spikes/plant and broomrape spikes /m², spike length (cm), broomrape dry weight (g/m²), and number of capsules/broomrape spike (38.6, 38.4, 31.1, 37.5 and 31.0%) in 2018/19 winter season and by 38.3, 38.2, 30.7, 41.7, 41.6, and 45.6%, in 2019/20 winter season, respectively, compared to the susceptible cultivar Sakha 3. This may be due to increase in biomass distribution of root system of Giza 843 as their increase in field exudates by faba bean plants, which increase the access of root exudates and consequently increase exudates stimulation for broomrape seed germination. This decrease may be due to the delayed of broomrape

attachment to faba bean plants and its delay emergence above soil surface and consequently partially escaped from broomrape injury. These findings are in harmony with those reported by Gadalla *et al.* (2010).

3.1.3. On yield and yield components

Results in Table (3) show that all faba bean cultivars differed significantly in faba bean seed yield per feddan and its components in both 2018/19 and 2019/20 winter seasons. Concerning, the tallest plants of faba bean belonged to cultivar Giza 843 which was taller by 8.2 and 8.1,%, respectively, in both seasons compared to cultivar Sakha 3. The highest numbers of branches/plant and pods/plant of faba bean belonged to the cultivar Giza 843 which recorded increase in number of pods/plant by 20.1 and 57.5% in 2018/19 season and by 24.3 and 65.8% in 2019/20 season, respectively, as compared to cultivar Sakha 3. The highest weight of pods/plant (g) and weight of seeds/plant (g) of faba bean belonged to the cultivar Giza 843 that gave increases in weight of pods/plant by 53.6, 67.2 %, respectively, and weight seeds/plant (g) by 40.4 and 65.6% in the 1st and 2nd season, respectively, higher than cultivar Sakha 3. The heaviest 100-seed weight (g) of faba bean belonged to the cultivar Giza 843 which gave increase in weight of 100-seed by 56.8 and 64.8% in the 1st and 2nd season, respectively, higher than cultivar Sakha 3. The highest seeds yield/fed of faba bean resulted from the cultivar Giza 843 which gave increases in seed yield (ardab/fed) by 57.3 and 64.5%, in 2018/19 and 2019/20 seasons higher than cultivar Sakha 3. From the previous results depending on *Orobanche*, severity scale Sakha 3 was considered as highly susceptible cultivar to *Orobanche* infection. These results proved that Giza 843 is considered tolerant and Sakha 3 was highly susceptible according to the scale

Table (2): Effect of faba bean cultivars on broomrape characters in 2018/19 and 2019/20 seasons.

Cultivars	Broomrape spike length (cm)	No of broomrape spikes/plants	No. capsules /broomrape spike	Broomrape dry weight (g/m ²)	No of broomrape spikes /m ²
2018/19 season					
Giza 843	46.1	4.89	23.1	42.3	24.5
Sakha 3	66.9	7.97	33.5	67.7	39.8
LSD_{0.05}	19.6	2.65	9.85	19.6	13.3
2019/20 season					
Giza 843	50.5	5.39	36.4	42.5	25.7
Sakha 3	72.9	8.74	66.9	72.8	41.6
LSD_{0.05}	20.4	2.79	18.6	17.3	13.4

Table (3): Effect of faba bean cultivars on yield and yield components in 2018/19 and 2019/20 seasons.

Cultivars	Plant height (cm)	No of branches /plant	No of pods /plant	weight of pods /plant (g)	weight of seeds /plant (g)	100-seed weight (g)	Seed yield (ardab/fed.)
2018/19 season							
Giza 843	147.1	2.69	14.25	32.49	19.12	74.97	6.07
Sakha 3	135.0	2.15	6.05	15.08	11.40	32.33	2.59
LSD_{0.05}	7.16	0.13	1.63	5.01	1.73	4.43	0.66
2019/20 season							
Giza 843	142.9	3.04	16.59	30.33	19.63	77.08	7.15
Sakha 3	131.2	2.30	5.67	9.73	6.74	27.13	2.54
LSD_{0.05}	7.08	0.12	0.633	1.31	0.853	4.57	0.405

suggested by Hassanein *et al.* (1998) indicated that one Orobanche spike per plant can decrease faba bean seed yield by 15 % and four spikes/ faba bean plant can decrease seed yield by 55%.

3.2. Effect of mulching methods and herbicides

3.2.1. On annual weeds

Data in Table (4) showed that all of mulching methods and herbicides treatments reduced significantly the dry weight (g/m²) of grassy, broad-leaved and total weeds in both seasons compared with untreated treatment (control). Black plastic for 9 weeks after planting (WAP) and mulching with sorghum straw layer of 5 cm thickness were the most effective in controlling grassy, broad-leaved, and total weeds; they reduced dry weight of grassy weeds, broad-leaved weeds and total weeds as compared to control treatment by (89.8 and 89.6%), (91.7 and 91.6 %) and (90.8 and 90.7 %) at 70 days from sowing and (89.8 and 89.6 %), (90.9 and 90.7 %) and (90.4 and 90.2 %) at 90 days from sowing in the 1st and 2nd seasons, respectively. While, stomp extra 1.5 l/fed + roundup 75 cm³/fed herbicides and using of mulching with rice straw layer of 5 cm thickness caused reduction in dry weight of grassy, broad-leaved and total weeds as compared to control treatment in both seasons by (89.6, 91.6 and 90.7 %) and (89.5, 90.7 and 90.1 %), respectively, at 1st survey by (89.5, 91.4 and 90.3 %), and (89.6, 90.7 and 90.2 %), respectively, at 2nd survey in 2018/19 and 2019/20 season, compared to untreated control. On average, mulching with blue plastic had the lowest dry weight of total weeds at 1st and 2nd survey (85.7 and 85.9 % reduction), followed by mulching with white plastic (74.2 and 73.8 %) and hand hoeing + pulling twice (84.6 and 84.4 %), respectively. The different results may be due to the application of stomp extra, which was highly efficient in controlling grassy and

broad weeds. Additionally, black plastic 9 WAP, mulching with sorghum straw and mulching with rice straw were more effective in controlling all annual weeds as compared to the other treatments. Similarly, Mehmood *et al.* (2018) reported that application of black plastic mulch showed a maximum reduction in weed density, fresh and dry weed biomass and suggested that organic mulches such as dry eucalyptus leaves and wheat or rice straw could be used for effective weed control in corn fields.

3.2.2. On broomrape

The data in Table (5) showed that the four mulching methods and the two herbicides treatments significantly reduced the number of broomrape spikes /plant, broomrape spikes /m², broomrape spike length (cm), broomrape dry weight (g/m²) and number of capsules /broomrape spike in both seasons as compared with untreated control. Mulching by sorghum straw, black plastic 9 WAP and using by stomp extra 1.5 l/fed + roundup 75 cm³/fed herbicides achieved good results in reducing the number of broomrape spikes/plant or per m² and dry weight of broomrape spikes/m². Mulching with sorghum straw reduced the number of broomrape spikes/plant or per m² and dry weight of broomrape spikes/m² by (88.3, 88.7 and 88.3 %) and (86.6, 86.7 and 85.6 %) followed by mulching with black plastic 9 WAP by (86.3, 86.8 and 86.3 %) and (86.3, 86.3 and 85.2 %) & using by stomp extra 1.5 l/fed + roundup 75 cm³/fed by (74.6, 75.6 and 74.6) and (72.6, 72.7 and 70.5 %), respectively, in both seasons. The number of capsules/ broomrape spike were gave same direction use mulching sorghum straw and black plastic 9 WAP, with a reduction 88.1 and 85.9% in 2018/19 season and 85.9 and 86.4% in 2019/20 season, respectively, compared with untreated control. Moisture was probably trapped under

Table (4): Effect of mulching methods on dry weight of annual weeds (g/m²) at 70 and 90 days from sowing in 2018/19 and 2019/20 seasons.

Mulching methods	Dry weight of annual weeds (g/m ²) at 70 days from sowing			Dry weight of annual weeds (g/m ²) at 90 days from sowing		
	Grassy weeds	Broad-leaved weeds	Total weeds	Grassy weeds	Broad-leaved weeds	Total weeds
2018/19 season						
Mulching with rice straw layer 5 cm	29.70	27.71	57.41	51.76	27.36	79.12
Mulching with sorghum straw layer 5 cm	26.63	24.84	51.47	46.41	24.53	70.95
Mulching with black plastic 9 WAP	26.25	24.49	50.74	45.74	24.18	69.93
Mulching with white plastic 9 WAP	71.69	66.88	138.57	124.93	66.05	190.9
Mulching with blue plastic 9 WAP	38.71	36.10	74.81	67.45	35.66	103.1
Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	26.67	24.88	51.56	46.48	24.57	71.06
Hand hoeing twice + Hand pulling twice	42.82	39.94	82.76	74.61	39.45	114.06
Untreated check	256.3	296.3	552.6	446.7	285.1	731.8
LSD _{0.05}	26.08	23.11	49.06	45.44	22.28	65.82
2019/20 season						
Mulching with rice straw layer 5 cm	29.32	22.09	51.41	30.92	32.79	63.71
Mulching with sorghum straw layer 5 cm	26.29	19.81	46.10	27.73	29.40	57.13
Mulching with black plastic 9 WAP	25.92	19.52	45.44	27.33	28.98	56.31
Mulching with white plastic 9 WAP	70.79	53.32	124.11	74.64	79.15	153.8
Mulching with blue plastic 9 WAP	38.22	28.78	67.00	40.30	42.73	83.03
Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	26.34	19.83	46.17	27.77	29.45	57.22
Hand hoeing twice + Hand pulling twice	42.27	31.84	74.11	44.58	47.27	91.85
Untreated check	253.1	214.3	467.4	266.9	318.1	585.0
LSD _{0.05}	25.75	23.06	47.58	27.15	34.24	59.86

Table (5): Effect of mulching methods and herbicides on broomrape characters in 2018/19 and 2019/20 seasons.

Mulching methods	Broomrape spike length (cm)	No of broomrape spikes/plants	No. capsules /broomrape spike	Broomrape dry weight (g/m ²)	No of broomrape spikes /m ²
2018/19 season					
Mulching with rice straw layer 5 cm	17.56	3.97	35.11	33.99	19.86
Mulching with sorghum straw layer 5 cm	7.93	1.78	15.86	15.29	8.92
Mulching with black plastic 9 WAP	9.24	2.09	18.86	17.87	10.44
Mulching with white plastic 9 WAP	36.81	8.33	73.63	71.26	41.64
Mulching with blue plastic 9 WAP	27.96	6.33	55.91	54.04	31.63
Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	17.13	3.88	34.25	33.15	19.39
Hand hoeing twice + Hand pulling twice	42.63	9.80	85.27	83.72	49.02
Untreated check	66.92	15.27	133.8	130.5	79.37
LSD _{0.05}	6.06	1.44	12.12	12.15	7.18
2019/20 season					
Mulching with rice straw layer 5 cm	38.02	4.33	35.04	36.25	20.53
Mulching with sorghum straw layer 5 cm	19.97	2.24	18.34	18.62	10.65
Mulching with black plastic 9 WAP	20.24	2.30	18.58	19.17	10.96
Mulching with white plastic 9 WAP	71.21	8.21	65.39	68.40	39.11
Mulching with blue plastic 9 WAP	65.15	7.38	59.83	61.48	35.15
Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	40.49	4.59	37.18	38.19	21.84
Hand hoeing twice + Hand pulling twice	92.86	10.75	85.31	89.61	51.23
Untreated check	145.75	16.76	134.5	129.6	79.81
LSD _{0.05}	16.87	1.93	15.59	18.85	9.19

the mulch and subsequently the mulch killed the broomrape (Tarara, 2009).

3.2.3. On yield and yield components

Data in Table (6) revealed significant differences between weed control treatments for faba bean yield and its components except for plant height (cm) and number of branches /plant (g), where the differences were not significant in both seasons. The highest number of pods/plant was achieved by shown by using sorghum mulch and black plastic mulch as compared to the untreated control which recorded increase in the number of pods/plant by (69.8 and 66.4) and (58.5 and 55.6 %), in the 1st and 2nd season, respectively, compared to the untreated control. The sorghum straw mulch and black plastic gave increases in weight of

and 70.7 %, in 2018/19 season and by (67.9 and 67.1 %), in 2019/20 season compared to untreated control. In this regard, Duppong *et al.* 2004 reported an increase in plant height when using oat straw mulch than flax and wood straw. It should be noted that, plant residues not only affect on the soil, but also can affect the germination, survival, growth, and competitiveness of weeds and crops. However, the use of mulch can be expensive due to labor costs and other costs associated with mulch preparation. It can be noted that environmentally friendly methods such as the application of plant residues allows long-term environmental durability (Azadbakht *et al.*, 2017).

Table (6): Effect of mulching methods on yield and yield components of faba bean in 2018/19 and 2019/20 seasons.

Mulching methods	Plant height (cm)	No of branches /plant	No of pods /plant	weight of pods /plant (g)	weight of seeds / plant (g)	100-seed weight (g)	Seed yield (ard./fed.)
2018/19 season							
Mulching with rice straw layer 5 cm	155.4	2.62	11.22	26.53	17.65	59.93	4.87
Mulching with sorghum straw layer 5 cm	142.8	3.10	13.33	31.51	19.55	67.07	6.22
Mulching with black plastic 9 WAP	139.3	2.80	11.97	28.30	18.48	63.90	5.18
Mulching with white plastic 9 WAP	141.3	2.30	9.90	23.38	15.23	52.82	4.27
Mulching with blue plastic 9 WAP	142.5	2.33	10.03	23.70	15.46	53.55	4.33
Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	142.4	2.67	11.45	27.07	18.15	61.15	5.03
Hand hoeing twice + Hand pulling twice	139.3	2.15	9.27	21.85	15.82	49.37	3.22
Untreated check	125.5	1.43	4.02	9.48	8.25	21.42	1.52
LSD _{0.05}	NS	NS	1.96	4.59	2.92	9.06	0.60
2019/20 season							
Mulching with rice straw layer 5 cm	150.9	2.85	11.76	21.06	13.99	56.30	5.32
Mulching with sorghum straw layer 5 cm	138.6	3.42	14.11	25.25	16.79	64.09	6.08
Mulching with black plastic 9 WAP	135.6	3.17	13.19	23.63	15.70	61.63	5.93
Mulching with white plastic 9 WAP	137.0	2.65	11.17	20.05	12.86	51.75	4.58
Mulching with blue plastic 9 WAP	138.3	2.75	11.67	20.05	13.88	55.85	5.33
Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	138.4	3.05	12.81	22.97	15.24	61.29	5.76
Hand hoeing twice + Hand pulling twice	135.2	2.08	8.47	15.15	10.09	40.57	3.80
Untreated check	122.4	1.4	5.85	10.48	6.96	25.37	1.95
LSD _{0.05}	NS	NS	1.77	3.23	2.10	6.92	0.768

pods/plant by (69.9 and 66.0 %) and (58.9 and 55.7 %), respectively, and weight of seeds/plant (g) by (69.9 and 66.0 %) and (58.5 and 55.0 %), respectively, in the 1st and 2nd seasons as compared to untreated control. In addition, using sorghum mulch and black plastic gave an increase in weight of 100-seed by (68.1 and 66.5%) in 2018/19 season and (60.4 and 58.9%) in 2019/20 season compared to untreated control. Sorghum mulch straw and black plastic gave increases in seed yield (ard./fed.) by 75.6

3.3. Effect of interaction between cultivars and mulching methods and herbicides

3.3.1. On annual weeds

The data presented in Table (7) showed that broad-leaved, grassy, and total weeds were affected significantly by the interaction between faba bean cultivars and mulching methods and herbicides treatments. The greatest reduction in total annual weeds was obtained by the interaction between cultivar Giza 843 with black plastic mulch treatment followed by

sorghum straw mulch, rice straw mulch and herbicides treatment. These results indicated that the highest reduction in dry weight of total weed (87.9 %) was obtained from mulching with black plastic in first seasons. The results have the same trend in the second season, for Sakha 3 cultivar with the same black plastic mulch. This may be owing to effect of

integration between cultivars and black polyethylene film, which gives effective weed control by cutting down solar radiation percentage by more than 90%, resulting in etiolated growth and the eventual death of weeds under the film. These results are in agreement with those obtained by Gadalla *et al.* (2010).

Table (7): Effect of interaction between faba bean cultivars and mulching methods on dry weight of annual weeds (g/m²) at 70 and 90 days from sowing in 2018/19 and 2019/20 season.

Cultivars	Mulching methods	Dry weight of annual weeds (g/m ²) at 70 days from sowing			Dry weight of annual weeds (g/m ²) at 90 days from sowing		
		Grassy weed	Broad-leaved weed	Total weed	Grassy weed	Broad-leaved weed	Total weed
2018/19 season							
Giza 843	Mulching with rice straw layer 5 cm	25.48	23.83	49.32	44.41	23.48	67.89
	Mulching with sorghum straw layer 5 cm	25.52	23.87	49.41	44.48	23.52	68.00
	Mulching with black plastic 9 WAP	25.12	23.49	48.62	43.78	23.15	66.92
	Mulching with white plastic 9 WAP	68.61	64.17	132.8	119.6	63.21	182.8
	Mulching with blue plastic 9 WAP	37.04	34.64	71.68	64.55	34.13	98.67
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	28.42	26.58	55.00	49.53	26.19	75.72
	Hand hoeing twice + Hand pulling twice	40.98	38.33	79.30	71.40	37.75	109.2
	Untreated check	207.4	194.0	401.4	361.4	191.1	552.5
Sakha 3	Mulching with rice straw layer 5 cm	27.78	25.85	53.63	48.41	25.59	74.00
	Mulching with sorghum straw layer 5 cm	27.82	25.89	53.71	48.49	25.63	74.12
	Mulching with black plastic 9 WAP	27.38	25.48	52.86	47.72	25.23	72.94
	Mulching with white plastic 9 WAP	74.78	69.60	144.4	130.3	68.90	199.1
	Mulching with blue plastic 9 WAP	40.37	37.57	77.94	70.35	37.19	107.5
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	30.98	28.83	59.81	53.99	28.54	82.53
	Hand hoeing twice + Hand pulling twice	44.66	41.56	86.23	77.83	41.15	118.9
	Untreated check	305.2	398.7	703.9	531.9	379.2	911.2
LSD _{0.05}	36.88	32.69	69.39	64.27	31.51	93.08	
2019/20 season							
Giza 843	Mulching with rice straw layer 5 cm	25.20	18.98	44.19	26.57	28.18	54.76
	Mulching with sorghum straw layer 5 cm	25.16	18.95	44.19	26.53	28.13	54.67
	Mulching with black plastic 9 WAP	24.81	18.68	43.49	26.15	27.73	53.89
	Mulching with white plastic 9 WAP	67.74	51.02	118.76	71.43	75.74	147.17
	Mulching with blue plastic 9 WAP	36.57	27.54	64.12	38.56	40.89	79.45
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	28.06	21.14	49.20	29.59	31.38	60.97
	Hand hoeing twice + Hand pulling twice	40.45	30.47	70.93	42.94	45.24	87.90
	Untreated check	204.8	154.2	359.0	215.9	228.9	444.8
Sakha 3	Mulching with rice straw layer 5 cm	27.47	20.69	48.16	28.96	30.72	59.68
	Mulching with sorghum straw layer 5 cm	27.43	20.66	48.09	28.92	30.67	59.59
	Mulching with black plastic 9 WAP	27.03	20.36	47.40	28.51	30.23	58.74
	Mulching with white plastic 9 WAP	73.84	55.62	129.46	77.85	82.56	160.41
	Mulching with blue plastic 9 WAP	39.86	30.02	69.89	42.03	44.57	86.61
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	30.59	23.04	53.63	32.25	34.20	66.46
	Hand hoeing twice + Hand pulling twice	44.10	33.21	77.31	46.50	49.31	95.81
	Untreated check	301.44	227.03	528.47	317.8	337.0	654.8
LSD _{0.05}	36.42	32.61	67.29	38.39	48.42	84.66	

3.3.2. On broomrape

Table (8) showed that the interaction of cultivars and mulching methods and herbicides significantly affected the number of broomrape spikes/plant, broomrape spikes /m², broomrape spike length (cm), dry weight (g/m²) and No. capsules /broomrape spike in both seasons. The highest reduction percentage on broomrape characters was obtained when using Giza 843 cultivar and mulching with sorghum straw as compared with the susceptible cultivar Sakha 3. Mulching with sorghum straw, black plastic with 9 WAP and mulching with rice straw achieved large reduction in number broomrape

spikes/ plant or per m² and dry weight of broomrape spikes (gm²) by (86.9, 86.6 and 82.8 %) and (79.9, 80.7 and 65.0 %), respectively, in the first season.

The results have the same trend, in the second season. No. of capsules /broomrape spike gave the same direction using mulching by sorghum straw and black plastic 9 WAP (88.1 and 85.9 % reduction, respectively) in the first season. Soil moisture was probably trapped under the mulch and subsequently mulch killed the broomrape. This may be due to increases in biomass of root system of faba bean plants, which increase the access of root exudates and

Table (8): Effect of interaction between faba bean cultivars and mulching methods on broomrape characters in 2018/19 and 2019/20 seasons.

Cultivars	Mulching methods	Broomrape spike length (cm)	No of broomrape spikes/plants	No of broomrape spikes /m ²	Broomrape dry weight (g/m ²)	No. capsules /broomrape spike
2018/19 season						
Giza 843	Mulching with rice straw layer 5 cm	31.79	3.37	16.87	29.17	15.89
	Mulching with sorghum straw layer 5 cm	15.74	1.67	8.33	14.44	7.87
	Mulching with black plastic 9 WAP	17.39	1.85	9.23	15.96	8.69
	Mulching with white plastic 9 WAP	67.20	7.13	35.67	61.65	33.60
	Mulching with blue plastic 9 WAP	51.97	5.53	27.67	47.69	25.99
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	31.31	3.33	16.67	28.72	15.65
	Hand hoeing twice + Hand pulling twice	52.15	5.53	27.63	47.85	26.08
	Untreated check	101.3	10.76	53.80	92.95	50.66
Sakha 3	Mulching with rice straw layer 5 cm	38.43	4.57	22.85	38.82	19.22
	Mulching with sorghum straw layer 5 cm	15.99	1.90	9.51	16.15	7.99
	Mulching with black plastic 9 WAP	19.58	2.33	11.64	19.78	9.79
	Mulching with white plastic 9 WAP	80.05	9.52	47.61	80.86	40.03
	Mulching with blue plastic 9 WAP	59.86	7.12	35.59	60.46	29.93
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	37.19	4.42	22.12	37.57	18.60
	Hand hoeing twice + Hand pulling twice	118.4	14.08	70.41	119.6	59.19
	Untreated check	166.4	19.79	98.93	168.0	83.18
LSD _{0.05}		16.77	1.98	9.93	16.82	8.39
2019/20 season						
Giza 843	Mulching with rice straw layer 5 cm	34.18	17.18	18.98	30.72	31.65
	Mulching with sorghum straw layer 5 cm	22.53	11.36	18.95	19.86	20.69
	Mulching with black plastic 9 WAP	19.15	9.76	18.68	17.06	17.59
	Mulching with white plastic 9 WAP	55.23	28.46	51.02	49.78	50.72
	Mulching with blue plastic 9 WAP	65.12	33.09	27.54	57.89	59.79
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	40.47	20.55	21.14	35.95	37.17
	Hand hoeing twice + Hand pulling twice	56.79	28.88	30.47	50.51	52.15
	Untreated check	110.3	56.22	154.2	78.32	101.3
Sakha 3	Mulching with rice straw layer 5 cm	41.85	23.88	20.69	41.77	38.43
	Mulching with sorghum straw layer 5 cm	17.41	9.93	20.66	17.38	15.99
	Mulching with black plastic 9 WAP	21.31	12.17	20.36	21.28	15.58
	Mulching with white plastic 9 WAP	87.18	49.75	55.62	87.02	80.05
	Mulching with blue plastic 9 WAP	65.19	37.19	30.02	65.07	59.86
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	40.51	23.12	23.04	40.43	37.19
	Hand hoeing twice + Hand pulling twice	128.9	73.57	33.21	128.7	118.4
	Untreated check	181.2	103.4	227.03	180.8	166.4
LSD _{0.05}		23.35	12.72	2.67	26.09	21.45

consequently increase exudates stimulation for broomrape seed germination.

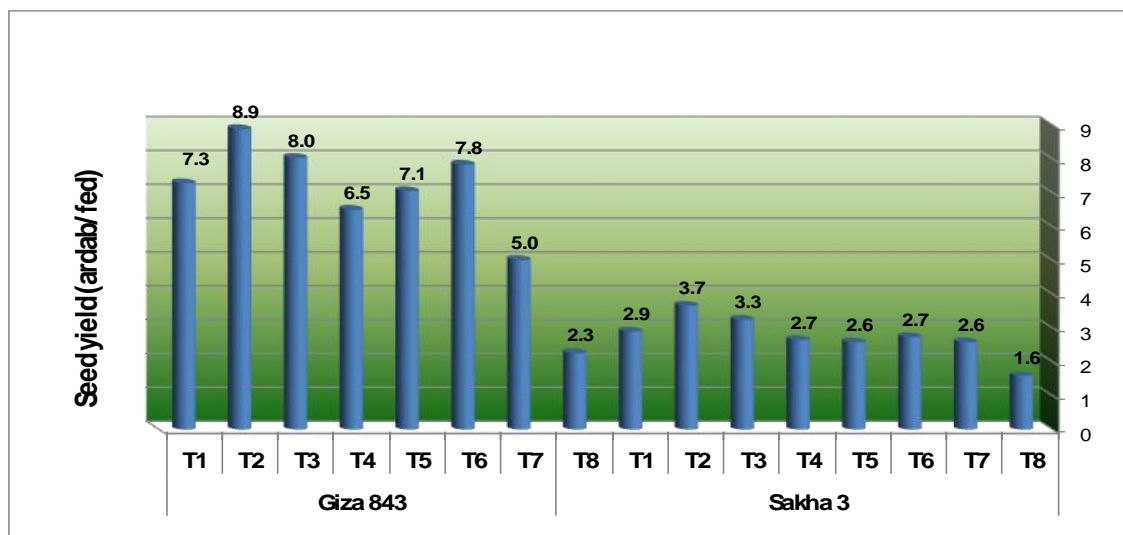
3.3.3. On yield and yield components

Data presented in Table (9) showed that the effect of interaction between cultivars and mulching methods and herbicides on yield and yield components was statistically significant at 5 % level in 2018/19 and 2019/20 seasons. The highest number of pods/plant of faba bean was obtained from the cultivar Giza 843 when using sorghum straw mulch, which increased by 36.7 and 23.4% in 2018/19 season and by 42 and 24.7% in 2019/ 20 season compared over

cultivar Sakha 3, respectively. Table (9) shows that the package which consist of planting Giza 843 cultivar with sorghum straw mulch gave the highest values of weight of pods/plant (g) and weight of seeds/plant (g) in both seasons, as compared with untreated Sakha 3 which gave the lowest values of 16.9, 6.0 (g) in 2018/19 and 10.4, 20.5 (g) in 2019/20 season. The highest yield of seeds (ard./fed.) (Fig. 1) was obtained from Giza 843 cultivar with sorghum straw mulch and spraying Roundup twice at the rate of 75 cm³/fed which increased by 8.97 and

Table (9): Effect of interaction between faba bean cultivars and mulching methods on yield and yield components in 2018/19 and 2019/20 seasons.

Cultivars	Mulching methods	No of pods /plant	weight of pods /plant (g)	weight of seeds /plant (g)	100-seed weight (g)	Seed yield (ardab /fed.)
2018/19 season						
Giza 843	Mulching with rice straw layer 5 cm	14.73	39.90	19.70	83.93	6.77
	Mulching with sorghum straw layer 5 cm	16.80	46.30	21.93	92.00	8.97
	Mulching with black plastic 9 WAP	15.63	39.60	19.67	88.73	7.23
	Mulching with white plastic 9 WAP	12.93	31.53	16.77	74.30	6.00
	Mulching with blue plastic 9 WAP	13.10	32.07	16.97	75.27	6.07
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	15.10	37.97	19.10	85.83	7.00
	Hand hoeing twice + Hand pulling twice	12.03	28.83	15.83	69.47	4.57
	Untreated check	4.57	6.90	8.00	30.23	1.93
Sakha 3	Mulching with rice straw layer 5 cm	5.70	16.83	9.10	35.93	2.97
	Mulching with sorghum straw layer 5 cm	6.87	19.73	10.33	42.13	3.97
	Mulching with black plastic 9 WAP	6.30	18.30	9.77	39.07	3.47
	Mulching with white plastic 9 WAP	4.87	14.70	8.20	31.33	3.13
	Mulching with blue plastic 9 WAP	4.97	14.93	8.30	31.83	2.53
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	5.80	17.07	9.20	36.47	2.60
	Hand hoeing twice + Hand pulling twice	4.50	13.73	7.80	29.27	3.07
	Untreated check	1.73	5.93	4.50	12.60	1.87
LSD _{0.05}		2.71	8.09	2.88	12.54	0.836
2019/20 season						
Giza 843	Mulching with rice straw layer 5 cm	16.29	35.79	20.57	82.77	7.80
	Mulching with sorghum straw layer 5 cm	19.75	42.95	24.69	92.33	8.80
	Mulching with black plastic 9 WAP	18.65	40.69	23.39	91.06	8.83
	Mulching with white plastic 9 WAP	15.65	35.04	19.32	77.75	7.00
	Mulching with blue plastic 9 WAP	16.83	36.92	21.22	85.39	8.03
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	18.29	39.93	22.95	92.35	8.67
	Hand hoeing twice + Hand pulling twice	11.19	25.24	14.51	58.38	5.46
	Untreated check	7.73	18.08	10.4	36.60	2.60
Sakha 3	Mulching with rice straw layer 5 cm	6.23	12.9	7.41	29.83	2.83
	Mulching with sorghum straw layer 5 cm	7.46	15.44	8.88	35.85	3.36
	Mulching with black plastic 9 WAP	6.72	13.92	8.00	32.19	3.03
	Mulching with white plastic 9 WAP	5.41	11.20	6.40	25.74	2.17
	Mulching with blue plastic 9 WAP	5.49	11.37	6.54	26.30	2.63
	Stomp extra 1.5 l/fed + Roundup 75cm ³ /fed.	6.31	13.07	7.51	30.23	2.87
	Hand hoeing twice + Hand pulling twice	4.75	9.84	5.66	22.76	2.1
	Untreated check	2.95	6.11	3.51	14.13	1.3
LSD _{0.05}		2.46	5.09	2.91	9.57	1.06



T1 mulching with rice straw layer 5 cm. T5 mulching with blue plastic 9 WAP.
 T2 mulching with sorghum straw layer 5 cm. T6 stomp extra at rate 1.5 L/fed + Round up at rate 75 cm³/fed.
 T3 mulching with black plastic 9 WAP. T7 Hand hoeing twice + hand pulling twice
 T4 mulching with white plastic 9 WAP. T8 untreated check (control).

Fig. (1): Effect of interaction between faba bean cultivars and mulching methods on seed yield.

7.0 ardab/fed., in both seasons, respectively as compared with untreated Sakha 3 cultivar in 2018/19 and by 8.80, 8.67 ard./fed, 2019/20 season, respectively as compared with untreated Sakha 3. Similarly, the hundred seed weight is also increased compared to untreated, but remains the same between the different types of mulch. The results obtained are in agreement with those obtained by Hassanein and Kholosy (1997) and Gadalla *et al.* (2010).

3.3.3.1. Correlation among studied characters and faba bean yield

Data presented in Table (10) indicated clearly that simple correlation coefficients

between dry weight of broadleaf, grassy, total weeds, No of broomrape spikes /plant or per m², No. of capsules /broomrape spike and dry weight of broomrape spikes/m² and faba bean yield were statistically significant strong negative at 5% level. This means that number of broomrape spikes/ plant or m² and dry weight of broomrape spikes/m² were more aggressive in their parasitism to seed yield (ard./fed.) of faba bean. In addition, correlation analysis revealed that the yield increases were positively contributed to the increases in No. of pods/plant, weight of pods/plant, 100-seed weight and seed yield (ard./fed.). Hence,

Table (10): Correlation coefficient analysis among all studied characters faba bean, broomrape and annual weeds.

Characters	Broad-leaved weed	Total weed	Broomrape spike length (cm)	No of broomrape spikes/plants	No of broomrape spikes /m ²	Broomrape dry weight (g/m ²)	No. capsules /broomrape spike	No of pods /plant	weight of pods /plant (g)	weight of seeds /plant (g)	100-seed weight (g)	Seed yield (ardab/fed.)
Grassy weed	.995**	.999**	.789**	.776**	.776**	.749**	.787**	-.421**	-.431**	-.420**	-.442**	-.464**
broad-leaved weed		.999**	.796**	.787**	.787**	.764**	.794**	-.425**	-.435**	-.424**	-.445**	-.461**
Total weed			.793**	.782**	.782**	.756**	.791**	-.423**	-.433**	-.422**	-.444**	-.463**
Broomrape spike length (cm)				.997**	.997**	.990**	1.000**	-.536**	-.543**	-.535**	-.550**	-.570**
No of broomrape spikes/plants					1.000**	.995**	.996**	-.569**	-.576**	-.569**	-.583**	-.597**
No of broomrape spikes /m ²						.995**	.996**	-.569**	-.576**	-.569**	-.583**	-.598**
Broomrape dry weight (g/m ²)							.990**	-.562**	-.568**	-.562**	-.576**	-.586**
No. capsules /broomrape spike								-.533**	-.540**	-.532**	-.548**	-.567**
No of pods /plant									1.000**	1.000**	.993**	.984**
weight of pods /plant (g)										.999**	.993**	.983**
weight of seeds /plant (g)											.993**	.985**
100-seed weight (g)												.988**

*Significant at 5% level of probability

**Significant at 1% level of probability

mulching methods play a major role in increasing faba bean productivity, if applied at the suitable time, rate, stage of weed growth and control broomrape growth.

Conclusion

The negative impacts of herbicides on humans, animals, and environment has attracted the attention of researchers to find new environmentally friendly methods for weed control. From the data presented, we conclude that the mulch practice could be one of the possible strategies to reduce the use of herbicides in the faba bean crop, mainly by reducing density and biomass of weed species. Indeed, the weed control efficiency of sorghum straw mulch and black plastic has been around 90.8 and 90.3 % respectively, which allow an improvement in faba bean yield components, therefore, they allowed an increase in faba bean yield (ard./fed.) by 71.8 and 68.9%, as compared to control treatment.

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تأثير بعض طرق التغطية كبدائل ممكنة لمكافحة الهالوك والحشائش الحولية على إنتاجية صنفين من الفول البلدي

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المعمل المركزي لبحوث الحشائش و* قسم بحوث المحاصيل البقولية - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية- الجيزة- مصر.

ملخص

أجريت تجربتان حقليتان في حقول مصابة طبيعياً بالحشائش الحولية والهالوك بمحطة البحوث الزراعية، سخا- كفر الشيخ خلال موسم الزراعة الشتوي 2018/2019 و2020/2019م لدراسة استجابة صنفين من الفول البلدي (جيزة 843 ، سخا 3) لبعض معاملات مكافحة الحشائش (تغطية بقش الأرز، تغطية بالسورجم ، تغطية بالبلاستيك الأسود، تغطية بالبلاستيك الأزرق، تغطية بالبلاستيك الأبيض، ستومب أكسترا بمعدل 1,5 لتر/ ف + راوند أب بمعدل 75سم³/ف، عزيق + نقاوة يدوية) مرتين وبدون معاملة (الكنترول) وتأثير ذلك على الحشائش الحولية والهالوك ومحصول الفول ومكوناته. أوضحت النتائج أن الصنف جيزة 843 أظهر أقل وزن جاف للحشائش الحولية عريضة و ضيقة الأوراق والحشائش الكلية في المتر المربع بنسبة 27,2 و 20,8 و 20,9% على التوالي مقارنة بالصنف سخا 3. كذلك أعطي نفس الصنف زيادة معنوية لمكونات محصول الفول البلدي مثل طول النبات وعدد القرون/ نبات ووزن القرون/ نبات ووزن الـ 100 بذرة في محصول الفول البلدي (أردب/ فدان). أعطت جميع معاملات مكافحة الحشائش نقصاً معنوياً في الوزن الجاف لجميع أنواع الحشائش الحولية (عريضة وضيقة الأوراق والحشائش الكلية) والهالوك. أيضاً أعطت جميع معاملات مكافحة الحشائش زيادة في محصول الفول البلدي (أردب/ فدان) وكذلك جميع مكونات المحصول خلال موسم الزراعة. حيث سجلت معاملات التغطية بالسورجم، والتغطية بالبلاستيك الأسود لمدة 9 أسابيع أعلى نسبة زيادة للمحصول يليها معاملة (ستومب أكسترا +راوند أب)، ثم معاملة التغطية بقش الأرز، التغطية بالبلاستيك الأزرق، التغطية بالبلاستيك الأبيض وذلك مقارنة بمعاملة الكنترول، وكانت نسب الزيادة 71,8 و 68,9 و 67,9 و 66,1 و 64,2 و 60,9% علي التوالي مقارنة بمعاملة الكنترول. أدت التفاعل بين الأصناف ومعاملات مكافحة الحشائش الي نقص معنوي في الوزن الجاف للحشائش الحولية عريضة وضيقة الأوراق والحشائش الكلية والهالوك. وتم الحصول علي أعلى محصول فول بلدي (أردب /فدان) بزراعة صنف الفول جيزة 843 مع استخدام التغطية بالسورجم أوالتغطية بالبلاستيك الأسود واستخدام معاملة (ستومب أكسترا + راوند أب) مقارنة بالصنف سخا 3 مع معاملة الكنترول. أظهر تحليل الارتباط أن الوزن الجاف للحشائش الحولية والهالوك يرتبط ارتباطاً سلبياً مع محصول الفول البلدي كما ارتبطت صفات المحصول ارتباطاً ايجابياً مع محصول الفول البلدي. لذا فإن مكافحة الحشائش الحولية والهالوك تلعب دوراً كبيراً في رفع إنتاجية الفدان من محصول الفول البلدي. توصي هذه الدراسة باستخدام أصناف الفول البلدي الأكثر مقارنة للحشائش الحولية والاكثر تحملاً للهالوك مثل صنف جيزة 843 مع استخدام التغطية بالسورجم أو البلاستيك الأسود لمدة 9 أسابيع أو استخدام معاملة (ستومب أكسترا بمعدل 1,5 لتر/ف +راوند أب بمعدل 75 سم/ف) لتلافي منافسة الحشائش الحولية والهالوك لمحصول الفول البلدي وبالتالي تحسين إنتاجية الفول البلدي.