*Egypt. J. Agron*. **Vol. 34**, No. 2, pp. 301-319 (2012)

# Integrated Broomrape (*Orobanche crenata* Forsk.) Control in Faba Bean (*Vicia faba* L.) with Nitrogen Fertilizer, Intercropping and Herbicides

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TWO FIELD experiments were carried out at the farm of Sakha Agricultural Research Station, Kafrelshiekh, Egypt, during 2010-2011 and 2011-2012 faba bean growing seasons (Latitude 30º 48` N, Longitude 31º 35`E). The trials studied integrated broomrape (*Orobanche crenata* Forsk.) control in faba bean cv. Giza 843 with nitrogen fertilizer, intercropping faba bean (*Vicia faba* L.) with oat (*Avena sativa* L.) or fenugreek (*Trigonella foenum-graecum* L.) and herbicides. Herbicide treatments were: 1- Untreated, 2- Glyphosate (48% WSC) at 36 g a.i./fed., (fed = feddan= 0.42 hectare),(once)., 3- Glyphosate (48% WSC) at 36 g a.i./fed. (twice)., 4- Imazapic (10 % EC) at 20 g a.i./fed. (once), 5- Imazapic (10 % EC) at 20 g a.i./fed. (twice). Sub-plots were assigned to faba bean (sole crop), intercropping (faba+ oats), (faba+ fenugreek) and nitrogen fertilizer with ammonium nitrate ($NH_4NO_3$).

The two broomrape control herbicides substantially suppressed number and dry weight of broomrape spikes / $m^2$ compared with untreated in both seasons. Foliar spray of Imazapic and Glyphosate twice on faba bean recorded a less number and dry weight of broomrape spikes / $m^2$ than its spray one time. Spikes number and dry weight of broomrape parasite weed/$m^2$ were significantly decrease in faba bean intercropped with fenugreek and oat or fertilized with nitrogen compared with sole faba bean in both seasons. Intercropping faba bean with fenugreek (*Trigonella foenum-graecum* L.) recorded the lowest number and dry weight of broomrape spikes/$m^2$ followed by application of N fertilizer then oat in the two seasons. Foliar spray of Imazapic twice on faba bean intercropped with fenugreek recorded a less number and dry weight of broomrape spikes/$m^2$. There were no significant differences in spikes number and dry weight of broomrape weed/$m^2$ among application of fenugreek and oat or $NH_4NO_3$ with spraying Imazapic or Glyphosate twice in both seasons. The greatest reduction in number (>82%) and dry weight (> 90%) of broomrape spikes/$m^2$ were obtained by application of fenugreek along with Imazapic herbicides twice in both seasons.

Repeating foliar spray with either Imazapic or Glyphosate on faba bean plants resulted in a significant decrease in photosynthetic pigments (chlorophyll a, b and total chlorophyll) content in leaves compared with untreated treatment in both seasons. All photosynthetic pigments contents were significantly greater in leaves of faba bean fertilized by N fertilizer than in those of sole faba bean plants without N fertilizer or intercropped with fenugreek or oat in

both seasons. Foliar spraying of the two herbicides once or twice on faba bean significantly increased plant height, number of branches and pods/plant, 100-seed weight, seed yield/plant, seed and biological yields/fed. of faba bean compared with untreated treatment in both seasons. Faba bean plants sprayed twice with of Imazapic herbicide significantly exceeded those sprayed once with Imazapic or Glyphosate herbicides in seed and biological yields as well as its attributes in both seasons. Faba been intercropped with fenugreek or fertilized with $NH_4NO_3$ produced significantly taller plants and greater seed and biological yields as well as its attributes than did sole faba bean without N fertilizer in both seasons. The combination of Imazapic herbicide twice and fenugreek recorded the highest seed yield, while sole faba bean plants without N fertilizer and untreated produced the lowest one in both seasons. It can be concluded that foliar spraying with Imazapic or Glyphosate twice on faba bean intercropped or fertilized with $NH_4NO_3$ could be recommended for optimum broomrape parasitic weed control and highest seed yield at Kafrelsheikh Governorate, Egypt.

**Keywords:** Intercropping, Nitrogen fertilizer, Broomrape, Fenugreek, Oat, Faba bean, Herbicide, Imazapic, Glyphosate

Crenate broomrape (*Orobanche crenata* Forsk.) is a root parasitic plant widely distributed in the Mediterranean region. It is a major constraint for the production of faba bean (*Vicia faba* L.) (Rubiales *et al.*, 2002). Because their infestation occurs underground, they can cause enormous damage before their scapes appear above ground. As a consequence, efficient control is extremely difficult and infestation frequently results in a severe reduction of crop yields (Yoneyama *et al.*, 2001). Many management practices have been tested against *Orobanche* including solarisation, herbicides, crop rotation, deep ploughing, intercropping, trap crops, resistant varieties, synthetic germination stimulants, animal manure, and inorganic nitrogenous synthetic fertilizers with limited success (Parker & Riches, 1993; Nandula, 1998 and Elzein & Kroschel, 2003). There is no one single method can give satisfactory control. Options for broomrape control are limited for most crops because of the difficulty of mechanical control and lack of reliable, selective herbicides. Integration of various control methods could lead to better control of broomrapes (Abu Irmaileh, 1994).

Some herbicides can be used successfully for broomrape (*Orobanche crenata* Forsk.) control in faba bean (*Vicia faba* L.). Imazapic, an imidazolinone herbicide used selectively PRE and POST, in peanut (*Arachis hypogaea* L.), soybean (*Glycine max* (L.) Merr.), and in non-crop areas, is usually applied at 50 to 70 g ai/ha. It is absorbed through the roots and foliage and rapidly translocated to growing points (Thomson, 1997). Imazapic has efficiently controlled *Orobanche crenata* and ensured a satisfactory equivalent yield in faba bean (Saffour *et al*., 2003; Ghalwash *et al*., 2008 and Kenapar, 2009). The application of Imazapic resulted in high level of broomrape (*Orobanche*

*crenata*) control up to 84.0% and 86.0% in lentil (Al-Rahban *et al*., 2009). Glyphosate was the first promising herbicide developed for *Orobanche crenata* control in faba bean (Schmitt *et al*., 1979). Glyphosate applied twice post emergence at 60 to 80 g a.i./ha controlled broomrape in faba bean (Sauerborn *et al*., 1989, García-Torres & López-Granados, 1991; Ghalwash *et al*., 2008 and Kenapar, 2009).

Among the cultural control methods is the use of nitrogenous fertilizers. Inhibitory effects of nitrogen on the growth of broomrapes, based on field, greenhouse, and laboratories studies, have been common in the many literatures. Broomrape tends to be associated with less fertile soil conditions. Nitrogen fertilizers reduced its seed germination, growth and development (Abu-Irmaileh, 1981, 1994 and Westwood & Foy, 1999). The numbers and dry weights of shoot of branched broomrape decreased when treated with N fertilizer (Mariam & Suwanketnikom, 2004). Ammonium sulfate were shown to decrease the percent seed germination and radicle elongation of crenate broomrape when applied during pre-conditioning and germination, although a greater effect was obtained when applications included the germination period (Pieterse, 1991 and Westwood & Foy, 1999).

Intercropping is regarded as an ecological method to manage pests, diseases and weeds via natural competitive principles that allow for more efficient resource utilisation (Liebman & Dyck, 1993). Fenugreek (*Trigonella foenum-graecum* L.) roots have been suggested to inhibit the *Orobanche crenata* germination, resulting in reduced infection of legumes when intercropped with the plant (Bakheit *et al*., 2002; Evidente *et al*., 2007; Fernandez-Aparicioa *et al*., 2008 and Fernandez-Aparicioa *et al*., 2011). The number of *Orobanche crenata* plants decreased when faba bean (*Vicia faba* L.) are intercropped with oat (*Avena sativa* L.) (Mallory-Smith *et al*.,2004; Fenandez-Aparicioa *et al*., 2007 and Fernandez-Aparicioa *et al*., 2011 ).

The objectives of this study were to determine the integrated broomrape (*Orobanche crenata*) control in faba bean (*Vicia faba* L.) with the nitrogen fertilizer, intercropped faba bean with oat or fenugreek and herbicides

## Materials and Methods

Two field experiments were carried out at the farm of Sakha Agricultural Research Station, Kafrelshiekh, Egypt, during 2010-2011 and 2011-2012 faba bean growing seasons (Latitude 30º 48` N, Longitude 31º 35`E). The trials studied integrated broomrape (*Orobanche crenata* Forsk.) control in faba bean (*Vicia faba* L.) cv. Giza 843 with nitrogen fertilizer, intercropped faba bean with oat (*Avena sativa* L.) or fenugreek (*Trigonella foenum-graecum* L.) and herbicides. The field was known to be naturally heavily and uniformly infested with *O. crenata* seeds. Representative soil samples were taken from each site at the depth of 0-30 cm from the soil surface. The experimental soil was clay in texture with pH 8.0-8.1, organic matter 1.44 – 1.51 % and available nitrogen

17.2 - 18.2 ppm in the two seasons. The procedure of soil analysis followed the methods of Black *et al*. (1965).

The experimental design was split plot with four replications. The main plots were assigned to herbicides, while the sub-plots were assigned to nitrogen and intercropping treatments. Herbicide treatments were: 1- Untreated, 2- Glyphosate (48% WSC) at 36 g a.i./fed., (fed = feddan= 0.42 hectare), (once)., 3- Glyphosate (48% WSC) at 36 g a.i./fed. (twice), 4- Imazapic (10 % EC) at 20 g a.i./fed. (once), 5- Imazapic (10 % EC) at 20 g a.i./fed. (twice).The first herbicide spray applied at the beginning of faba bean flowering and the second spray was after three weeks from the first one . Herbicidal nomenclatures are listed in Table 1. Sub-plots were assigned to faba bean (*Vicia faba* L.) (sole crop), intercropping faba+ oats (*Avena sativa* L.), intercropping faba+ fenugreek (*Trigonella foenum-graecum* L.) and nitrogen fertilizer. Nitrogen rate was 30 kg N/fed in the form of $NH_4NO_3$ (33% N) adding after 50 days from sowing.

**TABLE 1. Trade common and chemical names of the tested herbicides**

| Trade name | Common name | Chemical name |
|---|---|---|
| Roundup | Glyphosate | Isopropylamine salt of N-(phosphonomethyl)glycine |
| Oroban | Imazapic | 2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1*H*-imidazol-2-yl]-5-methyl-3-pyridinecarboxylic acid |

Sowing took place at 12$^{th}$ and 13$^{th}$ November in first and second seasons, respectively. Each plot consisted of five ridges each 3.5 m long and 60 cm apart. The seed of faba bean were sown in one side of the ridge in 2-seeds hill distanced 20 cm at sole system. At intercropping system, Seeds of faba bean were sown on one side of ridge and oats (*Avena sativa* L.) or fenugreek (*Trigonella foenum-graecum* L.) with rate 12 kg/fed were drill on the other side. All the recommended agricultural practices for faba bean production were applied at the proper time. Calcium superphosphate fertilizer was used at the rate of 15.0 kg $P_2O_5$/fed during land preparation. Hoeing was applied before the first and second irrigation. Number and dry weight of broomrape spikes / $m^2$ were taken at plant maturity.

The percentage of reduction in broomrape spikes number/$m^2$ and weight/$m^2$ was calculated using the following equation:

$$\text{Percentage of reduction} = \frac{A - B}{A} \times 100$$

where: A and B refer to number or dry weight of broomrape in the untreated and treated plots, respectively.

The photosynthetic pigments chlorophyll (mg/g) a, b and total were estimated in samples of fresh leaves of faba bean according to Moran & Porath (1982). The samples were taken 15 days after the 2$^{nd}$ application of herbicide treatments. At harvest, plant height (cm), number of branches/plant, number of pods/plant and weight of pods/plant (g), 100-seed weight (g), seed yield (g/plant), seed yield (tons/fed) and biological yield (tons/ fed) of faba bean were determined. The obtained data were subjected to analysis of variance according to Gomez & Gomez (1984). Treatment means were compared by Duncan's Multiple Range Test (Duncan, 1955). All statistical analysis was performed using analysis of variance technique by means of MSTAT-C computer software package.

## Results and Discussion

*Broomrape*

Number and dry weight of broomrape spikes / m$^2$ in faba bean as affected by broomrape control herbicides (Imazapic 10% EC and Glyphosate 48% WSC), intercropping with fenugreek or oat and nitrogen fertilizer in 2010/11 and 2011/2012 seasons are shown in Table 2. Broomrape control treatments had a significant effect on density and growth of broomrape parasite in both seasons. The two broomrape control herbicides substantially suppressed spikes number and dry weight of broomrape parasite weed / m$^2$ compared with untreated. Spikes number and dry weight of broomrape parasite weed / m$^2$ was markedly decreased by repeating spray of Imazapic or Glyphosate herbicides.

Foliar spray of Imazapic and Glyphosate twice on faba bean recorded a less number and dry weight of broomrape spikes / m$^2$ than its spray one time. Therefore, application of Imazapic or Glyphosate herbicides twice resulted in the best controlling for density and growth of broomrape parasite in both seasons. No significant differences in density and growth of broomrape parasite were detected between Imazapic and Glyphosate herbicides at each of one or two sprays. Data show that spray herbicides twice reduced number of broomrape spikes than untreated treatment by 80.7: 78.2% for Imazapic and 75.0: 73.9% for Glyphosate in the first and second season, respectively. The maximum control efficiency of broomrape parasite weeds obtained from herbicides application may be due to effective against broomrape because of its translocation from host to parasite through the phloem (Zahran *et al.*, 1980). These results are in harmony with those obtained with Ghalwash (2003), Ghalwash *et al.* (2008) and Kenapar (2009) whose reported that the action of glyphosate on broomrape is attributable to its selective accumulation in the young parasite plant up to a level four times as high as that in faba bean host root at three days after spraying.

**TABLE 2. Number and dry weight of broomrape spikes / $m^2$ on faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer and their interaction in 2010/11 and 2011/2012 seasons.**

| Factor | 2010/11 season | | 2011/12 season | |
|---|---|---|---|---|
| | Spikes (No./$m^2$) | Spikes dry weight (g/$m^2$) | Spikes (No./$m^2$) | Spikes dry weight (g/$m^2$) |
| **Herbicide:** | | | | |
| Untreated (C) | 14.1 a | 22.1 a | 15.7 a | 24.0 a |
| Imazapic, once ($I_1$) | 7.8 b | 9.8 b | 8.2 b | 11.0 b |
| Glyphosate, once ($G_1$) | 8.2 b | 11.5 b | 8.4 b | 12.2 b |
| Imazapic, twice ($I_2$) | 3.4 c | 3.7 c | 4.1 c | 4.8 c |
| Glyphosate, twice($G_2$) | 4.4 c | 4.8 c | 5.1 c | 6.1 c |
| | ** | ** | * | ** |
| **Intercropping and N :** | | | | |
| Sole faba bean (S) | 9.4 a | 15.9 a | 10.2 a | 17.7 a |
| FB+Fenugreek (F) | 6.4 c | 7.2 c | 7.1 c | 8.5 c |
| FB+Oat (O) | 7.7 b | 10.1 b | 8.5 b | 10.9 b |
| FB+ $NH_4NO_3$ (N) | 6.7 c | 8.3 c | 7.3 c | 9.4 c |
| | * | ** | * | ** |
| **Interaction:** | | | | |
| C x S | 17.6 a | 33.0 a | 19.3 a | 36.2 a |
| C x F | 11.9 c | 14.3 d | 13.6 c | 16.3 d |
| C x O | 14.4 b | 23.5 b | 16 b | 23.9 b |
| C x N | 12.6 c | 17.5 c | 13.8 c | 19.6 c |
| $I_1$ x S | 9.7 d | 17.0 c | 10 de | 17.7 cd |
| $I_1$ x F | 6.6 g | 6.8 fg | 7.1 fg | 8.3 efg |
| $I_1$ x O | 7.9 ef | 8.3 ef | 8.3 f | 9.2 ef |
| $I_1$ x N | 6.9 fg | 7.2 fg | 7.3 fg | 8.9 ef |
| $G_1$ x S | 10.2 d | 17.6 c | 10.3 d | 19 cd |
| $G_1$ x F | 6.9 fg | 8.5 ef | 7.2 fg | 9.1 ef |
| $G_1$ x O | 8.3 e | 10.3 e | 8.5 ef | 11.2 e |
| $G_1$ x N | 7.3 efg | 9.5 e | 7.4 fg | 9.3 ef |
| $I_2$ x S | 4.2 ij | 5.2 gh | 5.2 hi | 6.9 fgh |
| $I_2$ x F | 2.9 k | 2.8 i | 3.3 j | 3.6 i |
| $I_2$ x O | 3.5 ijk | 3.6 hi | 4.3 ij | 4.6 hi |
| $I_2$ x N | 3 jk | 3.2 hi | 3.7 ij | 4 hi |
| $G_2$ x S | 5.4 h | 6.8 fg | 6.2 gh | 8.7 ef |
| $G_2$ x F | 3.7 ijk | 3.8 hi | 4.4 ij | 5.1 hi |
| $G_2$ x O | 4.5 hi | 4.6 hi | 5.2 hi | 5.7 ghi |
| $G_2$ x N | 3.9 ijk | 4 hi | 4.4 ij | 5 hi |
| | * | * | * | * |

FB= Faba bean.

* and ** NS indicate $P < 0.05$, $P < 0.01$ and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level using DMRT

Intercropping faba bean with some winter crops and nitrogen fertilizer significantly influenced spikes number and dry weight of broomrape parasite weed/$m^2$ in both seasons. Spikes number and dry weight of broomrape parasite weed / $m^2$ were significantly decrease on faba bean intercropped with fenugreek and oat or fertilized with ammonium nitrate ($NH_4NO_3$) compared with sole faba bean without N fertilizer in both seasons. Intercropping faba bean with fenugreek recorded the lowest number and dry weight of broomrape spikes/$m^2$

followed by application of N fertilizer then oat in the two seasons. Application of fenugreek or N fertilizer with faba bean resulted in a decrease in number of broomrape spikes / $m^2$ by > 61 % and dry weight of spike by >73% than sole faba bean without N fertilizer in both seasons. Generally, fenugreek and oat roots had inhibitory effect on broomrape. This is possibly due to release allelochemicals from fenugreek and oat roots. Previous reports on the beneficial effect of intercropping with fenugreek were inconclusive and conflicting, with some authors suggesting a beneficial effect of fenugreek when intercropped with faba bean for O. *crenata* (Bakheit *et al*., 2002) or *O. foetida* (Kharrat & Halila, 2005) control in the field, and others denying it (Khalaf, 1994). Fernandez-Aparicio *et al*. (2008) attributed the decrease of O. *crenata* infection to an allelopathic interference on the parasitic life cycle at the level of germination. Inhibition of *O. crenata* seed germination by allelochemicals released by fenugreek roots is suggested as the mechanism for reduction of *O. crenata* infection. This has been confirmed in a subsequent work, and trigoxazonane identified from fenugreek root exudates might be responsible for the inhibition of *O. crenata* seed germination (Evidente *et al*., 2007). Fernandez-Aparicio *et al*. (2011), also shows that intercrops with cereals or with fenugreek can reduce *O. crenata* on legumes being allelopathy a major component for the reduction. However, N fertilizer decreased the density and growth of broomrape parasite, may be through its effect on reducing potassium uptake, since broomrape seeds had a high demand for potassium (Abu-Irmaileh, 1994).

Also, the reduction in broomrape parasite infestation with ammonium nitrate ($NH_4NO_3$) could be attributed mainly to N role in the stimulation of various physiological processes including cell division and cell elongation resulting in more photosynthetic area and photosynthetic pigments content, which resulted in more photosynthetic production and consequently improved crop performance and tolerance to attack by parasite (Jain & Foy,1992). Several researchers have reported that broomrape infestation *in vivo* can be suppressed by nitrogen fertilization (Abu-Irmaileh, 1981 and Jain & Foy, 1992). The integration between herbicides and intercropping faba bean with fenugreek and oat or fertilization with $NH_4NO_3$ had a significant effect on number and dry weight of broomrape spikes/$m^2$ in both seasons. All combinations of herbicides and intercropping or N fertilizer resulted in a significant reduction in number and dry weight of broomrape spikes/$m^2$ compared with sole faba bean without either herbicides or N fertilizer in both seasons. Data in Table 2 and Fig. 1, 2, 3 and 4 show that application of herbicides along with intercropping fenugreek with faba bean substantially suppressed number and dry weight of broomrape spikes/$m^2$ than single application of each one in both seasons.

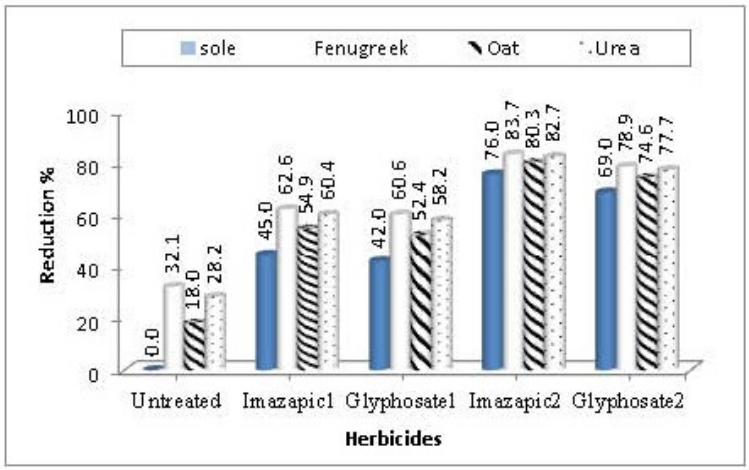


**Fig. 1. Percentage of reduction in broomrape spikes number /m$^2$ in faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer in 2010/11 season.**

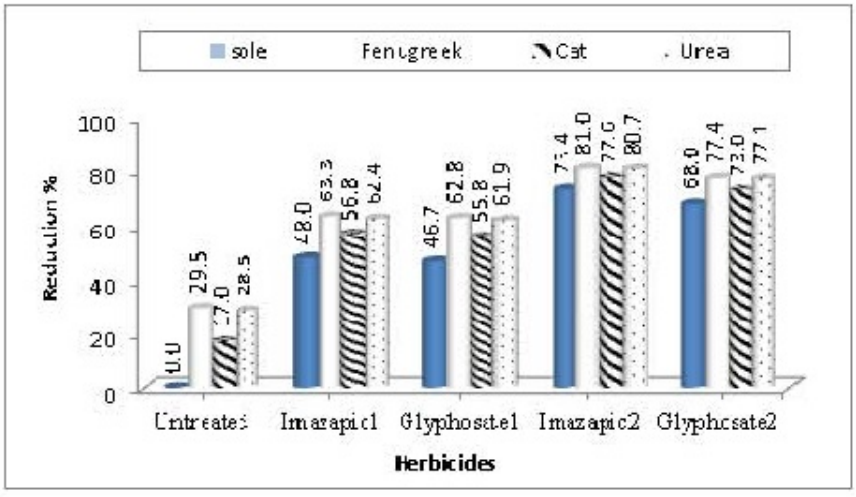


**Fig. 2. Percentage of reduction in broomrape spikes number/m$^2$ in faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer in 2011/12 season.**

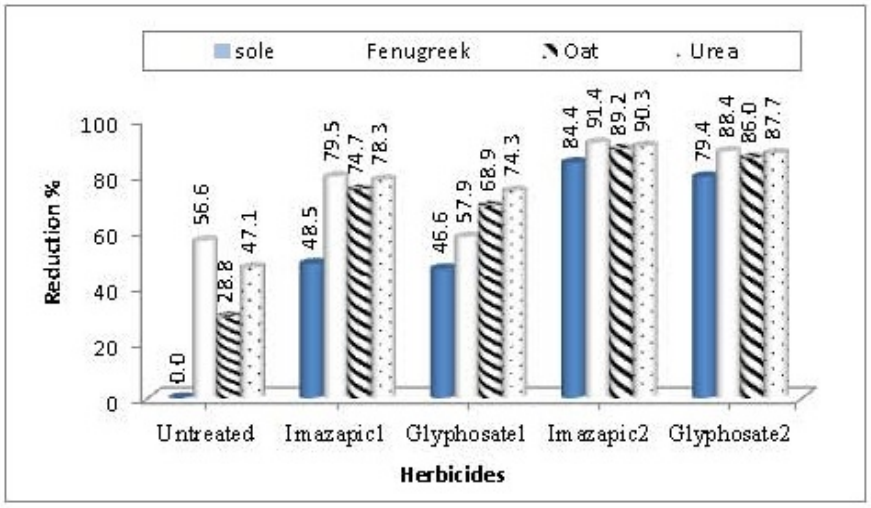


**Fig. 3. Percentage of reduction in broomrape spikes dry weight/m$^2$ in faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer in 2010/11 season.**

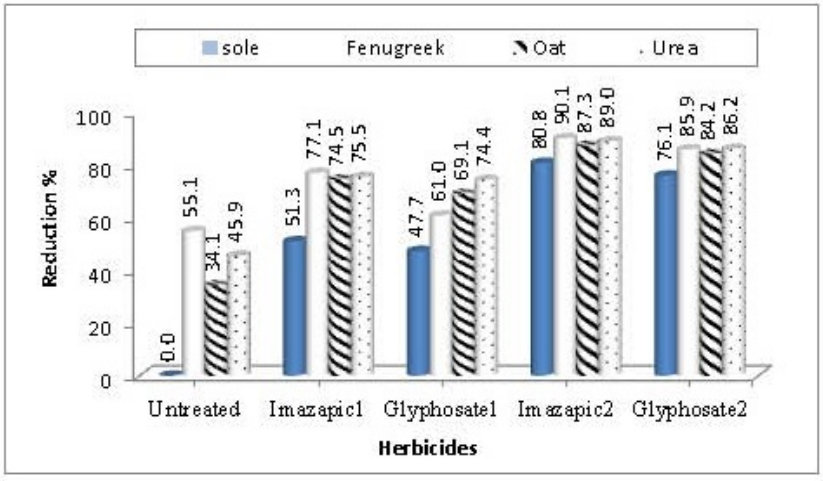


**Fig. 4. Percentage of reduction in broomrape spikes dry weight/m$^2$ in faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer in 2011/12.**

Repeating spray of Imazapic or Glyphosate herbicides markedly reduced number and dry weight of broomrape spikes / $m^2$ at the same intercropping or $NH_4NO_3$ treatments in the two seasons. Foliar spray of Imazapic twice on faba bean intercropped with fenugreek recorded a less number and dry weight of broomrape spikes / $m^2$. There were no significant differences in spikes number and dry weight of broomrape parasite weed / $m^2$ among application of fenugreek and oat or ammonium nitrate ($NH_4NO_3$) fertilizer with spraying Imazapic or Glyphosate twice in both seasons. Figures 1 and 2 show that the reduction in broomrape spikes number/$m^2$ was ranged from 29.5: 32.1% for fenugreek, 17.0 : 18.0% for oat and 28.2:28.5% for $NH_4NO_3$ without herbicides and 45.0: 48.0% for Imazapic once, 42.0 : 46.7% for Glyphosate once, 73.4 : 76.0% for Imazapic twice, 68.0: 69.0% for Glyphosate twice separately as well as 81.0: 83.7% for fenugreek with Imazapic twice and 80.7: 82.7% for $NH_4NO_3$ with Imazapic twice in the first and second season. Also, Fig. 3 and 4 show that the reduction in broomrape spikes dry weight / $m^2$ was ranged from 55.1 : 56.6% for fenugreek, 28.8 : 34.1% for oat and 45.9: 47.1% for $NH_4NO_3$ without herbicides and 48.5 : 51.3% for Imazapic once, 46.6: 47.7% for Glyphosate once, 80.8: 84.4% for Imazapic twice, 76.1: 79.4% for Glyphosate twice separately as well as 90.1: 91.4% for fenugreek with Imazapic twice and 89.0: 90.3% for $NH_4NO_3$ with Imazapic twice in the first and second season. The greatest reduction in number (> 82%) and dry weight (> 90%) of broomrape spikes/$m^2$ were obtained by application of fenugreek along with Imazapic herbicides twice in both seasons. However, the highest values of these traits were obtained from plots of Untreated without N fertilizer in the two seasons. Therefore, spraying of Imazapic or Glyphosate herbicides twice on faba bean intercropped with fenugreek and oat or fertilized by ammonium nitrate ($NH_4NO_3$) resulted in the best controlling for density and growth of broomrape parasite in both seasons. The maximum control efficiency of broomrape parasite weeds obtained from the integration of the mentioned treatments through inhibition of *O. crenata* seed germination by allelochemicals released by fenugreek roots or oat (Fernandez-Aparicioa *et al*.,2008), and mortality due to phytotoxic effect of herbicide on broomrape parasite weeds.

*Faba bean*

*Photosynthetic pigments content*

Photosynthetic pigments content (chlorophyll a, b and total chlorophyll) in leaves of faba bean plants as affected by broomrape control herbicides (Imazapic 10% EC and Glyphosate 48% WSC), intercropping with fenugreek or oat and nitrogen fertilizer in 2010/11 and 2011/2012 seasons are shown in Table 3. Application of broomrape control herbicides had a significant effect on chlorophyll a, b and total chlorophyll in the two seasons. Repeating foliar spray with either Imazapic 10% EC or Glyphosate 48% WSC on faba bean plants resulted in a significant decrease in all estimated photosynthetic pigments content in leaves compared with Untreated treatment in both seasons. The lowest values of photosynthetic pigments content were recorded by spraying Imazapic 10% EC or Glyphosate 48% WSC twice. In this connection, El-Hattab *et al.* (1987) found that chlorophyll a, b and total chlorophyll content decreased by increasing the dose of glyphosate. They reported that glyphosate induced phytotoxicity on decreasing the chlorophyll a, b and total chlorophyll content in the leaves of faba bean. Data in Table 3 show that chlorophyll a, b and total chlorophyll contents were significantly greater in leaves of faba bean fertilized by N fertilizer than in those of sole faba bean plants without N fertilizer or

intercropped with fenugreek or oat in both seasons. The beneficial effects of nitrogen in increasing photosynthetic pigments content were reported by El-Hattab *et al.* (1987). The interaction between broomrape control herbicides and intercropping had a significant effect on chlorophyll a, b and total chlorophyll content in both seasons. At the same herbicide treatment, photosynthetic pigments content were increased in leaves of faba bean fertilized by N fertilizer in the form of ammonium nitrate ($NH_4NO_3$) than those of sole faba bean or intercropped with oat. Repeating spray of herbicides decreased these traits at any intercropping treatment. Sole faba bean plants fertilized by $NH_4NO_3$ recorded the highest values of photosynthetic pigments content (chlorophyll a, b and total chlorophyll) in its leaves in both seasons.

**TABLE 3. Photosynthetic pigments content (chlorophyll a, b and total chlorophyll) in leaves of faba bean plants as affected by broomrape control herbicides, intercropping and nitrogen fertilizer in 2010/11 and 2011/2012 seasons.**

| Factor | 2010/11 season | | | 2011/12 season | | |
|---|---|---|---|---|---|---|
| | Chlorophyll (gm/g) | | | Chlorophyll (gm/g) | | |
| | a | b | Total | a | b | Total |
| **Herbicide:** | | | | | | |
| Untreated (C) | 4.21 a | 1.64 a | 7.31 a | 4.28 a | 2.08 a | 7.82 a |
| Imazapic, once ($I_1$) | 4.19 a | 1.56 ab | 7.17 a | 4.35 a | 1.94 ab | 7.73 a |
| Glyphosate, once ($G_1$) | 3.77 b | 1.5 ab | 6.59 b | 3.91 b | 1.75 bc | 7.04 b |
| Imazapic, twice ($I_2$) | 3.61 b | 1.34 c | 6.18 b | 3.75 b | 1.6 c | 6.61 b |
| Glyphosate, twice($G_2$) | 3.63 b | 1.48 bc | 6.41 b | 3.78 b | 1.77 bc | 6.87 b |
| | ** | * | * | * | * | ** |
| **Intercropping and N :** | | | | | | |
| Sole faba bean (S) | 3.51 c | 1.43 bc | 6.18 c | 3.71 c | 1.7 b | 6.69 c |
| FB+Fenugreek (F) | 4.01 b | 1.53 b | 6.92 b | 4.11 b | 1.85 b | 7.4 b |
| FB+Oat (O) | 3.71 c | 1.4 c | 6.39 c | 3.79 c | 1.69 b | 6.77 c |
| FB+ $NH_4NO_3$ (N) | 4.29 a | 1.65 a | 7.43 a | 4.44 a | 2.08 a | 7.99 a |
| | ** | * | ** | ** | * | * |
| **Interaction:** | | | | | | |
| C x S | 3.74 e | 1.48 def | 6.52 efg | 3.97 def | 1.93 cd | 7.26 def |
| C x F | 4.4 ab | 1.63 bcd | 7.51 abc | 4.54 a | 2.07 abc | 8.05 ab |
| C x O | 4.2 c | 1.72 abc | 7.42 abc | 4 de | 2.11 ab | 7.64 cd |
| C x N | 4.49 a | 1.74 abc | 7.79 a | 4.61 a | 2.21 a | 8.33 a |
| $I_1$ x S | 3.83 e | 1.61 bcd | 6.82 de | 4.1 cd | 1.94 cd | 7.42 cde |
| $I_1$ x F | 4.32 bc | 1.69 abc | 7.51 abc | 4.28 a-d | 2.17 a | 8.05 ab |
| $I_1$ x O | 4.2 c | 1.17 h | 6.63 def | 4.49 abc | 1.42 jk | 7.21 ef |
| $I_1$ x N | 4.4 ab | 1.76 ab | 7.7 a | 4.52 ab | 2.23 a | 8.25 a |
| $G_1$ x S | 3.41 fg | 1.44 ef | 6.07 gh | 3.6 fgh | 1.56 g-j | 6.49 hi |
| $G_1$ x F | 4.01 d | 1.32 fg | 6.62 def | 4.14 bcd | 1.47 ijk | 6.92 fg |
| $G_1$ x O | 3.46 f | 1.43 ef | 6.12 fgh | 3.59 fgh | 1.74 f | 6.63 gh |
| $G_1$ x N | 4.2 c | 1.82 a | 7.56 ab | 4.3 a-d | 2.21 a | 8.11 ab |
| $I_2$ x S | 3.26 g | 1.22 gh | 5.59 h | 3.3 h | 1.36 k | 5.81 j |
| $I_2$ x F | 3.45 f | 1.43 ef | 6.12 fgh | 3.66 e-h | 1.68 fgh | 6.63 gh |
| $I_2$ x O | 3.36 fg | 1.33 fg | 5.87 h | 3.47 h | 1.62 f-i | 6.26 hi |
| $I_2$ x N | 4.37 ab | 1.38 f | 7.13 bcd | 4.55 a | 1.75 ef | 7.76 bc |
| $G_2$ x S | 3.31 fg | 1.39 f | 5.89 h | 3.57 gh | 1.69 fg | 6.47 hi |
| $G_2$ x F | 3.87 de | 1.6 bcd | 6.85 de | 3.92 d-g | 1.89 de | 7.36 de |
| $G_2$ x O | 3.35 fg | 1.37 fg | 5.91 h | 3.39 h | 1.53 hij | 6.13 ij |
| $G_2$ x N | 4.01 d | 1.58 cde | 6.99 cde | 4.23 a-d | 1.99 bcd | 7.52 cde |
| | * | * | * | * | * | * |

FB= Faba bean. * and ** indicate $P < 0.05$, $P < 0.01$ and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level using DMRT

*Growth, seed yield and its attributes*

Data in Tables 4 and 5 show that all herbicidal treatments significantly increased plant height, number of branches and pods/plant, 100-seed weight, seed yield/plant, seed and biological yields/fed of faba bean compared with untreated treatment in both seasons. Plots sprayed twice with of Imazapic herbicide significantly exceeded those sprayed once with Imazapic or Glyphosate herbicides in seed and biological yields as well as its attributes in both seasons. Such increases in seed yield per feddan obtained from the mentioned treatments may be attributed to successful control broomrape parasite weed which reduced competition and consequently favored growth of faba bean plants, yield attributes (number of branches and pods/plant, 100-seed weight and seed yield/plant) and consequently seed yield. In this connection, Fayed *et al.* (2002) found a significant negative correlation between seed yield of faba bean and number of *Orobanche* / $m^2$. These results are in agreement with those obtained by Ghalwash (2003) , Ghalwash *et al.* (2008) and Kenapar (2009).

Plant height, seed and biological yields and its attributes of faba bean were significantly affected by intercropping and N fertilizer in both seasons. Faba been intercropped with fenugreek or fertilized with $NH_4NO_3$ produced significantly taller plants and greater seed and biological yields as well as its attributes than did sole faba bean without N fertilizer in both seasons. Such increases in grain yield obtained from the mentioned treatments may be attributed to successful control broomrape parasite weeds which reduced competition and consequently favored growth of faba been plants, yield attributes and 100-grain weight and consequently seed yield. The increase in seed yield might be due to increased availability of nitrogen causing accelerated photosynthetic rate and thus leading to the production of more carbohydrates, consequently it improved faba bean plant growth and development of yield attributes which in turn resulted in increasing seed yield. Also, this may be due to rapid growth of faba bean plants by adding nitrogen fertilizer, which resulted in improving the competitive ability of faba bean to suppress density and growth broomrape parasite weed.

The interaction of herbicides and intercropping had a significant effect on number and weight of pods/plant and seed yield per plant as well as per feddan in both seasons (Table 6). The combination of Imazapic herbicide twice and fenugreek recorded the highest values of these traits, while sole faba bean plants without N fertilizer and Untreated produced the lowest ones in both seasons. Faba bean intercropped with fenugreek or fertilized with $NH_4NO_3$ and sprayed twice by Imazapic 10% EC herbicide produced significantly greater seed yield than each of them application alone in both seasons.

**TABLE 4. Plant height, number of branches, number of pods and weight of pods of faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer in 2010/11 and 2011/12 seasons.**

| Factor | Plant height (cm) | Branches (no/plant) | Pods (no/plant) | Pods weight (g/plant) |
|---|---|---|---|---|
| 2010/11season | | | | |
| **Herbicide:** | | | | |
| Untreated (C) | 90 c | 2.3 c | 3.8 c | 11.1 c |
| Imazapic, once ($I_1$) | 95.6 b | 2.9 bc | 5.4 bc | 15.7 bc |
| Glyphosate, once ($G_1$) | 95.1 b | 2.8 c | 5.3 bc | 15.1 c |
| Imazapic, twice ($I_2$) | 105.9 a | 4.1 a | 8.5 a | 25.9 a |
| Glyphosate, twice($G_2$) | 102.3 a | 3.4 ab | 6.9 ab | 20.7 ab |
| | * | ** | * | * |
| **Intercropping and N :** | | | | |
| Sole faba bean (S) | 94.3 b | 2.8 b | 5.1 b | 15.0 c |
| FB+Fenugreek (F) | 100.6 a | 3.5 a | 6.8 a | 20.3 a |
| FB+Oat (O) | 97.6 ab | 2.9 b | 5.8 ab | 17.2 b |
| FB+ $NH_4NO_3$ (N) | 98.6 a | 3.1 ab | 6.3 a | 18.4 ab |
| | * | * | * | * |
| **Interaction** | N.S. | N.S. | * | ** |
| 2011/12 season | | | | |
| **Herbicide:** | | | | |
| Untreated (C) | 86.6 c | 2.2 c | 3.8 c | 10.8 c |
| Imazapic, once ($I_1$) | 92.4 b | 2.9 b | 5.5 b | 18.0 b |
| Glyphosate, once ($G_1$) | 91.5 bc | 2.8 b | 5.1 b | 16.5 b |
| Imazapic, twice ($I_2$) | 104.0 a | 4.0 a | 8.0 a | 27.7 a |
| Glyphosate, twice($G_2$) | 100.9 a | 3.6 a | 7.1 a | 23.4 a |
| | ** | * | * | ** |
| **Intercropping and N :** | | | | |
| Sole faba bean (S) | 92.2 b | 2.8 c | 5.2 b | 16.5 c |
| FB+Fenugreek (F) | 97.5 a | 3.4 a | 6.6 a | 21.7 a |
| FB+Oat (O) | 94.9 ab | 3 bc | 5.8 ab | 19 b |
| FB+ $NH_4NO_3$ (N) | 95.8 a | 3.2 a | 6.1 a | 19.9 ab |
| | * | * | * | * |
| **Interaction** | N.S. | N.S. | * | * |

FB= Faba bean.

*, ** and ns indicate $P < 0.05$, $P < 0.01$ and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level using DMRT.

**TABLE 5. Seed yield, biological yield and 100-seed weight of faba bean as affected by broomrape control herbicides, intercropping with fenugreek or oat and nitrogen fertilizer in 2010/11and 2011/12 seasons.**

| Factor | 100-seed weight (g) | Seed yield (g/plant) | Seed yield (t/fed) | Biological yield (t/ fed) |
|---|---|---|---|---|
| 2010/11 season | | | | |
| **Herbicide:** | | | | |
| Untreated (C) | 71.93 c | 7.113 d | 0.163d | 0.36 c |
| Imazapic, once ($I_1$) | 75.5 b | 10.517 c | 0.387c | 0.993 b |
| Glyphosate, once ($G_1$) | 74.44 b | 10.045 c | 0.335c | 0.913 b |
| Imazapic, twice ($I_2$) | 83.84 a | 18.555 a | 1.005a | 2.273 a |
| Glyphosate, twice($G_2$) | 80.31 a | 14.367 b | 0.682b | 1.673 a |
| | * | ** | * | * |
| **Intercropping and N :** | | | | |
| Sole faba bean (S) | 75.51 c | 10.023 c | 0.364c | 0.974 c |
| FB+Fenugreek (F) | 79.36 a | 13.988 a | 0.633a | 1.464 a |
| FB+Oat (O) | 76.29 bc | 11.784 b | 0.497 b | 1.198 bc |
| FB+ $NH_4NO_3$ (N) | 77.64 ab | 12.682 ab | 0.563ab | 1.335 ab |
| | * | * | * | * |
| **Interaction** | N.S. | * | ** | N.S. |
| 2011/12 season | | | | |
| **Herbicide:** | | | | |
| Untreated (C) | 72.38 c | 7.351 c | 0.224d | 0.413 c |
| Imazapic, once ($I_1$) | 79.28 b | 11.607 b | 0.502c | 1.326 b |
| Glyphosate, once ($G_1$) | 78.78 b | 10.048 b | 0.430c | 1.166 b |
| Imazapic, twice ($I_2$) | 85.34 a | 18.589 a | 1.124a | 2.701 a |
| Glyphosate, twice($G_2$) | 83.87 a | 16.356 a | 0.942b | 2.23 a |
| | ** | * | * | ** |
| **Intercropping and N :** | | | | |
| Sole faba bean (S) | 76.91 c | 10.87 c | 0.465b | 1.305 c |
| FB+Fenugreek (F) | 82.4 a | 14.721 a | 0.823a | 1.806 a |
| FB+Oat (O) | 79.53 b | 12.046 bc | 0.575 b | 1.528 bc |
| FB+ $NH_4NO_3$ (N) | 80.87 ab | 13.525 ab | 0.715a | 1.63 ab |
| | * | * | * | * |
| Interaction | N.S. | * | * | N.S. |

FB= Faba bean. fed = feddan= 0.42 hectare.

*, ** and N.S. indicate $P < 0.05$, $P < 0.01$ and not significant, respectively. Means of each factor designated by the same latter are not significantly different at 5% level using DMRT.

**TABLE 6. Seed yield and some yield attributes of faba bean as affected by the interaction between broomrape control herbicides and intercropping or nitrogen fertilizer in 2010/11 and 2011/12 seasons.**

| Intercropping and N | Herbicides | | | | |
|---|---|---|---|---|---|
| | Untreated | Imazapic, once | Glyphosate, once | Imazapic, twice | Glyphosate, twice |
| 2010/11 season | | | | | |
| | Pods (No/plant) | | | | |
| Sole faba bean (S) | 3.oi | 4.7 fghi | 4.7 fghi | 6.8 de | 6.3 def |
| FB+Fenugreek (F) | 4.5 fghi | 6.1 defg | 6.1 defg | 9.9 a | 7.3 bcd |
| FB+Oat (O) | 3.7 hi | 5.0 efgh | 4.8 fgh | 8.7 abc | 6.8 de |
| FB+ $NH_4NO_3$ (N) | 4.3 ghi | 5.7 defg | 5.7 defg | 8.9 ab | 7.2 cd |
| | Pods weight (g/plant) | | | | |
| Sole faba bean (S) | 7.8 k | 14.2 g-j | 14.2 g-j | 20. cde | 18.6 c-g |
| FB+Fenugreek (F) | 13.6 hij | 17.8 d-h | 16.3 e-i | 30.7 a | 23. 0bc |
| FB+Oat (O) | 10.5 jk | 15.1 f-j | 14.5 g-j | 26. b | 19.7 c-f |
| FB+ $NH_4NO_3$ (N) | 12.5 ij | 15.8 e-i | 15.6 e-i | 26.8 ab | 21.5 cd |
| | Seed yield (g/plant) | | | | |
| Sole faba bean (S) | 4.96 h | 9.32 e-h | 9.218 e-h | 13.89 cde | 12.73 c-f |
| FB+Fenugreek (F) | 8.77e-h | 12.13 c-f | 10.99 d-g | 21.89 a | 16.16 bc |
| FB+Oat (O) | 6.70 gh | 10.03 d-g | 9.55 e-h | 19.04 ab | 13.60 cde |
| FB+ $NH_4NO_3$ (N) | 8.02fgh | 10.59 d-g | 10.42 d-g | 19.40 ab | 14.98 bcd |
| | Seed yield (t/fed) | | | | |
| Sole faba bean (S) | 0.098 k | 0.277 g-k | 0.242h-k | 0.668 bcd | 0.535 c-f |
| FB+Fenugreek (F) | 0.223h-k | 0.499 d-g | 0.443 e-h | 1.173a | 0.830 b |
| FB+Oat (O) | 0.864 jk | 0.351 f-j | 0.290 g-k | 1.081a | 0.630 b-e |
| FB+ $NH_4NO_3$ (N) | 0.135ijk | 0.420 e-i | 0.365 f-j | 1.100 a | 0.734bc |
| 2011/12 season | | | | | |
| | Pods (No/plant) | | | | |
| Sole faba bean (S) | 2.8 i | 4.8 e-i | 4.5 f-i | 7.0 a-e | 6.7 a-f |
| FB+Fenugreek (F) | 4.3 ghi | 6.6 ab-g | 5.6 b-h | 8.9 a | 7.3 abc |
| FB+Oat (O) | 3.8 hi | 5.4 c-h | 4.9 d-i | 7.8 ab | 7.0 a-e |
| FB+ $NH_4NO_3$ (N) | 4.1 hi | 5.4 c-h | 5.4 c-h | 8.3 a | 7.2 a-d |
| | Pods weight (g/plant) | | | | |
| Sole faba bean (S) | 7.4 j | 15.4 ghi | 14.4 ghi | 23. 0cde | 22.0 cdef |
| FB+Fenugreek (F) | 13.4 ghi | 21.7 c-f | 18.3 d-g | 30.1 a | 25.2 abc |
| FB+Oat (O) | 10.4 ij | 17.2 fgh | 15.8 ghi | 28.7 ab | 22.9 cde |
| FB+ $NH_4NO_3$ (N) | 11.8 hij | 17.5 e-h | 17.4 e-h | 28.9 ab | 23.7 bcd |
| | Seed yield (g/plant) | | | | |
| Sole faba bean (S) | 5.074 h | 9.974 efg | 9.273 fgh | 15.25 bc | 14.78 bcd |
| FB+Fenugreek (F) | 9.696 fg | 14.41 b-e | 10.60 def | 20.35 a | 18.55 ab |
| FB+Oat (O) | 5.766 gh | 10.19 efg | 10.11 efg | 18.96 ab | 15.20 bc |
| FB+ $NH_4NO_3$ (N) | 8.870 fgh | 11.86 cdef | 10.21 efg | 19.80 a | 16.89 ab |
| | Seed yield (t/fed) | | | | |
| Sole faba bean (S) | 0.119k | 0.349hij | 0.287h-k | 0.849d | 0.722de |
| FB+Fenugreek (F) | 0.336hij | 0.690de | 0. 6 22ef | 1.307a | 1.160abc |
| FB+Oat (O) | 0.184jk | 0.417ghi | 0.360 hij | 1.094bc | 0.817de |
| FB+ $NH_4NO_3$ (N) | 0.257ijk | 0.551efg | 0.449 fgh | 1.248ab | 1.068c |

FB= Faba bean. fed = feddan= 0.42 hectare

Means of each trait designated by the same latter are not significantly different at 5% level using DMRT.

It can be concluded that foliar spraying with Imazapic 10% EC or Glyphosate 48% WSC twice on faba bean intercropped or fertilized with ammonium nitrate ($NH_4NO_3$) could be recommended for optimum broomrape parasitic weed control and highest seed yield at Kafrelshiek Governorate.

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(*Received* 26/12/2012;
*accepted* 28/ 2/ 2013*)*

# المكافحه المتكامله للهالوك فى الفول البلدى بإستخدام السماد النيتروجينى والتحميل و مبيدات الحشائش

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المعمل المركزى لبحوث الحشائش- مركز البحوث الزراعية- الجيزة و
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أجريت تجربتان حقليتان بالمزرعة البحثية بمحطة البحوث الزراعية بسخا- محافظة كفر الشيخ- مصر خلال موسمى الزراعة ٢٠١٠/٢٠١١ ، ٢٠١١/٢٠١٢ ، لدراسة تأثير التكامل بين خمس معاملات مبيدات حشائش (الرش الورقى بمبيدى جليفوسيت ٤٨٪ WSC ، ايمازبيك ١٠٪ EC مرة واحدة أو مرتين إلى جانب معاملة المقارنة بدون رش) وأربع معاملات زراعية (تحميل الفول مع الحلبه ، وتحميل الفول مع الشوفان، و تسميد الفول بالسماد النيتروجينى نترات الأمونيوم بمعدل ٣٠ كجم ن/فدان، الفول منفرد) على مقاومة الهالوك فى الفول البلدى. تمت الرشة الأولى لمبيدات الحشائش فى بداية تزهير الفول البلدى والثانية بعد ٣ أسابيع. وتتلخص أهم النتائج فيما يلى:

أدى استخدام مبيدات الحشائش إلى نقص معنوى فى كثافة شماريخ الهالوك ونموها عن معاملة المقارنة فى الموسمين. وقد سجلت معاملات الرش بمبيدى جليفوسيت ، ايمازبيك أقل عدد و وزن جاف لشماريخ الهالوك بالمتر المربع عن الرش مرة واحدة. وقد أدى تحميل الحلبة والشوفان مع الفول أو التسميد بالسماد النيتروجينى الى إنخفاض العدد والوزن الجاف لشماريخ الهالوك بالمتر المربع بالمقارنة بزراعة الفول منفردا. اعطت معاملات تحميل الحلبة مع الفول أقل عدد ووزن جاف لشماريخ الهالوك بالمتر المربع يليها التسميد بالسماد النيتروجينى ثم تحميل الشوفان مع الفول على الترتيب فى كلا الموسمين. وقد أدى رش الفول المحمل مع الحلبة مرتين بمبيد ايمازبيك الى الحصول على أقل عدد و أقل وزن جاف لشماريخ الهالوك بالمتر المربع. ولم تكن الفروق معنوية بين هذه المعاملة ورش المبيدين مرتين على الفول المحمل او المسمد فى الموسمين. تم الحصول على أعلى نقص فى عدد شماريخ الهالوك (اعلى من ٨٢٪) وفى الوزن الجاف (اعلى من ٩٠٪) من رش الفول المحمل مع الحلبة مرتين بمبيد ايمازبيك فى كلا الموسمين.

أدى تكرار رش مبيدات الحشائش الى نقص معنوى فى الصبغات النباتية فى أوراق الفول (كلوروفيل A ، B ، الكلوروفيل الكلى) عن معاملة المقارنة فى الموسمين. زادت كل الصبغات النباتية فى أوراق الفول بمعاملة التسميد النيتروجينى عن زراعة الفول منفردا بدون تسميد نتروجينى أو محمل.

أدى الرش بأى من مبيدى الحشائش مرة أو مرتين الى زيادة معنويه فى أرتفاع النبات ، وعدد الأفرع بالنبات وعدد القرون بالنبات ووزن ١٠٠- بذرة ووزن بذور النبات ومحصولى البذور والبيولوجى بالفدان عن معاملة المقارنة فى الموسمين. وقد تفوقت نباتات الفول فى معاملة الرش مرتين بمبيد ايمازبيك على النباتات المرشوشة مره واحده لأى من المبيدين فى محصول البذور والمحصول البيولوجى ومكونات المحصول. وقد أدى تحميل الحلبة الفول أوالتسميد بالسماد النيتروجينى الى زيادة معنويه فى أرتفاع النبات ، وعدد الأفرع بالنبات وعدد القرون بالنبات ووزن ١٠٠- بذرة ووزن بذور النبات ومحصولى البذور والبيولوجى للفول البلدى بالفدان عن الفول المنفرد بدون تسميد نيتروجينى فى الموسمين. وقد تم الحصول على أعلى محصول بذور من رش الفول المحمل مع الحلبة مرتين بمبيد ايمازبيك . ولم تكن الفروق معنوية فى محصول البذور بين تلك المعاملة ورش المبيدين مرتين على الفول المحمل او المسمد فى الموسمين.

من نتائج هذا البحث يمكن التوصية بتحميل الحلبة مع الفول أو تسميد الفول بنترات الأمونيوم بمعدل ٣٠ كجم ن/فدان الى جانب الرش مرتين بأحد المبيدين ايمازبيك ، جليفوسيت للحصول على أفضل مقاومة للهالوك وأعلى محصول من بذور فول البلدى ، تحت نفس ظروف هذا البحث بمحافظه كفرالشيخ ، مصر.