INTEGRATION EFFECTS OF MULCHING AND BURNING WITH HOEING ON SUGAR BEET AND ASSOCIATED WEEDS.

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ABSTRACT

Two field experiments were carried out during 2008/2009 and 2009/2010 winter seasons to evaluate the effect of some non-traditional methods for weed control on growth, yield and juice quality as well as associated weeds of sugar beet (*Beta vulgaris*, L.) grown in salinity soil condition at El-Serw Research Station. The most important results obtained could be summarized as follows:

- All weed control treatments reduced significantly fresh, dry weight and total of sugar beet weeds as compared to the unweeded check.
- Two hoeing with mulching was the most effective on controlling weeds followed by one hoeing with mulching and burning with two hoeing, respectively.
- Application of two hoeing improved drastically the efficiency of the mulching and burning in controlling sugar beet weeds when compared with other treatments.
- The showed that two hoeing with mulching resulted in good control of total weeds after 120 days from sowing (DAS).
- All growth criteria i.e., plant height (cm), leaves number/plant, root/top ratio and root characters responded significantly to two hoeing with mulching followed by one hoeing with mulching and burning with two hoeing , respectively, as compared with the untreated control treatment.
- Concerning the effect of weed control methods treatments on yield components of sugar beet plants, corresponding data cleared that two hoeing with mulching gave the highest values of tops, roots, biological and sugar yields.
- Application of hoeing with mulching or burning caused significant increases in values of juice quality parameters i.e., sucrose and purity % as compared with the untreated control treatment.
- Generally, it can be concluded that application of two or one hoeing with mulching of rice straw and burning with two hoeing were the recommended treatments for obtaining the highest growth, yield and juice quality of sugar beet plants as well as significant reduction in total weeds under salinity lands condition at El-Serw.

INTRODUCTION

Sugar beet (*Beta vulgaris*, L.) is an important crop not only in Egypt, but also in many different countries of the world production of sugar was depend mainly on sugar can from long time ago. About 45% of sugar in the world is normally produced from sugar beet. After introducing sugar beet in Egypt and its success as the second source of sugar production as well its more adaptability to our environmental factors, it became the second source for sugar industry. Egyptian Government imports large amounts of sugar every year to face the rapid increase of population. Recently production of sugar is not adequate enough to our consumption. Therefore more attention has been given to grow and development sugar beet crop to overlap the gab between consumption and production, especially its suitability to grow well salinity lands at El-Serw region as well its tolerant to stresses in addition to its low requirements of water. In this respect, several factors are believed to affect sugar yield such as weed control treatments. Reduction in sugar beet yield caused by weed competition depend on its characterized by their slow rate of growth during the early stages, i.e. from emergence to singling during which they may be heavily infested with weeds. So, the final stand of beet plants and, hence, their yields are reduced. In Egypt, leaving weeds without removal from sugar beet field caused losses in yield by about 50% **El-Hattab and Shaban (1982).** Therefore, it could be mentioned that weed control in sugar beet fields is a must to achieve high sugar yield.

Weeds are considering one of the most agricultural problems in salinity lands. This is because weeds cause losses in yield and its quality. Herbicides in sugar beet with a narrow limit and it does not on its own internal pressure to give high efficiency on its own without finding other alternatives to control weeds such as mulching by straw rice or burning the soil before planting. However, farmers have to use herbicides to control in weeds. But food products may become contaminated with herbicides through direct application of the chemical herbicides to the plant and land. Also the herbicides prices are expensive, environmental pollution, some of it kills one weed and leaves another, lead to loss of natural-balance between the pests and natural enemies **(Ismail, 1990).** So to avoid these harms and increase the crops yield, an attempt was carried

to develop a flame unit. In a trial to kill seeds, rhizomes, bulbs and tubers of weeds which lie dormant in the soil directly after tillage and before crops planting for increase crop yield and reduce environmental pollution. **El-Nakib (1990)** stated that flame was more efficient with the grass, the efficiency was 98-100%. Flame is preferable with the grass then the mechanical methods because of mechanical methods diffuse the rhizome (stock root) in the soil. Therefore, prescribed burning has primarily been used as a tool for the control of invasive annual broadleaf and grass species **Ditomaso *et al.* (2006)**.

Mulching is a material applied to the soil surface primarily to prevent loss of water by evaporation, suppress weeds, and reduce temperature fluctuations or to promote productivity **Jack *et al.* (1955).** Mulching material is usually bulky and costly to transport. Consequently, mulching is unlikely to economic unless inexpensive material or a local waste product is available **Rowe-Dutton (1957).** The possibility of using rice straw mulch for their many positive effects such as low costs, in harmony with ecosystem without no harmful residual effect especially. In additions, soil mulch with rice straw improving growth, through releasing its mineral content soil leaves mineral contents as well as produced higher yield and better quality and gave good control of weeds when they used as soil mulch. The benefits of these methods are controlling all types of weeds and to avoid the chemical herbicides pollution. Most weed species were controlled by the mulching materials, the best organic mulch was rice straw and clearly related to weed control and are potential substitutes for herbicides **Anzalone *et al.* (2010)**.

Mechanical methods such as hoeing are used to destroy the weed plants which survived and escaped from the herbicides. Moreover, environmental factors may limit herbicidal effect of controlling weeds as well as pollution **(Abdel-Aal, 1995)**. Therefore, mechanical methods such as hoeing are used to destroy the weed plants which survived and escaped from the herbicides. Moreover, hoeing causes good aeration of the soil which encourages the growth of crop plants **Fayed *et al.* (1983).**

The objectives of this study were to determine the effects of some non-traditional methods for weed control i.e. burning and biodegradable as straw rice mulching as compared with hand hoeing on associated weeds, growth, yield and quality of sugar beet. Investigation we efficiently evaluate the current state of knowledge on the use of non-traditional methods to weeds control as a means to prevent or reduce the growth of weeds to find alternative ways to use herbicides or reduce the rates recommended in order to maintain a clean environment.

MATERIALS AND METHODS

Two field experiments were carried out during at 2008/2009 and 2009/2010 winter seasons in the Experimental Station of Agriculture Research Center, El-Serw Station, Damietta Governorate, Egypt. The Experimental soil was clayey as shown in Table (1) Mechanical and chemical characters:

Table (1): Mechanical and chemical analysis of soil.

Particle Size distribution				
Coarse sand %	Fine sand %	Silt %	Clay %	Texture
1.55	10.70	22.4	85.0	Clayey

Characters / Treatments	OM %	Available N ppm	Available P Ppm	Available K ppm	PH Of soil Susp 1:25	Total dissolved salts	
						%	mmhos /cm
Burning	2.66	81.4	40.0	607.3	8.4	0.21	0.655
Without Burning	2.94	84.3	33.3	624.0	8.7	0.17	0.542

The eight treatments used were as follows:

1- Burning of the soil surface by fire unit pre sowing.

2- Burning of the soil surface by fire unit pre sowing and followed by one hoeing after first irrigation.

3- Burning of the soil surface by fire unit pre sowing and followed by two hoeing after first and second irrigation.

4- Mulching post emergence by the straw rice 15 kg/plot (5 cm) in the furrow between plants and ridges.

5- One hoeing after first irrigation and mulching post hand hoeing by the straw rice 15 kg/plot (5 cm) in the furrow between plants and ridges.

6- Two hoeing after first and second irrigation and mulching post second hand hoeing by the straw rice 15 kg/plot (5 cm) in the furrow between plants and ridges.

7- Two hoeing after first and second irrigation.

8- Untreated check.

Experimental design was randomized complete blocks with three replications, plot area was 15 m^2 (containing 6 rows width 50cm apart and five meters length). The sugar beet seed variety Teri at rate 4 kg/fad was planted at distance of 20 cm between hills on the 15 November for the two growing seasons. Thinning was carried out for once month from planting to one plant/hill. The burning process has been carried after ridging and directly before planting by using a fire unit connected to cylinder gas (liquefied petroleum gas) and this process lasted for 15 minutes each experimental plot. Straw rice mulching was carried in the spaces between the sugar beet plants which equal 15 kg (5 cm) for each experimental unit. All the normal cultural practices of growing sugar beet recommended for the region were followed. The following data were recorded:

I-On weeds:

Weeds were hand pulled from one square meter chosen at random from each plot at 120 (DAS). Weeds were identified and classified to annual broad-leaves and narrow leaved weeds in both seasons to determine number, fresh and dry weight (g/m^2) of total weeds were recorded after drying in an oven at 70 C^o for 72 hours.

II- On sugar beet plants:

1-Growth parameters:

2- Yield and its components:

At harvest, plants of four guarded rows for each treatment were uprooted and toped to determine the following parameters: tops yield (ton / fad), roots yield (ton / fad), biological yield (ton / fad) and sugar yield (ton / fad).

3-Chemical constituents:

At harvest, samples of ten sugar beet plants were taken randomly from the central area of each plot to study the chemical analyses of juice: Sucrose content, purity percentage, impurities contents, i.e. K, Na, and α-amino nitrogen milleq/100 grams beet. Sucrose content was determined as described by **Le-Docte (1927)**. T.S.S was determined with hand referactometer. Juice purity percentage was determined as a ratio between sucrose % and T.S.S according to **Carruthers *et al.* (1962)**. Impurities components were determined according to the method described by **A.O.A.C. (1984)**.

Statistical analysis: data were statistically analyzed according to **Snedecor and Cochran (1980).**

RESULTS AND DISCUSSION

I. Weeds:

The results obtained reveal the influence of some non-traditional methods for weed control on weeds associated with sugar beet plants at 120 (DAS). The most common weed species accompanied with sugar beet plants in this work were: sweet clover (*Melilotus indica*, L.), dentated dock (*Rumex dentatus,* L.), wild beet (*Beta vulgaris,* L.), watercress (*Coronopus squamatus*, Forssk.), and lambsquarters (*Chenopodium album*, L.) as broadleaf weeds and beard grass (*polypogon monspeliensis,* L.), canary grass (*Phalaris minor*, Retz.) as grasses.

The effect of non-traditional methods for weed control on fresh and dry weight (g/m^2) of broad-leaf, grassy and total weeds growth with sugar beet plants at 120 (DAS) are presented in Table (2). The results indicated clearly weed management caused a significant effect on fresh weight (g/m^2) of broad-leaf, grassy and total weeds growth which associated with sugar beet plants. All weeded treatments decreased fresh weight (g/m^2) of total annual weeds comparing to untreated control. Moreover, the weeded treatments differed in their efficiency in weed suppression. In this respect, two hoeing with mulching, one hoeing with mulching and burning with two hoeing came in the first order for decreasing fresh weight (g/ m^2) of total annual weeds. Mulching only came in the second rank followed by that of two hoeing only, burning with one hoeing and burning only.

Data presented in Table (2) clearly revealed that weed control significantly decreased in dry weight (g/m^2) of total annual weeds. Two hoeing with mulching, one hoeing with mulching and burning with two

hoeing recorded the highest efficiency in decreasing dry weight of total annual weeds. These treatments reduced dry weight of total annual weeds than untreated control by 91.1, 85.9 and 82.8% in the first season and 92.2, 86.5 and 84.2% in the second season, respectively. This favorable effect of hoeing with treatment is due to elimination of weeds growth. Superiority of mulching or burning with hoeing in controlling weeds could be attributed to the integral destroying effects of frequent hoeing on annual weeds since these weeds are not capable to regrowth from the underground parts. Also, mulching delayed growth from weeds seedling by to prevent sunlight and considerably reduced weed infestation.

Table (2): Effect of weed control treatments on fresh and dry weight (g/m^2) of total annual weeds of sugar beet at 120 (DAS) during at 2008/2009 and 2009/ 2010 seasons.

Characters / Treatments	Weed Growth											
	٢٠٠٨/٢٠٠٩						٢٠٠٩/٢٠١٠					
	Fresh weight of weeds (g/m^2)			Dry weight of weeds (g/m^2)			Fresh weight of weeds (g/m^2)			Dry weight of weeds (g/m^2)		
	Broad	Grass	Total	Broad	Grass	Total	Broad	Grass	Total	Broad	Grass	Total
١-Burning	١٣٥٤,٠	١٣٥,٦	١٤٨٩,٦	١٩١,٨	٢٨,٦	٢٢٠,٤	١٤٢٩,٦	١٥٤,٠	١٥٨٣,٦	٢٢٧,٦	٣١,٤	٢٥٩,٠
٢- Burning + one hoeing	٩٦٤,٠	١٣١,٦	١٠٩٥,٦	١٤٧,٧	٢٧,١	١٧٤,٨	١٠٧٥,٦	١٣٨,٦	١٢١٤,٢	١٩٩,٠	٢٩,١	٢٢٨,٢
٣-Burning + two hoeing	٢٢٩,٠	٥٠,٠	٢٧٩,٠	٣٢,٨	٩,٨	٤٢,٦	٢٨٣,٦	٥٤,٠	٣٣٧,٦	٣٨,٧	١٠,٩	٤٩,٠
٤-Mulching	٧١٦,٦	١١٦,٠	٨٣٢,٦	١١٤,١	٢٠,٥	١٢٤,٦	٨٠١,٠	١٢٧,٣	٩٢٨,٣	١٢٧,٣	٢٣,٧	١٥١,٠
٥-One hoeing + mulching	٢٠٩,٦	١٩,٦	٢٢٩,٣	٢٩,٧	٥,٣	٣٥,٠	٢٣٣,٠	٢١,٣	٢٥٤,٣	٣٥,٥	٦,١	٤١,٦
٦-Two hoeing + mulching	١١٤,٦	١٨,٦	١٣٣,٣	١٧,٥	٤,٥	٢٢,٠	١٢٢,٦	٢٠,٠	١٤٢,٦	١٩,٠	٥,١	٢٤,١
٧-Two hoeing	٨٧٦,٦	١٢٤,٣	١٠٠١,٠	١٣٧,٤	٢٦,٢	١٦٣,٦	٩٣٦,٠	١٣٣,٣	١٠٦٩,٣	١٤٨,٣	٢٧,١	١٧٥,١
٨-Untreated check	١٥٤٥,٦	١٧٦,٣	١٧٢٢,٠	٢١٩,٢	٢٩,٦	٢٤٨,٨	١٩١٠,٣	٢١٧,٠	٢١٢٧,٣	٢٧٢,١	٣٨,٢	٣١٠,٣
L.S.D. at ٥٪	٥٢٢,٦	٨٨,٢	٥٥٣,٨	٩٧,٩	١٥,٢	٩٨,٩	٤٠٨,٨	٥١,٨	٤٢٨,٤	٦٣,١	٧,٨	٦٦,١

On the other side, the lowest efficiency decreasing of dry weight (g/ m^2) of total annual weeds by using mulching only, two hoeing, burning with one hoeing and burning only gave less effective than of all other treatments and as compared with untreated control treatment obtained by 49.9, 34.2, 29.7 and 11.4% in the first season and 51.3, 43.5, 26.4 and 16.5% in the second season, respectively. In view of these results, we find that it reduced the impact of such treatments prior to the growth of weeds due to the long period of growth in sugar beet, which extends to six months, which helps the appearance of successive generations of weeds it creates great competition and have a negative influence on the growth of sugar beet plants. The burning of the surface layer of the soil is effective in the first period of plant stage, but this effect no continues to the end of the stage of growth. Also mulching by straw rice give a positive influence in the weeds, but in the process of aeration affects soil. **Teasdale *et al.* (1991); Ateh and Doll (1996) and Monks *et al.* (1997)** they found that the cover crops mulch on the soil surface can greatly reduce weed density and biomass. The excellent examples of successful use of prescribed burning for the control of invasive annual broad leaf and grass species. These results were in harmony with those obtained by **Ditomaso *et al.* (2006); Cisneros and Zandstra (2008) and Rask *et al.* (2011)** suggested that hoeing improves aeration of the soil which may encourage germination of additional weed seeds. Similar finding for the excelsior effect of hoeing were obtained by **Wevers (1995)**. Mulch and hoeing were the most effective for controlling of weeds. Similar finding were reported by **Lee *et al.* (1992)**. No significant difference between two hoeing with mulching, one hoeing with mulching and burning with two hoeing on dry weight of total weeds.

II- Sugar beet plants:

1-1 Growth parameters:

Table (3) indicated that all growth characters responded significantly to all weed control. The results showed, also, that there was a marked increase in leaves number/plant, fresh weight and root/top ratio due to of two hoeing with mulching, one hoeing with mulching and burning with two hoeing when compared with other weed control treatments.

These results suggest that weed control is necessary for sugar beet plants during early and advanced growth stages. The effect of weed control treatments on height of beet plants are illustrated in Table (3). It obviously cleared that elimination of weeds increased height sugar beet plants at 120 (DAS) than unweeded plants. The tallest beet plants were achieved at 120 (DAS) by burning only, untreated control treatment, burning with one hoeing, two hoeing, mulching only, burning with two hoeing and one hoeing with mulching treatments, respectively. Plant height of these treatments was significantly greater than that of two hoeing with mulching by 20.4, 19.9, 18.2, 16.4, 15.6, 7.4 and 5.6% in the first and second season, respectively. The

increase in the height of sugar beet plants are deceptive because they increase arising from increased competition with weeds this pushed the beet plants to rise and be at the expense of the rest of the characteristics of growth.

Table (3): Effect of weed control treatments on growth characters of sugar beet at 120 (DAS) during at 2008/2009 and 2009/ 2010 seasons.

Characters / Treatments	Growth Characters							
	Plant height (cm)		No. of leaves/plant		Fresh weight of plant		Root/top Ratio	
	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10
1- Burning	46.0	47.0	21.6	21.6	691.3	801.6	1.51	1.40
2- Burning + one hoeing	45.3	46.0	22.3	22.6	861.3	817.0	1.54	1.49
3- Burning + two hoeing	40.6	42.3	23.6	24.3	1201.0	1081.0	1.89	1.95
4-Mulching	45.3	44.0	23.0	23.6	1105.6	1054.0	1.86	1.88
5-One hoeing + mulching	40.3	41.3	24.3	24.3	1204.6	1090.0	2.10	2.07
6-Two hoeing + mulching	38.6	38.6	26.3	26.3	1293.0	1192.0	2.58	2.51
7-Two hoeing	45.3	44.6	23.0	23.0	922.0	962.0	1.66	1.79
8-Untreated check	45.6	47.0	18.3	20.6	609.6	683.3	1.49	1.38
L.S.D. at 5%	5.78	6.54	4.81	6.76	387.01	404.88	1.28	1.23

Number of leaves/plant, fresh weight of plant (g) and root/top ratio tended to increase by using two hoeing with mulching, one hoeing with mulching and burning with two hoeing which gave the highest number of leaves/plant, fresh weight of plant and root/top ratio at 120 (DAS) followed by mulching only, two hoeing, burning with one hoeing and burning only treatments respectively. The superiority of the above mentioned treatments were significantly greater than that of unweeded check by 35.7, 25.4 and 23.5% and by 82.1, 68.4 and 67.5% at 120 (DAS) in first and second season for number of leaves/plant and by 112.1, 97,5 and 97.0 % in first season and by 61.4, 47.6 and 46.4 % in second season for fresh weight of plant and by 73.1, 40.9 and 26.8 % in first season and by 81.8, 50.0 and 41.3 % in second season for root / top ratio, respectively. While the lower value was achieved with untreated control treatment. However, the lowest efficiency decreasing of number of leaves/plant, fresh weight of plant and root/top ratio at 120 (DFS) by using mulching only, two hoeing, burning with one hoeing and burning only gave less effective than of all other treatments and as compared with untreated control treatment. The aforementioned results indicated that controlling weeds encouraged plant growth of sugar beet, this, in turn, might increased the leaves number/plant and given more chance to better use of the edaphic and aboveground environmental resources and consequently, stimulated all growth characters of beet plants. These results were true for both growing seasons. Similar results were obtained by **Kudryashov and Semisal (1992)** and **Khalak and Kumaraswamy (1992)** found that the hoeing and mulch treatments recorded the highest growth of potato plant.

1-2 Root characters:

Sugar beet root characters i.e. length (cm), diameter (cm) and dry weight (g/plant) was studied and their response to different non-traditional methods for weed control. Relevant results presented in Table (4), for 2008/2009 and 2009/2010 growing seasons. It could be concluded that all studied weed control treatments whether mechanically and their combinations succeeded to attain statistical superiority over those of the untreated control treatment which showed the lowest root dimensions of beet roots at 120 (DAS). However, the application of one or two hoeing with mulching or burning improved significantly root length, root diameter and root dry weight of beet plants not only over the untreated control treatment but also over those of another weed control treatments.

Table (4): Effect of weed control treatments on root characters of sugar beet at 120 (DAS) during at 2008/2009 and 2009/ 2010 seasons.

Characters / Treatments	Root Characters					
	Length (cm)		Diameter (cm)		Dry weight (g)/plant	
	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10
1- Burning	23.3	22.6	9.6	9.8	123.3	115.5
2- Burning + one hoeing	25.3	23.6	10.5	10.6	137.3	142.9
3- Burning + two hoeing	27.3	25.6	12.0	12.9	194.6	203.3
4-Mulching	26.0	24.3	11.8	12.2	176.8	189.6
5-One hoeing + mulching	27.3	26.6	12.1	13.2	203.5	233.8
6-Two hoeing + mulching	27.6	30.3	12.6	13.4	218.0	239.6
7-Two hoeing	25.3	24.0	11.0	11.7	155.5	165.7
8-Untreated check	22.6	22.0	7.0	8.5	108.0	101.6
L.S.D. at 5%	5.78	7.16	2.64	2.34	61.01	68.60

The highest values of root dimensions were obtained by two hoeing with mulching then one hoeing with mulching followed burning with two hoeing. These results may show to what extend hoeing with mulching or burning is very important not only for weed control but also to create suitable edaphic environmental condition i.e., good aeration, high biotic activity and increasing availability of some nutrients for sugar beet plant to grow well away from weed competition on the soil space and soil nutrition. These findings are in line with those obtained by **El-Zouky and Maillet (1998)**. All non-traditional methods for weed control treatments increased significantly root dry weight of beet plant than unweeded check. Comparative results between mulching and burning with hoeing treatments indicate that using two hoeing with mulching attained the root dry weight of beet plants at 120 (DAS). It could be noticed that application two or one hoeing to the used mulching or burning gave and additional increment in the root dry weight of beet plant. It is also interesting to note that using two hoeing with mulching, one hoeing with mulching and burning control with two hoeing attained a superiority advantage in respect to root dry weight beet plant not only over untreated control but also over the other treatments whether used alone or in combination with hoeing treatment. This observation was fairly true in growth stage. The advantage effect of two and one hoeing with mulching and burning with two hoeing in relation to root dry weight of sugar beet plants over the other weed control treatments may be due to is effective capability on weed elimination compared with other weed control treatments (Table 4). The lower dry weight of total weeds at growth stages gave to the higher the root dry weight. These results are in agreement with those obtained by **El-Zouky and Maillet (1998)**.

2-Yield components:

Results in Table (5) show that the yield trails of sugar beet plants affected by non-traditional methods for weed control. Weeds interference in the unweeded plots reduced significantly all yield traits of sugar beet plants. **Dollinger and Benz (1994)** mentioned that the presence of (*Aethusa cynapium,* L.) in sugar beet field at 8 plant/ m^2 reduced yield by more than 100 dt/ha compared to weed free areas.

Table (5): Effect of weed control treatments on yield traits of sugar beet at harvest during at 2008/2009 and 2009/ 2010 seasons.

Characters / Treatments	Yield Trails							
	Tops Yield (ton / fad)		Roots Yield (ton / fad)		Biological Yield (ton / fad)		Sugar Yield (ton / fad)	
	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10
1- Burning	6.27	6.52	8.83	10.94	15.10	17.46	1.39	1.66
2- Burning + one hoeing	7.79	7.13	11.83	11.07	19.62	18.20	1.81	1.69
3- Burning + two hoeing	9.64	8.43	17.08	15.66	26.72	24.09	2.87	2.63
4-Mulching	8.17	9.92	15.05	14.16	23.22	24.08	2.44	2.29
5-One hoeing + mulching	9.92	10.78	18.71	19.03	28.63	30.82	3.21	3.08
6-Two hoeing + mulching	11.71	13.48	21.57	20.04	33.28	32.56	3.77	3.50
7-Two hoeing	7.95	8.46	14.16	12.76	22.11	21.22	2.21	1.98
8-Untreated check	5.85	6.14	8.90	9.93	14.75	16.07	1.31	1.45
L.S.D. at 5%	3.27	3.06	5.39	4.01	7.53	7.48	0.94	0.72

Elimination weeds by mulching and hoeing treatments increased significantly sugar beet tops, roots, biological and sugar yields, but significant superiority remained with two hoeing with mulching treatment which increased over the untreated control by 100.2, 142.4, 125.6 and 187.8% in the first season and 119.5, 101.8, 102.6 and 141.4% in the second season respectively. Above mentioned findings sustained that mulching, burning and hoeing treatments were not suffient with themselves in controlling weeds in sugar beet fields. The application of supplement two or one hoeing for plots previously for weeded with mulching or burning increased markedly sugar beet yields. This application hoeing destroyed survival and late emerged weed flushes and minimized weed competition to a great extent and consequently favored growth of beet plants. Similar observations were reported by **El-Zouky and Maillet (1998)** who stated that weed control alone was insuffient to control all weed species during the whole crop cycle. Weed control plus hoeing resulted in increased sugar beet yields. The highest yield of sugar beet was obtained by controlling weeds by mulch followed by hoeing treatments. These results may be due to that hoeing and mulching treatments reduced weed density and increased yield and surface hoeing may a cerate and improve structure of some soils, especially those high in silt and very fine sand **Kudryashov and Semisal (1992)**; **Khalak and Kumaraswamy (1992) and Eberlein *et al.* (1997).** The successful use of prescribed burning for the control of invasive annual broad leaf and grass species and enhanced yield. These results were in harmony with those obtained by **Ditomaso *et al.* (2006); Cisneros and Zandstra (2008) and Rask *et al.* (2011).**

3- Root juice quality:

Data presented in Table (6) showed the values of quality parameters i.e., sucrose content, purity %, impurities content i.e. potassium (K), sodium (Na) and α-amino nitrogen (AN) milleq/100 grams beet during at 2008/2009 and 2009/2010 seasons. Sucrose and purity percentage values responded significantly and a positive relationship was exhibited for these quality parameters. There was a remarkable and significant increase in these tested quality parameters with applying non-traditional methods for weed control alone or in combination. These results mean that untreated control treatment gave lowest values, while two hoeing with mulching gave the higher values.

With regard to sucrose percentage, the available data in Table (6) revealed that one hoeing with mulching and burning with two hoeing were the most effective treatments followed by hoeing process two times which induced the highest values for sucrose percentage sugar beet root. The distinct influence hoeing with mulching or burning on sucrose percentage may be due to the encourage effect of hoeing to root dimensions and weight and to the pronounced increase in assimilation organs (tops). Consequently increasing the assimilation and storage process which, in turn, reflected on the amount of stored sugar in root tissue. These finding are in accordance with those found by **El-Zouky and Maillet (1998).** While, **Odero *et al.* (2010)** found that the root and sucrose yield loss per hectare increased as weeds density increased. This observation may be considered a good indication to the important of hand hoeing in addition to any weed control application to induce a good soil condition for growth consequently more assimilation and, in turn, increased storage capacity for root sugar which directly increased juice purity percentage.

Table (6): Effect of weed control treatments on juice quality of sugar beet. Combined analysis at 2008/2009 and 2009/ 2010 seasons.

Characters / Treatments	Root Juice Quality				
	Quality Traits		Impurities content milleq / 100 g beet		
	Sucrose %	Purity %	K	Na	α-amino-N
1- Burning	15.1	78.5	6.42	1.87	4.47
2- Burning + one hoeing	15.4	78.3	6.39	1.87	4.33
3- Burning + two hoeing	16.8	80.2	5.49	1.75	4.00
4-Mulching	16.2	79.7	6.03	1.82	4.01
5-One hoeing + mulching	17.1	81.2	4.89	1.65	4.00
6-Two hoeing + mulching	17.4	82.7	4.46	1.55	4.00
7-Two hoeing	15.5	78.3	6.09	1.85	4.28
8-Untreated check	14.6	75.5	6.58	2.10	4.69
L.S.D. at 5%	1.06	3.47	1.25	0.29	0.37

On the other hand, we find that there is an inverse relationship between the percentage of sucrose and purity of the juice and the percentage of potassium, sodium, α-amino nitrogen (impurities) in the juice, we find that the more the percentage of sucrose, also increases the purity of the juice and conversely the contrary less percentage of potassium, sodium, α-amino nitrogen (impurities) in the juice.

CONCLUSION

As a conclusion from the obtained results in this study, the hand hoeing once or twice with burning or mulching by rice straw developed the best good recommendation for the non-traditional methods for weed control in sugar beet. Moreover, improving growth, and increased yield and quality, also the relationship between this and decreasing fresh and dry weight of total weeds. The possibility of using rice straw mulching and burning by cylinder gas (liquefied petroleum gas) for their many positive effects such as low coasts, in harmony with ecosystem without no harmful residual effect in order to maintain a clean environment free from pollution.

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الملخص العربي

تأثير تكامل التغطية والحرق مع العزيق علي بنجر السكر والحشائش المصاحبة له.

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تم إقامة تجربتان حقليتان خلال موسمي ٢٠٠٨/٢٠٠٩ ، ٢٠٠٩/٢٠١٠ في الأراضي الملحية بالسرو وذلك لتقييم بعض الطرق غير التقليدية لمكافحة الحشائش في بنجر السكر وأثر ذلك علي النمو والمحصول وبعض صفات الجودة للعصير وكذلك الحشائش المصاحبة ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي :

- أظهرت معاملات مكافحة الحشائش نقصا معنويا في الوزن الغض والجاف الكلي للحشائش المصاحبة للنباتات بنجر السكر مقارنة بمعاملة الكنترول.
- وكانت أفضل المعاملات هي معاملة العزيق مرتين مع التغطية التي كانت أكثر فاعلية في مكافحة الحشائش يليها عزقة واحدة مع التغطية ثم الحرق مع عزقتين علي التوالي.
- وجد أن تطبيق عزقتين إلي التغطية والحرق قد حسنت بقوة في فاعلية مكافحة حشائش البنجر مقارنة بالمعاملات الاخري.
- أوضحت النتائج أن عزقتين مع التغطية أظهرت مقاومة جيدة للحشائش الكلية في البنجر بعد ١٢٠ يوم من الزراعة.
- لوحظ أن جميع صفات النمو مثل طول النبات، عدد الأوراق/للنبات، نسبة الجذر/العرش وصفات الجذر قد استجابت معنويا للعزيق مرتين مع التغطية يليها عزقة واحدة مع التغطية ثم معاملة الحرق مع عزقتين علي التوالي.
- بالنسبة لتأثير معاملات مكافحة الحشائش علي مكونات المحصول لنبات بنجر السكر أوضحت النتائج أن عزقتين مع التغطية أعطي أعلي القيم لمحصول العرش والجذور والمحصول البيولوجي ومحصول السكر.
- وجد أن تطبيق العزيق للتغطية والحرق أدي إلي زيادة معنوية في قيم الجودة للعصير وهي النسبة المئوية للسكروز والنسبة المئوية للنقاوة وذلك أذا ما قورنت بمعاملة المقارنة.
- عموما يمكن استنتاج أن تطبيق عزقتين أو عزقة واحدة مع التغطية بقش الأرز والحرق مع عزقتين تعتبر معاملات يمكن التوصية بها للحصول علي أفضل نمو ومحصول ونقاوة للعصير وكذلك أفضل مكافحة للحشائش في نباتات بنجر السكر تحت ظروف الأراضي الملحية بالسرو.