INTEGRATED WEED CONTROL IN SUGAR BEET (*Beta vulgairs*, L.)

Sorour, S. Gh. R.* Anaam.H. Galal A.A.Shalaby***; H. A. Elsherif(4) and M.K.M. Abed- Elsalam*****

*** Agron.Dept., Fac. of Agric., Kaferelsheikh Univ., ** Agron.Dept., Fac.of Agric. Assuit Univ. *** Agriculture Research Center and ****Delta Sugar Company, Egypt**

ABSTRACT

Two field experiments were conducted at the Agricultural Research Farm of Delta Sugar Company, El-Hamol, Kaferelsheikh Governorate, Egypt, in 2010/2011 and 2011/2012 seasons to study the effect of weed control treatments on yield, quality and associated weeds of sugar beet (*Beta vulgaris* L.) cv."Pleno". The treatments were: Betanox 18% EC, Select Super 12.5%, Harness 84%, Goltix plus 50%, Targa super 5% + Safari, Goltix plus 50% + Fusilade forty 15% EC, Venzar + Safari, Betanal maxxpro 20% herbicides followed one hoeing (H) and hoeing 1, 2 and 3 times as well as unweeded as cheek treatment. Data obtained clearly revealed that:

Ten species of weeds infested sugar beet crops in both seasons. Approximately 70 % of weeds found in sugar beet crop are broadleaf species and 30 % are grass species. Weed control treatments substantially decreased number of weeds/m^2 compared with unweeded treatment at 180 days from sowing in both seasons. Harness 84%+ H, Targa super 5% + Safari+ H, Goltix P.50% + Fusilad forty15% +H, Betanal maxxpro 20%+ H and hoeing three times were among those having great reduction in number, fresh and dry weights of total weeds in both seasons.

Weed control treatments significantly increased root dimensions (length and diameter), root weight and top yield compared with unweeded treatment in both seasons. Hoeing three times, Harness 84%+ H and Goltix P.50% + Fusilad forty 15%+H were among those having great root yield per feddan in both seasons. There were no significant differences in root yield among the mentioned treatments and Targa super 5% + Safari+ H, Venzar + Safari+ H and Betanal maxxpro 20% +H in the first season and Select Super 12.5%+ H in the second season. Mechanical and chemical weed control treatments increased extractable white sugar % and juice purity% through improving sugar beet quality by increasing gross sugar % and reducing K+ Na and α-amino nitrogen contents compared with unweeded treatment. The maximum white sugar yield was obtained from application of Targa super 5% + Safari+ H, Goltix P.50% + Fusilad Forty 15% +H and hoeing three times treatments in both seasons. The mentioned treatments did not significantly differ in this respect than Venzar + Safari+ H and Betanal maxxpro 20%+ H in

the first season and Select Super 12.5%+ H and Harness 84%+ H in the second season.

It can be concluded that hoeing three times, Targa super 5% + Safari+ H, Goltix P.50% + Fusilad F.15% + H and Harness 84% + H could be recommended for optimum weed control as well as root and sugar yields of sugar beet under this conditions of research at Kaferelsheikh Governorate.

***Keywords*: weeds, herbicide, sugar beet**

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) is a major winter crop in Kaferelsheikh Governorate, Egypt. Therefore, efforts are focused for increasing the productivity of this crop by growing high yielding varieties under the most favorable cultural treatments such as weed control. Weeds have been a major problem in sugar beet since crop was first grown in the late 1700s. Weeds compete with sugar beet for light, nutrients and water. Sugar beet can tolerate weeds until 2-8 weeks after emergence, depending on the weed species, planting date, the time of weed emergence relative to crop and environmental conditions. Weeds are limiting factors in sugar beet production. Integrated weed control management is necessary for minimizing weeds interference and maximizing the crop yield (**Cooke and Scott, 1993**). Weeds can also cause problems unrelated to sugar beet. They can cause problems with harvest, reduce sugar beet quality, produce seed that contributes to future weed problems, and act hosts for insects and diseases (**Dexter, 2004**). Management practices that increase the competitive ability of crops with weeds can be important components of integrated weed management systems (**Blackshaw *et al.*, 2007**).

Selecting which herbicide to use for weed control in sugar beets is just like selecting herbicides for weed control in any other crop. Herbicide selection depends on the weed species to be controlled. **Miller and Fornstrom (1989)** reported that herbicides reduced early-season weed populations by 33 to 97% and hoeing times by 38 to 89% as compared with an untreated control. Similarly, herbicide treatments reduced mid-season weed populations by 48 to 97% and hoeing time by 48 to 88% as compared with an untreated control in the same study. Over time, there has been an increased cost associated with contract hand labor for weed control in sugar beet which has resulted in less labor and more use of herbicides and

cultivation. Despite the increased cost, hand labor remains an important tool in sugar beet weed management.

This investigation was carried out to study the effect of some weed control treatments on growth, yield and quality of sugar beet and weed control.

MATERIALS AND METHODS

Two field experiments were carried out at the Agricultural Research Farm of Delta Sugar Company, El-Hamol, Kaferelsheikh Governorate, Egypt, during 2010/2011 and 2011/2012 seasons, to study the effect of some weed control treatments on weeds, yield and quality of sugar beet (*Beta vulgaris* L.) cv. "Pleno". The preceding crop was rice in both seasons. The experimental soil was clay loam in texture with PH 8.08-7.99, organic matter with 1.32 – 1.41 % and available nitrogen with 26.01 – 26.85 ppm in the two seasons, respectively. During soil preparation, ordinary calcium super phosphate (15.5 % P_2O_5) was added at the rate of 30 kg P_2O_5 /faddan to the experimental field. Nitrogen fertilizer in the form of ammonium nitrate (33.5%) was applied at the rate of 90 kg N/feddan at 4-leaf stage and 8-leaf stage.

Twelve weed control treatments were allocated in randomized complete blocks design with five replicates. The weed control treatments were as follows:

1- Betanox 18% EC at the rate of 1.0 L/fed applied as post-emergence at 2-4 true sugar beet leave stage followed by one hand hoeing at 55 days after sowing (DAS).
2- Select Super 12.5% (clethodium) at the rate of 750 cm^3/fed applied at post-emergence at 2-3 leaves stage followed by one hand hoeing at 55 DAS.
3- Harness 84% (acetochlor) at the rate of 630 cm^3/fed applied as preemergence after sowing before irrigation followed by one hand hoeing at 55 DAS.
4-Goltix plus 50% (ethofumesate + metametron) at rate of 2.5 L/fed applied at pre-emergence after sowing before irrigation followed by one hand hoeing at 55 DAS.
5-Targa super 5% (quizalofop) at the rate of 500 cm^3/fed + Safari (trifusulfuron-methyl) at rate of 15g /fed applied as post-emergence after emerges broad and grassy weeds followed by one hand hoeing at 55 DAS.
6-Goltix plus 50% (ethofumesate + metametron) at the rate of 2.5 L/fed, applied at pre-emergence after sowing before

irrigation + Fusilade forty 15 % EC (fluazifop-p-butyl) at the rate of 750cm^3 /fed applied at post-emergence at 2-3 leaves of grassy weeds followed by one hand hoeing at 55 DAS.

7-Venzar at the rate of 250 g/fed applied at pre-emergence after sowing before irrigation + Safari (trifusulfuron-methyl) at rate of 15g/fed applied as post-emergence at two leave stage of broad weeds followed by one hand hoeing at 55 DAS.

8-Betanal maxxpro 20% at the rate of 630 cm^3/fed twice times, applied as pot-emergence at 2-4 true sugar beet leave stage and after 7 days followed by one hand hoeing at 55 DAS.

9- Hand hoeing three times, carried at 15&35&55 DAS.

10- Hand hoeing two times, carried at 35&55 DAS.

11- Hand hoeing once, carried at 55 DAS.

12- Control (Untreated).

The plot size was 22.5 m^2 (3 × 7.5 m). Each plot included five ridges 60 cm apart. Sowing took place on 13 and 19 October in 2010 and 2011seasons, respectively. Seed of multigerm sugar beet cultivar "Pleno" was sown in hills 20 cm apart at the rate of one seed by using mechanical planting method. Seed was soaking in tap water for 24 hours, and then dried at air room temperature for 24 hours before sowing. Other cultural practices were done as recommended in sugar beet fields.

Collected Data

I. Weeds:

Weeds were hand pulled from one square meter in each plot after 180 days from sowing and classified into two categories (broad-leaved and grassy weeds). Weeds were air-dried, then oven dried to constant weight for 48 hours at 70°C. The percent of weed reduction (R) was calculated using the following equation:

$$R = \frac{A - B}{A} \times 100$$

Where: A and B refer to dry weight of weeds in the untreated and treated plots, respectively.

II. Sugar beet:

At harvest (210 days after sowing), the central area of 9.6 m^2 of each plot were harvested to obtained number of harvested plants, root and top yields. Ten guarded plants were

taken at random and were screened for root weight, and top yield/plant, root diameter and root length.

Sugar and other chemical content in roots were determined in Delta Company of Sugar by means of an automatic sugar polarimeter according to Le Docte as described by **Mc Ginnus (1971)**. Corrected sugar content (white sugar) of beet was calculated by linking the beet non-sugars K, Na and α-amino-N (expressed as milliequivalents/100g of beet) as described by **Harvey and Dutton (1993)** as follows:

$$Z_B = Pol - [0.343(K+Na) + 0.094\ N_{BI} + 0.29].$$

Where:

Z_B = corrected sugar content (% beet)

N_{BI}= α-amino-N determined by the "blue number" method.

Juice purity percentage (QZ) was calculated as following in the Delta Company:

$$QZ = \frac{Z_B}{Pol}$$

Sugar yield per feddan was calculated from root yield per feddan multiplied by white sugar percentage.

The obtained data were subjected to analysis of variance according to **Gomez and 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 "MSTATC" computer software package.

RESULTS AND DISCUSSION

I. Weeds:

I.A. Species abundance

The most abundant weed species in sugar beet field at harvest in 2010/11 and 2011/12 seasons are shown in Table 1. Ten species of weeds infested sugar beet crops in both seasons. The most dominant weeds in sugar field were *Beta vulgaris* L., *Melilotus indicus*,All., *Chenopodium murale* L., *Malva sylvestris* L., *Solanum nigrum* L., *Rumex dentatus* L. and *Vicia sativa* L.as broadleaf weeds and *Polypogon monspeliensis* L., *Avena fatua* L. and *Phalaris sp.*as grass weeds in both 2010/2011 and 2011/2012 seasons. The percentage of broadleaf weeds number was 79% and 15%, while the percentage of grass weeds was 21% and 85% in the two

seasons, respectively. In concerning to weeds biomass, the percentage of broadleaf weeds were 91.5% and 8.5%, while the percentage of grass weeds were 16.8% and 83.2% in the two seasons, respectively.

I.B. Density and growth of weeds

Data in Table 2 and 3 shows that weed control treatments had a significant effect on weed density, fresh and dry weights of broadleaf, grass and total weeds at 180 DAS in both seasons. All applied weed control treatments substantially suppressed unweeded check number, fresh and dry weights of broadleaf, grass and total weeds in both seasons. The relative ranking of weed control treatments was inconsistent in density and growth of broadleaf weeds. Betanal maxxpro or Venzar + Safari with one hoeing and three hoeing treatments were among those having great reduction in number, fresh and dry weights of broadleaf weeds in both seasons. Fig. 1 shows that the reduction in dry weight of broadleaf weeds as average of two seasons was 85.7% for Betanal maxxpro plus one hoeing (H), 81.0 % for Venzar + Safari+ H and 71.7% for three hoeing (HHH).

Application of Select Super + H., Goltix plus+ Fusilad F.+ H and HHH being insignificant, recorded the maximum reduction in number, fresh and dry weight of grass weeds in both seasons. Fig. 2 shows that the reduction in dry weight of grass weeds as average of two seasons was 96.9% for Goltix plus+ Fusilad F.15% + H, 96.4 % for Select Super + H and 82.6% for three hoeing (HHH).

Harness 84%+ H., Targa super 5% + Safari+ H., Goltix P.50% + Fusilad F.+H., Betanal maxxpro 20%+ H., HHH were among those having great reduction in number, fresh and dry weight of total weeds in both seasons (Table 3). Fig. 3 shows that the reduction in dry weight of total weeds as average of two seasons was 81.5% for Goltix P.50% + Fusilad F.+H., 77.8% for Harness 84%+ H, 77.6% for HHH and 68.6% for Betanal maxxpro 20%+ H. Similar results were obtained by **AL-Moghazy (2000),Shalaby (2001) and Kaya and Buzluk (2006)**.

Table 1: Common and scientific name of weeds, their density and biomass in unweeded plots in 2010/2011and 2011/2012 seasons.

Common name	Scientific name	Density (No./m^2)		Biomass (g./m^2)	
		2010/11	2011/12	2010/11	2011/12
Broadleaf weeds					
Wild beets	*Beta vulgaris*, L	11.25	1	970	26.5
Sour clover	*Melilotus indicus*, All	2.5	0.75	147.25	136.5
Lambs quarter	*Chenopodium murale*, L.	3	1.5	180.65	35.5
High mallow	*Malva sylvestris*, L.	4.25	2.5	1098.5	213.1
Black Nightshade	Solanum nigrum. L.	1	1	25.15	20.4
Sorrel	*Rumex dentatus*, L	1.3	0.75	86.45	95.5
Common vetch	*Vicia sativa*, L.	1	0.5	50	51.3
Total of broad species		24.3	8.0	2558	578.8
Narrow leaf weeds					
Beard grass	*Polypogon monspeliensis*, L.	2.5	1.5	65.3	46.25
Wild oat	*Avena fatua*, L.	2.75	2.5	151.5	137.05
Phalaris	*Phalaris sp.*	1.25	40.5	20	2680.7
Total of grass species		6.5	44.5	236.8	2864
Total of all weed species		30.8	52.5	2795	3443

Table 2: Numbers, fresh and dry weights (g/m^2) of broad leaf and grassy weeds as affected by weed control treatments in 2010/20011 and 2011/2012 seasons.

Treatments	Density (No./m^2)		Fresh weight (g/m^2)		Dry weight (g/m^2)	
	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12
	Broad leaf weeds /m^2					
Betanox	13.5 bcd	3.0 cde	1723. bc	81 de	484.5 b	21.0 e
Select Super	17.3 b	6.0 abc	1698. bc	407.6 b	453.0 bc	149.6 ab
Harness	9.0 d	4.3 bcd	846.3 ef	215.1 c	212.6 def	80.9 cd
Goltix plus	12.8 bcd	3.3cde	1976. b	155.5 cd	502.7 b	58.1 de
Targa super + Safari	12.3 bcd	5.8 abc	1032. def	388 b	273.6 def	110.0 bc
Goltix P.+ Fusilad F.	9.80 cd	6.8 ab	960.6 ef	332 b	234.8 def	92.4 cd
Venzar+ Safari	8.0 d	1.0 e	684.3 ef	103.1 de	139.4 ef	30.5 e
Betanal maxxpro.	7.3 d	1.5 de	558.1 f	52.6 e	111.7 f	16.5 e
Hoeing (3 times)	8.3 d	0.3 e	969.3 ef	32.1 e	245.4 def	7.9 e
Hoeing (twice)	11.5 bcd	1.0 e	1176. de	34.3 e	298.3 cde	15.2 e
Hoeing (once)	16.3 bc	3.3 cde	1464. cd	130.3 cde	344.4 bcd	45.3 de
Control	24.3 a	8.0 a	2558. a	578.8 a	716.2 a	179.4 a
	**	**	**	**	**	*
	grassy weeds /m^2					
Betanox	2.3 b	16.8bc	134.0 c	1801 bc	45.4 cd	473.9 bc
Select Super	0.3 b	0.3 d	9.6 e	133 e	2.6 f	34.6 e
Harness	0.5 b	10.3 bcd	24.30 e	640.1 d	6.9 f	129.0 de
Goltix plus	1.3 b	9.3 cd	72.0 d	824.8 d	21.4 ef	253.7 cde
Targa super + Safari.	2.0 b	7.3 cd	112.3 c	575 d	33.4 de	174.5 cde
Goltix P. + Fusilad F.	0.3 b	0.3 d	3.000 e	125 e	0.9 f	30.8 e
Venzar + Safari	1.8 b	19.8 bc	121.3 c	1650 bc	42.6 cde	429.1 bcd
Betanal maxxpro.	2.8 b	13.8 bcd	223.5 ab	1388 c	70.4 b	391.2 bcd
Hoeing (3 times)	1.8 b	6.8 cd	150.3 c	445 de	45.2 cd	135.4 de
Hoeing (twice)	1.8 b	15.3 bcd	191.3 b	1634 bc	60.4 bc	455.7 bcd
Hoeing (once)	2.0 b	25.0 b	224.3 ab	1878 b	71.1 b	582.2 b
Control	6.5 a	44.5 a	236.8 a	2864 a	92.3 a	945.1 a
	**	**	**	**	**	*

*and ** and indicate $p < 0.05$ and $P < 0.01$ respectively. Means of each factor designated by the same letters are not significantly different at 5% level using Duncan's Multiple Range Test.

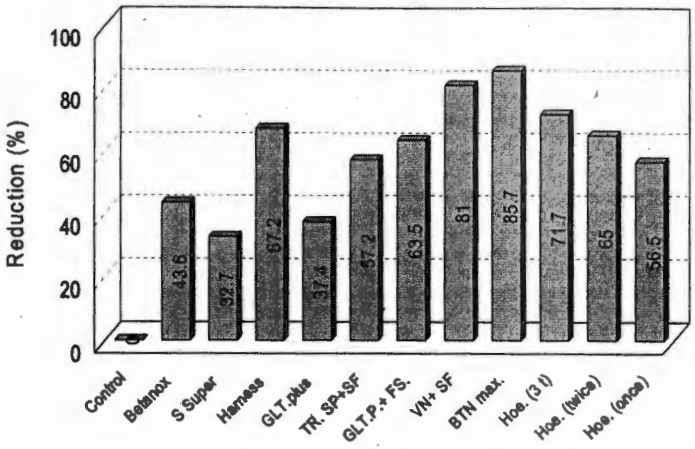

Figure 1: Percentage of reduction in dry weight of broadleaf weeds as affected by weed control treatments in combined the two seasons.

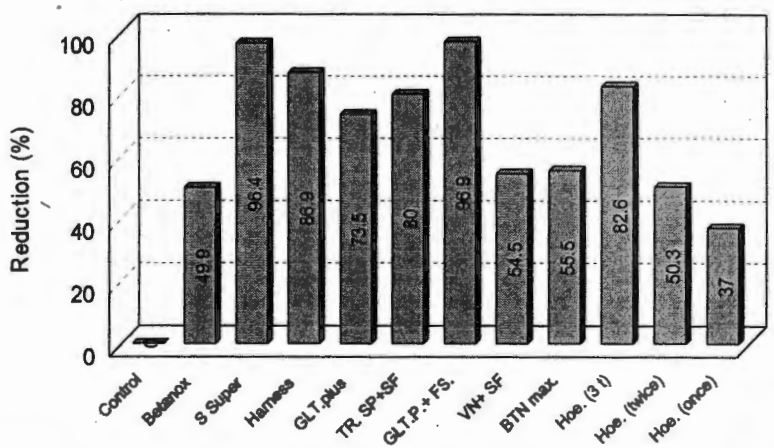

Figure 2: Percentage of reduction in dry weight of grass weeds as affected by weed control treatments in combined the two seasons.

Table 3: Numbers, fresh and dry weights (g/m^2) of total weeds as affected by weed control treatments in 2010/20011 and 2011/2012 season.

Treatments	Density (No./m^2)		Fresh weight (g/m^2)		Dry weight (g/m^2)	
	2010/11	2011/12	2010/11	2011/12	2010/11	2011/12
Betanox 18%+ H.H.*	15.8 bcd	19.8 bc	1857. b	1882 b	529.8 b	494.8 bc
Select Super 12.5%+ H.H.	17.5 bc	6.3 c	1707. bc	540.6 e	455.5 bcd	184.2 cd
Harness 84%+ H.H.	9.5 d	14.5 bc	870.5 e	855.3 de	219.8 ef	209.9 cd
Goltix plus 50%+ H.H.	14 bcd	12.5 c	2048. b	980.3 d	524.3 bc	311.8 cd
Targa super 5% + Safari+ H.H.	14.3 bcd	13.0 c	1144. de	963 d	307.3 def	284.5 cd
Goltix P.50% + Fusilad F.+H.H.	10.0 cd	7.0 c	963.6 de	457 e	234.8 ef	123.1 d
Venzar + Safari+ H.H.	9.8 bcd	20.8 bc	805.5 e	1753. bc	182.3 f	459.6 bc
Betanal maxxpro 20%+ H.H.	10.1 bcd	15.3bc	794.9 e	1441 c	200.3 ef	407.7 bcd
Hand Hoeing (3 times)	10.1 d	7.0 c	1121. de	477.1 e	290.0 def	143.3 d
Hand Hoeing (twice)	13.3 bcd	16.3 bc	1368. cd	1669 bc	358.8 cde	470.9 bc
Hand Hoeing (once)	18.3 b	28.3 b	1688. bc	2008 b	415.5 bcd	627.4 b
Untreated	30.8 a	52.5 a	2795. a	3443 a	808.5 a	1125 a
	**	**	**	**	*	*

*and ** and indicate p < 0.05 and P < 0.01, respectively. Means of each factor designated by the same letters are not significantly different at 5% level using Duncan's Multiple Range Test.

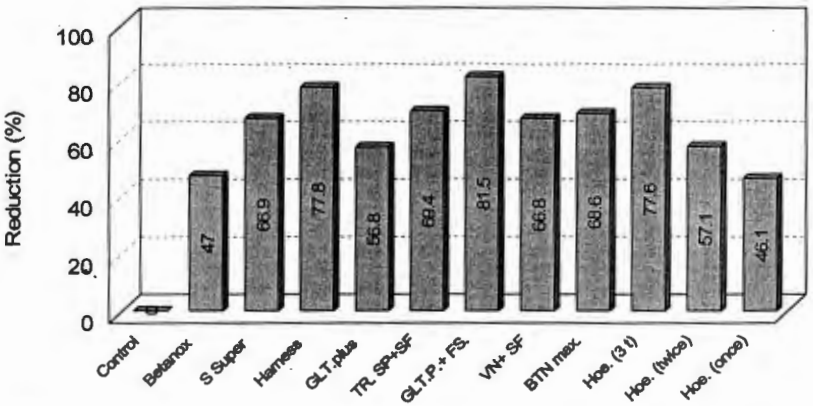

Figure 3: Percentage of reduction in dry weight of total weeds as affected by weed control treatments in combined the two seasons.

II. Sugar beet

II. A. Growth:

Means of root length and diameter as affected by weed control treatments during 2010/11 and 2011/12 seasons are presented in Table 4. Weed control treatments significantly increased root length in the second season and root diameter in both seasons as compared with unweeded treatment. There were no significant differences among mechanical and chemical weed control treatments in root length in the second season

and root diameter in both seasons. The shortest and lightest roots were obtained from unweeded check treatment in both seasons. This reduction in root dimensions may be occurred as a result of the competition between beet and weed plants for nutrients and water. Hoeing resulted in an increase in root deepen and thickness. These results reflects the negative correlation between weed density and root dimensions, whereas the hoeing destroyed survival and late emerged weeds and minimized weed competition to a great extent. These results are in good agreement with those reported as **Abd El-Aal (1995), Abo El-Kheir (1996) AL- Moghazy (2000)** and Shaban *et al.* (2001).

II. B. Yield and its components:

Numbers of harvested plants, root weight, top yield, and root yield of sugar beet cv. "Pleno" as affected by weed control treatments in 2010/2011 and 2011/2012 seasons are presented in Table 4. Data show that weed infestation in the unweeded plots excerted a sharp reduction in number of harvested plants per feddan. Number of survival beets per unite area at harvest was markedly greater in all plots of weed control treatments than in those of unweed treatment in the two seasons. The relative rankings of weed control treatments for number of harvested plants per feddan in both seasons. Select super, Harness 84%, Targa super 5% + Safari and Goltix P.50% + Fusilad F herbicides followed by one hoeing were among those having great number of harvested plants per feddan in the two seasons. Root weight, top and root yields per feddan were significantly influenced by applied treatments in favour of mechanical and chemical weed control treatments as compared with unweeded treatment. Select super, Harness 84%, Targa super 5% + Safari and Goltix P.50% + Fusilad F herbicides followed by one hoeing and three hoeing were among those treatments having high top yield and root weight in both seasons. The relative rankings of weed control treatments for root yield per feddan in both seasons. This may be due to different weed species in the two seasons, where the broad-leaved weeds were prevalent in the first season, while grass weeds were prevalent in the second season. Hoeing three times, Harness 84%+ H and Goltix P.50% + Fusilad F.+H were among those having great root yield per feddan in both seasons. There were no significant differences in root yield

among the mentioned treatments and Targa super 5% + Safari+ H, Venzar + Safari+ H and Betanal maxxpro 20%+ H in the first season and Select Super 12.5%+ H in the second season.

Table 4: Root length(cm), root diameter(cm), number of harvested plants, root weight (kg/plant), top yield (t/fed) and root yield (t/fed) top yield of sugar beet cv. "Pleno" as affected by weed control treatments in 2010/2011 and 2011/2012 seasons.

Treatments	Root	Root	Harvested	Root	Top	Root
	2010/2011 season					
Betanox 18%+ H.H.*	22.08	9.25 a	26350 ab	0.85 ab	6.45 ab	22.46 cd
Select Super 12.5%+ H.H.	24.33	9.50 a	27880 ab	0.84 ab	6.32 ab	23.42 bcd
Harness 84%+ H.H.	22.66	9.73 a	28140 ab	0.87 ab	7.57 ab	24.59 a-d
Goltix plus 50%+ H.H.	23.35	9.23 a	26760 ab	0.87 ab	6.51 ab	23.41bcd
Targa super 5% + Safari+ H.H.	24.17	9.98 a	28290 ab	1.00 a	8.63 a	28.4 a
Goltix P.50% + Fusilad F.+H.H.	25.83	9.48 a	29070 a	0.94 ab	6.9 ab	27.34 ab
Venzar + Safari+ H.H.	23.17	9.93 a	27610 ab	0.89 ab	6.77 ab	24.75 a-d
Betanal maxxpro 20%+ H.H.	22.50	9.38 a	28200 ab	0.94 ab	6.83 ab	26.54 ab
Hand Hoeing (3 times)	23.35	9.25 a	27810 ab	0.97 ab	8.75 a	27.2 ab
Hand Hoeing (twice)	21.92	8.30 a	26960 ab	0.83 ab	6.48 ab	22.42 d
Hand Hoeing (once)	23.92	9.00 a	24430 b	0.81 b	5.53 bc	19.86 de
Untreated	20.83	5.38 b	22500 c	0.22 c	4.01 c	5.03 f
	NS	*	*	**	**	*
	2011/2012 season					
Betanox 18%+ H.H.*	23.81 a	9.06 ab	24111 c	0.86 b	6.01 cd	20.74 de
Select Super 12.5%+ H.H.	26.52 a	9.86 a	27417 a	1.04 ab	7.98 ab	28.51 a
Harness 84%+ H.H.	25.73 a	10.36 a	26642 ab	0.995 ab	7.44 abc	26.51 ab
Goltix plus 50%+ H.H.	27.04 a	9.94 a	25482 b	0.91 ab	6.82 bc	23.52 bcd
Targa super 5% + Safari+ H.H.	24.89 a	9.17 ab	26233 ab	0.93 ab	7.81 abc	24.4 bc
Goltix P.50% + Fusilad F.+H.H.	25.98 a	10.06 a	26102 ab	1.14 ab	9.10 a	29.76 a
Venzar + Safari+ H.H.	25.04 a	8.54 ab	25861 b	0.84 b	7.39 abc	21.72 cd
Betanal maxxpro 20%+ H.H.	24.52 a	9.29 ab	25602 b	0.95 ab	6.08 cd	24.32 bc
Hand Hoeing (3 times)	24.83 a	9.52 ab	24274 c	1.21 a	9.01 a	29.34 a
Hand Hoeing (twice)	23.97 a	8.67 ab	23593 c	1.02 ab	7.00 bc	24.06 bc
Hand Hoeing (once)	24.29 a	7.49 b	21778 d	0.86 b	4.87 d	18.73 e
Untreated	17.54 b	3.35 c	18580 e	0.21 c	0.94 e	3.9 f
	*	**	**	**	**	**

*,** 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 Duncan's Multiple Range Test.

The favorable effect of weeding treatment in this respect reflects their high efficiency in controlling beets weeds giving lower weed competition and more chance to better growth of sugar beet plant and in turn increased number of survival

plants, root dimensions and root weight that led to increase root yield. Effect of weed interference on growth and yield of beets is not defined only in the competition impact but mostly include also the allelochimical resultant by weeds in soil and their harmful effect on growth and yield of sugar beet. Confirming results on the damage effect of weeds on sugar beet yield were obtained by **Abd El-Aal (1995), Abo El-Kheir (1996) and Meighani and Jahedi (2010).** **I.C. Sugar yield and root quality:**

The soluble non-sugars, potassium, sodium and α-amino nitrogen in the roots are regarded as impurities because they interfere with sugar extraction. Means of these impurities, gross sugar %, extractable white sugar %, juice purity % and white sugar yield per feddan as affected by weed control in in 2010/11and 2011/12 seasons are presented in Table 5.

Table 5: Sugar yield and some root quality of sugar beet cv. "Pleno" as affected by weed control treatments in 2010/2011 and 2011/2012 seasons.

Treatments	Gross sugar (%)	K +Na (meq/100 g)	α–N (meq/100g)	K +Na /α–N	Juice purity (%)	White sugar (%)	Sugar yield (t/fed)
	season 2010/2011						
Betanox 18%	18.06 a	5.93 bc	1.86	3.19	86.1 a	15.56 ab	3.48 e
Select Super 12.5%	17.76 a	5.69 bc	1.83	3.11	86.4 a	15.35 ab	3.6 cd
Harness 84%	18.08 a	5.68 bc	1.69	3.36	86.7 a	15.68 ab	3.86 bcd
Goltix plus 50%	17.66 a	6.18 b	1.81	3.41	85.4 a	15.07 b	3.53 cde
Targa super 5% + Safari	18.16 a	5.66 bc	1.66	3.41	86.8 a	15.77 ab	4.49 a
GoltixP.50%+ Fusilad F	18.56 a	5.57 c	1.8	3.09	87.2 a	16.18 ab	4.42 a
Venzar + Safari	18.61 a	5.77 bc	1.8	3.21	86.9 a	16.18 ab	4 abc
Betanal maxxpro 20%	18.87 a	5.53 c	1.69	3.27	87.5 a	16.53 a	4.38 a
Hand Hoeing (3 times)	17.72 a	5.78 bc	1.79	3.23	86.2 a	15.28 ab	4.16 ab
Hand Hoeing (twice)	18.04 a	5.85 bc	1.77	3.31	85.0 a	15.34 ab	3.44 e
Hand Hoeing (once)	18.11 a	5.98 bc	1.65	3.62	86.2 a	15.62 ab	3.1 e
Untreated	14.64 b	6.85 a	2.15	3.19	80.7 b	11.80 c	0.59 f
	**	**	NS	NS	**	**	**
	season 2011/2012						
Betanox 18%*	17.76bcd	5.97 cd	1.38 e	4.33 abc	86.1 a	15.29 abc	3.18 de
Select Super 12.5%	17.83bcd	5.3 e	1.79 c	2.96 de	87.1 a	15.54 abc	4.44 ab
Harness 84%	17.96bcd	5.43 de	1.83 c	2.97 de	87.1 a	15.64 abc	4.15 abc
Goltix plus 50%	17.78bcd	5.4 de	1.35 ef	4 bcd	87.2 a	15.51 abc	3.65 cd
Targa super 5% + Safari	18.99a	5.54 de	1.19 g	4.66 abc	87.9 a	16.69 a	4.07 abc
GoltixP.50%+Fusilad F.	18.25abc	5.58 de	1.51 d	3.7 cde	87.1 a	15.9 abc	4.73 a
Venzar + Safari	17.67bcd	6.34 bc	1.28 fg	4.95 ab	85.4 a	15.09 bc	3.28 de
Betanal maxxpro 20%	18.31 ab	5.14 e	1.59 d	3.23 de	88.0 a	16.11 ab	3.92 bc
Hand Hoeing (3 times)	17.29 cd	5.93 cd	2.10 b	2.82 e	85.4 a	14.77 bc	4.34 ab
Hand Hoeing (twice)	17.23 d	6.67 b	1.24 g	5.38 a	84.4 ab	14.54 c	3.5 cd
Hand Hoeing (once)	17.27 cd	6.68 b	2.12 b	3.15 de	83.9 ab	14.49 c	2.72 e
Untreated	15.46 e	7.45 a	2.43 a	3.07 de	80.1 b	12.39 d	0.48 f
	**	*	**	**	*	**	**

*, ** 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 Duncan's Multiple Range Test.

Weed control treatments had a significant effect on sugar yield and all root juice quality in the two seasons, except concentration of α-amino nitrogen and alkalinity coefficient (K+Na/α-N) in the first season. Mechanical and chemical weed control treatments increased extractable white sugar % and juice purity% through improving sugar beet quality by increasing gross sugar % and reducing K+ Na and α-amino nitrogen contents as compared with unweeded treatment. Beet plants of all weed control treatments outyielded control plants in white sugar yield. The maximum white sugar yield was obtained from application of Targa super 5% + Safari+ H, Goltix P.50% + Fusilad F.+H and hoeing three times treatments in both seasons without significant differences from Venzar + Safari+ H and Betanal maxxpro 20%+ H in the first season and Select Super 12.5%+ H and Harness 84%+ H in the second season. Such increase in white sugar yield may be attributed to increase root yield and white sugar extraction %. These results are in agree with those obtained by **Abo El-Kheir (1996)** and **AL-Moghazy (2000) and Develkyte (2005).**

CONCLUSION

It can be concluded that hoeing three time, Targa super 5% + Safari+ H, Goltix P.50% + Fusilad F.15% +H and Harness 84%+ H could be recommended for optimum weed control and root and sugar yields of sugar beet at Kaferelsheikh Governorate.

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المكافحة المتكاملة للحشائش في بنجر السكر

صبحى غريب رزق سرور* ، أنعام حلمى جلال ** ، على أحمد شلبى***، حازم أحمد الشريف ***، موسى كامل محمد عبدالسلام****

*قسم المحاصيل كلية الزراعة – جامعة كفرالشيخ ، **قسم المحاصيل كلية الزراعة – جامعة أسيوط ، ***مركز البحوث الزراعية ****شركة الدلتا للسكر، مصر

أجريت تجربتان حقليتان على محصول بنجر السكر فى أرض طينية بمزرعة بالمزرعة البحثية لشركة الدلتا للسكر بمنطقة الحامول - بمحافظة كفر الشيخ خلال موسمي ٢٠١٠/٢٠١١ و ٢٠١١/٢٠١٢ لدراسة تأثير بعض معاملات مقاومة الحشائش على الحشائش ومحصول بنجر السكر. وقد تم استخدام الصنف عديد الأجنة (بلينو). وتضمنت الدراسة اثنى-عشر معاملة وزعت فى تصميم القطاعات الكاملة العشوائية فى خمس مكررات. تضمنت التجارب معاملات مقاومة الحشائش التالية: استخدام مبيد الحشائش بيتانوكس ١٨% ، سلكت سوبر ١٢،٥%، هارنس٨٤% ، جولتكس بلس، تارجا سوبر٥% + سفاري ، جولتكس بلس ٥٠% + فيوزيليد فورتى١٥% ، فنزار + سفاري ، بيتانال ماكس برو ٢٠% مع عزقة واحدة والعزيق مره واحدة ومرتان وثلاث مرات الى جانب معاملة المقارنة (بدون معاملة). وتتلخص أهم النتائج فيما يلى:

الحشائش:

تم حصر عشر أنواع من الحشائش فى أرض تجارب بنجر السكر خلال الموسمين ، تمثل الحشائش عريضة الأوراق بنسبة ٧٠ % و الحشائش النجيلية بنسبة ٣٠ % فى الموسمين. والحشائش عريضة الأوراق كانت السلق البرى والحندقوق المر والزربيح والخبيزه الشيطانى وعنب الديب والحميض والدحريج. أما الحشائش النجيلية كانت ذيل القط والزمير والفلارس .

أثرت معاملات مقاومة الحشائش معنوياً على عدد الحشائش/م٢ حيث أدت جميع معاملات مقاومة الحشائش الى انخفاض معنوى فى كثافة الحشائش بالمقارنة بالكنترول(الغير معامل) عند ١٨٠ يوماً من الزراعة فى الموسمين. معاملة هارنس٨٤% ، تارجا سوبر٥% + سفاري ، جولتكس بلس ٥٠% + فيوزيليد فورتى١٥% ، بيتانال ماكس برو ٢٠% مع عزقة واحدة ومعاملة العزيق ثلاث مرات من بين المعاملات التى أدت للحصول على أعلى نسبة لانخفاض العدد والوزن الطازج والجاف للحشائش الكلية فى وحدة المساحة فى الموسمين.

بنجر السكر:

أدت معاملات مقاومة الحشائش لزيادة معنوية فى طول وسمك الجذر،وزن الجذروكذلك محصول العرش عند الحصاد فى كلا الموسمين. معاملة العزيق ثلاث مرات ، هارنس٨٤% و جولتكس بلس ٥٠% + فيوزيليد فورتى١٥% مع عزقة واحدة من بين المعاملات التى اعطت اعلى محصول للجذر/فدان فى الموسمين،ولا توجد فروق معنوية بين المعاملات السابقة فى محصول الجذور وبين معاملة فنزار + سفاري ١٥جم/ف و بيتانال ماكس برو ٢٠% مع عزقة واحدة فى الموسم الأول و معاملة سلكت سوبر ١٢،٥% مع عزقة واحدة فى الموسم الثانى.

أدت معاملات مقاومة الحشائش الميكانيكية والكيميائية لزيادة النسبة المئوية للسكر الأبيض المستخلص ونقاوة العصير بتحسين صفات جودة البنجر وذلك بزيادة نسبة السكر الكلى وخفض المواد الغير سكرية الذائبة (البوتاسيوم والصوديوم والنتروجين الأمينى) بالمقارنة بمعاملة الكنترول فى الموسمين.أظهرت النتائج أن أعلى محصول سكر حقق من معاملة تارجا سوبر ٥% + سفارى وجولتكس بلس ٥٠% + فيوزيليد فورتى١٥% مع عزقة واحدة والعزيق ثلاث مرات فى الموسمين بدون اختلافات معنوية مع معاملة فنزار + سفاري ١٥جم/ف و بيتانال ماكس برو ٢٠% مع عزقة واحدة فى الموسم الأول ومعاملة هارنس٨٤% وسلكت سوبر ١٢،٥% مع عزقة واحدة فى الموسم الثانى.

من نتائج هذا البحث يمكن التوصية بإستخدام مكافحة الحشائش باستخدام مبيد تارجا سوبر ٥% + سفارى ،جولتكس بلس ٥٠% + فيوزيليد فورتى١٥% و هارنس٨٤% مع عزقة واحدة أوالعزيق ثلاث مرات للحصول على أفضل مقاومة للحشائش وأعلى محصول من بنجر السكر وأعلى جودة ، تحت نفس ظروف هذا البحث بمنطقة كفرالشيخ.