Efficiency of Certain Pre-Emergence Herbicides on Associated Weeds in *Glycin max* L. Yield

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ABSTRACT:

Two field trials were carried out over two summer seasons in 2021 and 2022 in soybean crop (*Glycin max* L.) Giza 111 was planted at the experimental farm at Itay EL-Baroud-Agricultural Research Station, Itay EL-Baroud, Beherah Governorate, Egypt to evaluate the effect of four pre-emergence herbicides as acetochlor 84% EC (Harness), butralin 96% EC (Amex), pendimethalin 45.5%CS (Stomp Extra) and s-metolachlor 96 % EC (Gardo) as well as hand hoeing this was done (twice at 21 and 35 days after sowing (DAS)) at 60 DAS, the unweeded control was used to weed control biomass (gmm^{-2}) of broad-leaved, grass, and total weeds in soybean fields. Results showed in both seasons that all weed management methods considerably reduced weed parameters while increasing yield components. It resulted with a significantly substantial increase in seed soybean yield (Kg. fed^{-1}). During two seasons, butralin (97.82 and 96.18%) and acetochlor (94.94 and 94.23%) were found to be effective. The maximum effect on soybean leaf biochemical after 30 days of seeding was obtained as (chlorophyll a, chlorophyll b, total chlorophyll (mg.g^{-1} fresh weight), total carbohydrate (%), protein content (%), and total phenolic content (%) with all the tested herbicides.

Keywords: *Glycin max* L.; weed control; crop.

INTRODUCTION

In Egypt, soybean (*Glycin max* (L.) is a protein and mineral source for human consumption and livestock feed, as well as a significant source of straw fodder for animal feed. Weeds sprout concurrently with crop plants and compete with soybean, resulting in yield loss (35-55%) depending on weed flora and density (Kewat *et al*. 2000). Furthermore, weeds impede crop development and productivity by acquiring necessary resources such as light, water, and nutrients (John and Michel, 2010). Furthermore, one of the most significant agricultural practises is weed management. Weeds compete for space, nutrients, water, and sunlight with agricultural plants. Weeds serve as hosts and give refuge for a variety of pests (Singh 2007**)**

Although weeds can be controlled using cultural, biological, and chemical means, labour problem shortage is getting more acute by the day, and it will no longer be practicable or economical either to continue with traditional weed management practises (Oreck and Dehne 2004; Oerke, 2005). Herbicides alone, however, are incapable of providing total weed control due to their selective killing. Their usage can be improved by combining it with hand weeding or hoeing (Nainwal *et al.* 2010).

Many studies on the influence of weeds on soybean yield have been published. Many researchers discovered that controlling weeds using herbicides enhanced productivity. Soybean cultivars differ in productivity based on their responsiveness to diverse agricultural environmental circumstances and competitiveness in weed management (Ahadiyat and Sarjito, 2011; Guilherme *et al.*, 2015). Hand hoeing has now become more costly than the use of herbicides. Herbicides are less expensive and easier to apply for weed management than hoeing. Thus, chemical weed control is required to reduce costs and boost soybean output. This crop is a heavy pesticide user, approximately 100% of Egypt's cultivated acreage is herbicide-treated. When compared to other weed management alternatives, herbicide treatment provides the highest weed control effectiveness, the best selectivity, and the lowest cost Solimn *et a.l* (2015).

According to Solimn *et al*. (2015), explained that weed control treatments decreased the dry weight of broadleaf, grassy, and total weeds when compared to unweeded treatments. Butralin and metribuzin treatments were shown to be the most effective in suppressing broad-leaved weeds and grasses by El-Metwally *et al*. (2017). In this regard, the chemical control approach is faster, more effective, and saves time and labour compared to others. (Ahmed *et al*. 2008).

This study aimed to compare the impacts of four pre-emergence herbicides, as well as unweeded control and hand hoeing (twice), on annual broad-leaved and grassy weeds, in soybean fields, its yield and constituents.

MATERIALS AND METHODS

Experimental treatments and dosing

The field trials were carried out in order to compare the efficiency of four pre-emergence herbicides i.e. acetochlor 84% EC (Harness), butralin 96% EC (Amex), pendimethalin 45.5% CS (Stomp Extra) and S-metolachlor 96% EC (Gardo) as well as hand hoeing (twice at 21 and 35 days after sowing (DAS) and unweeded control in controlling broad-leaved, grassy weeds and total weeds in soybean (*Glycin max* (L.) crop during the two growing seasons 2021 and 2022. Moreover, the effects of all the tested treatments on soybean agronomic traits as well as its yield were recorded. Also, after 30 days of planting, soybean leaf biochemicals such as (Chlorophyll a, Chlorophyll b, total chlorophyll ($mg.g^{-1}$ fresh weight), total carbohydrate (%), protein content (%), and total phenolic content (%) were measured. The studies were conducted out in Egypt's El-Beherah Governorate's Itay El-Baroud Agricultural Research Station. A randomized complete block design with three replications (RCBD) was used to distribute all weed control method treatments. The plot size was 21 m^{-2} (7.0 X 3.0 m). A knapsack sprayer (Gloria Hoppy No. 299 TS. (CP_3) at 200 L water fed^{-1} was used to apply the herbicide treatments. While hand hoeing was used twice (21 and 35 DAS before the 1st and 2nd irrigations, respectively). Table (1) shows the herbicidal treatments. The herbicides were sprayed after sowing but before irrigation.

Sowing

Soybean grains (***Glycin max* L.**) (c.v. Giza 111) were obtained from Administration of Seeds, ARC, Ministry of Agriculture and Land Reclamation. In both seasons, soybean grains were hand planted in hills 25 cm apart and ridges 70 cm, 21 and 28 May, respectively, at the recommended rate of 40 kg. fed^{-1}. The soil from the experimental field was tested at the department of Soils and Water at the Faculty of Agriculture in Alexandria. Table (2) shows some of the physical and chemical parameters of the experimental soil.

Determination of photosynthetic pigments and some biochemical parameters of soybean leaves.

Chlorophyll:

Fresh leaves of plants from all treatments were picked and cut into small pieces then 250 mg sample was taken and homogenized by hand glass homogenizer with 5 ml acetone 80 %. The resulting homogenate was filtered using a buchner funnel through whitman filter paper, No. 1. The filtrate was finished with 80% acetone to get a final volume of 50 mL, and the absorbance (optical density) of the clear solution was measured. spectrophotometrically at 645 and 663 nm wavelengths using Jenway 6305 UV/Visible spectrophotometer, according to Grodzinsky and Grodzinsky (1973) as modified by El-Nawawy *et al.,* (1978) and Sabra (1988). Chlorophyll a, b, and total (a+b) concentrations in mg chlorophyll/g sample fresh weight were estimated using the following equations:

$$Ch.\ a = (((12.7 \times O.D_{663}) - (2.69 \times O.D_{645})) \times 0.2)$$

$$Ch.\ b = (((22.9 \times O.D_{645}) - (4.68 \times O.D_{663})) \times 0.2)$$

Total = Ch. a (mg/ g fresh wt.) + Ch. b (mg/g fresh wt.)

These equations were used for optical density measurements of chlorophyll extracts (acetone and water) in a 1 cm glass vial.

Carotenoides:

Samples, each of 0.25 g of fresh leaves, were extracted with acetone 80% by grinding in glass homogenizer; the plant material was completely decolorized. The extract was filtered by using Buchner funnel. The marc was successively washed with acetone until it became colorless. The combined extracts were applied on alumina column for purification and eluted by diethyl ether. The absorbance (A) of diethyl ether elute was measured at 450 nm using Jenway 6305 UV/Vis spectrophotometer, according to Canal Villanueva *et al.,* (1985); Rouchaud *et al.,* (1985) and Sabra (1993). The µg carotenes per gram fresh weight leaf were calculated from the following equation:

$$\mu g/\ g.\ F.\ Wt. = ((A/K) \times (1/0.25)).$$

The extension coefficient (K) was obtained from 1-10 µg β-carotene and it was equal 0.0754583.

Determination of Crude Protein Content:

Crude protein content (%) was obtained using (AOAC, 2000); crude protein of each sample was computed by multiplying total nitrogen by 6.25.

Determination of Total Carbohydrate Content:

To estimate the total carbohydrate percentage. 0.1 g of air-dried samples were immersed overnight in 10 ml of 80% (v/v) ethanol at 25 °C with occasional shaking. The ethanolic mix was filtered, and a known volume of ethanol filtrate was produced. Carbohydrates are first degraded into simple sugars using weak hydrochloric acid. In a hot acidic medium, glucose is dehydrated to hydroxymethyl furfural. Using a Jenway 6305 UV/Visible spectrophotometer with a standard curve of 0, 0.2, 0.4, 0.6, 0.8, and 1 ml of glucose, this chemical yields a green-colored result with an absorbtion maximum at 630 nm. According to Hedge and Hofreiter (1962), the carbohydrate amount of 100 g of sample = mg of glucose / volume of test sample x 100.

Determination of Poly Phenolic Compounds:

Samples of Soybean leaves were dried, and ground to the powder material. The polyphenolic compound of ground materials were extracted with acidic methanol (1% HCl in methanol). In 10 ml centrifuge tube 0.5 g of the ground material was stirred with 1.5 ml of the solvent in shaker at 250 rpm for 30 min., and the resulted supernatant was re-extracted and centrifuged as previously mentioned. The combined supernatants were made up to 5 ml with the same extractant before estimating the total polyphenols. Total phenols were determined using the Folin-Ciocalteau reagent, as described by Malick and Singh (1980). In the Folin-Ciocalteau reagent, phenols react with phosphomolybdic acid in an alkaline media to generate a blue complex. The combination's absorbance was measured at 650 nm with a Jenway 6305 UV/visible spectrophotometer against a reagent blank. A standard curve was created using various catechol concentrations, and total phenols were represented as phenols / 100g material.

Evaluation of weed control treatments:

Nine weeks after sowing in both growing seasons 2021 and 2022, weeds of the middle row in each plot of all treatments were gathered and sorted counted, identified (according to Hassanein *et al.*, 2000) and their fresh weights were recorded as gm. m^{-2}.

The following criteria were calculated:

Weed density =average number of each weedm^{-2}.

Percent of density as = average number of weed/ average total number of weeds x100

Weed biomass =average (fresh) weight of each weed (gm^{-2}).

Percent of weed biomass= Average (fresh) weight of one weed/ average (fresh) weight of total weeds X100

Weed control effectiveness (WCE) % =(C-T/C) X100

Where:

C= Weed biomass in the unweeded control area.

T= Weed biomass of weeds in the treated area.

Yield evaluation:

At harvest, in 20 and 28 September in both seasons, respectively, ten plants were chosen at random from each plot, then air dried for 4 days and the following agronomic traits were measured:

At harvesting, the following data were recorded:

1. Number of pods / plant.
2. Pods dry weight / plant (g).
3. Seeds weight / plant (g).
4. Number of seeds / plant
5. 100- seed weight (g)

Biological yield (ton fed^{-1}.) = average weight of all plants.

Statistical analysis:

The data collected was statistically analysed in accordance with Gomez and Gomez (1984). The least difference significant (LSD) test was used to compare means at 5% significance levels.

RESULTS AND DISCUSSION

Weed Survey (weed type).

Table (3) shows the yearly broad-leaved and narrow weeds that predominated in the experiment soybean field throughout two seasons of growth (2021 and 2022).

Weed biomass (gm. m^{-2}) and density (m^{-2}):

During the growth seasons 2021 and 2022, weed density and weight of individual and overall weeds in the untreated control were assessed 60 days after planting (table, 4). For broad-leaved weeds, *Amaranthus ascendens*, L. had the greatest weed density in both seasons, with 9.32 and 11.52 weeds m^{-2}, representing 32.22 and 41.68% of total broad-leaved weeds, and 20.11 and 26.7% of total weeds, respectively. In terms of broad-leaved weed biomass, the results showed that *Amaranthus ascendens*, L. had the highest values of 2317.92 and 2213.21 gm.m^{-2}, representing 49.12 and 40.64% of the total broad-leaved weeds, and 25.16 and 26.67% of the total weeds, respectively.

Hibiscus trionum, L., on the other hand, had the lowest weed density of 3.21 and 3.81 weeds m^{-2}, representing 11.1 and 13.78% of total wide-leaved weeds and 6.926 and 8.83% of total weeds wide and narrow- leaves in both seasons, respectively.

In both seasons, the same pattern was seen with weed biomass (average fresh weight g. m^{-2}). Weed biomass values for the listed weeds were (126.75 and 632.41g.m^{-2}). In both seasons, the percent of each weed biomass from total broad-leaved weeds (1.376 and 7.622%) followed the same pattern.

While *Corchorus olitorius* and *Portulaca oleracea* ranked second and third, respectively, with weed density rates of 2.67 and 2.00 weeds m^{-2}, representing 18.63 and 13.96% of the total broad-leaved weeds in the first season and 3.00 and 4.66 weeds m^{-2}, representing 17.66 and 27.42% of the total wide-leaved weeds in the second season. In terms of weed density and biomass, the data in table (4) demonstrate that *Echinochloa colonum* had the greatest values of 7.98, 6.74 m-2 and 2867.21, 1201.31 gmm-2 in both seasons, respectively. In both seasons, *Setaria viridis*, L. had the lowest results. These findings are consistent with those reported by other writers. Skora-Neto (2001) found that weed density in soybean fields fluctuated depending on meteorological and cultural conditions over successive years.

Effect of chemical treatments on weed biomass:

Effect of treatments on the individual broad-leaved weeds (BLW).

Tables 5 and 6 of the results showed that all weed control methods considerably decreased weed biomass (fresh weight) of broad-leaved weeds compared to the unweeded control (UWT) at 60 days after sowing (DAS) over the two summer seasons (2021 and 2022), respectively. For the control of *Amaranthus ascendens,* L. weed, the butralin at 2.0L fed.$^{-1}$ gave 100% WCE. Also, s-metolachlor at 300 ml fed.$^{-1}$ gave 97.66 and 86.51 % WCE of this weed followed by (fb) acetochlor which gave 96.60 and 100 % WCE. The lowest effective on this weed were pendimethalin and hand hoeing which gave 83.97 to 97.6 % WCE, in both seasons respectively.

For the control of *Euphorbia geniculata,* Ortega. , *Hibiscus trionum,* L and *Portulaca oleracea*, L. weeds, the results showed that all treatments (acetochlor, butralin, pendimethalin , s-metolachlor and Hand hoeing in both seasons) significantly (*p* =0.05) reduced these weed biomass (fresh weigh) and increase weed control efficiency compared with UWT in the two tested seasons. all tested herbicide formulations gave the highest effect to this weeds ranged from 80.44 to 100 % WCE in both seasons. It also clear from our results that the lowest effective on this weed was hand hoeing which gave ranged from 80.44 to 96.25 % WCE, in both seasons, respectively.

The data in tables 5 and 6 demonstrate that there are substantial differences in the effects of acetochlor, butralin, pendimethalin, and s-metolachlor on these weeds compared to manual hoeing at 60 DAS in both seasons. When compared to manual weeding, butralin considerably (p=0.05) reduced the fresh weight (gm^{-2}) of broad-leaved weeds. Butralin, on the other hand, had the best weed control efficiency (WCE%) rates of total annual wide leaved-weeds in both seasons (96.24 and 95.6%), followed by acetochloro (92.88 and 93.25%), pendimethalin (91.47 and 85.75%), and lastly S-metolachlor (91.22 and 89.64%). Hand hoeing treatment also yielded the lowest WCE% in seasons, representing 86.82 and 83.68%, respectively (tables 5 and 6). In general, all of the herbicides tested showed substantial (p=0.05) decreases in new broad-leaved weeds. The tested herbicides varied in their activity against the prevailed broad-leaved weeds which follow different species and therefore, may be posses differential susceptibility to the tested herbicide formulations.

Also, the activities of the tested herbicides were varied in both seasons and this may be due to different climatic conditions. Furthermore, these results may be related to the inhibitory impact of herbicidal treatments on weed development, as well as the kind of formulations, adjuvant ingredients in pesticide formulations. These results agree with those obtained by El-Metwally *et al.* (2017) and Soliman *et al.* (2015). After 60 and 90 days following seeding, there was a substantial influence on weed biomass of broad-leaved, grassy, and total weeds. Weed growth in Giza 111 fields may be reduced as a result of producing the maximum vegetative growth soybean plant. El-Mahy (2005) who found that metribuzin at 300 gm fed.$^{-1}$ resulted in the highest control of broad- leaved and grassy weed. Senseman (2007) Pendimethalin was discovered to regulate acetolactate synthase and triazine-resistant biotypes as well as common lamb'squarters (*Chenopodium album* L.) and redroot pigweed (A*maranthus retroflexus* L.).

Soltani *et al*. (2013) reported that pendimethalin provided from 82 to 97% control of *Chenopodium album* and reduced density and dry weight of this weed by 89% and 97%, respectively, compared to UWT. in white bean fields. Jovović *et al. (*2013) showed that metribuzin and acetochlor gave 95 and 94% inhibition in weed numbers and 92 and 88.8% in weed biomass, respectively. According to Jadhav and Kashid (2019), the lowest weed biomass (38.1 g/m) was associated with a greater weed management efficacy (62%) and a lower weed index (8.0). The greatest weed biomass was found with weedy. Jadhav and Kashid (2019) discovered that all treatments considerably decreased weed biomass in the soybean crop in Serbia between 2016 and 2018, compared to the untreated control, as metribuzin and s-metolachlor.

Effect of treatments on the individual grassy-leaved weeds (BLW).

Data presented in tables 7 and 8 demonstrate that all weed control treatments and hand hoeing twice considerably (p=0.05) reduced the fresh weight of total grassy-leaved weeds in both growing seasons compared to weedy control. Butralin clearly resulted in the highest biomass reduction rates of total grassy-leaved weeds of (99.47 and 97.27%) in both growing seasons (2021 and 2022), respectively. Butralin and acetochlor provided the highest weed control efficiency (WCE%) for chemical weed control treatments, dramatically reducing fresh weight of total grassy-leaved weeds by (99.47 and 97.27%) and (97.10 and 96.12%) in both seasons, respectively. In contrast, the lowest (WCE%) of total grassy-leaved weeds were reported using Pendimethalin (90.62 and 94.05%) and s-metolachlor (96.84 and 85.41%), respectively, whereas hand hoeing twice yielded the lowest WCE% (88.19 and 83.24%) in both seasons, respectively, when compared to unweeded control.

For narrow-leaved weeds, data in tables (7 and 8) revealed that there were substantial variations in herbicidal activities of pre-emergence herbicides (acetochlor, butralin, pendimethalin, and s-metolachlor) as well as hand hoeing twice in both seasons. The results showed that the studied herbicide formulations had varying efficiency against weed biomass (fresh) of grassy and total grassy weeds cultivated in an experimental soybean field. Such varying efficiency may be attributed to the different sensitivity rates of the major weeds, as well as these herbicides have a specific mechanism of action and have an inhibiting effect on weed development and growth. Similar findings were reported by Belfry *et al.* (2016), who found that the weedy check had the highest fresh and dried weed biomass (414.08 and 82.81 gm.m^{-2}) whereas the pendimethalin treatment had the lowest (169.50 and 33.90 gm m^{-2}). According to Du *et al.* (2008), s-metolachlor + metribuzin reduced more than 94% of *Setaria viridis* (L.) *P. Beauv*., *Ch. album*, and *A. artemisiifolia* at two weeks following soybean emergence.

Influence of weed control interventions on soybean crop yield and yield component:

In both growing seasons (2021 and 2022), weed control treatments had a substantial influence on yield and yield characteristics of soybean tables (9 and 10). In comparison to other therapies, butralin application enhanced the number of pods plant^{-1}, number of seeds pods^{-1}, number of seeds plant^{-1}, pods weight plant^{-1} (g), 100-seed weight(g), straw yield ton fed^{-1}, and seed yield ton fed^{-1}. Acetochlor was ranked second, followed by s-metolachlor, pendimethalin, and hand hoeing twice treatments. In contrast, the unweeded plots yielded the lowest values for the aforementioned traits.

The rise in yield characteristics generated by various weed control treatments may be ascribed to effective weed management and weed competition, which offered a high possibility of soybean development and boosted yield attributes as well as seed production. The current study's findings are consistent with those of El-Metwally (2016). The data in tables 9 and 10 reveal a substantial relationship between weed control treatments and unweeded control seed output.

Tables 9 and 10 show that the tested weed management methods and components significantly boosted all of the measured maize crop agronomic attributes over the two growth seasons. Such findings may be attributable to the herbicidal efficiency of the investigated weed management methods, which resulted in reduced weed population, and their growth, and their competition with maize plants, and hence increased nutrition availability to maize plants. Many others agreed with these findings. EL-Metwally *et al.* (2013) discovered that the acetochlor and hand hoeing twice treatments considerably increased grain production and outperformed the unweeded control by 42.9 and 42.3%, respectively.

The effect of all treatments on leaf pigments in soybean

In the first season (2021), data in table (11) revealed a significant difference in chlorophyll a, chlorophyll b, total chlorophyll, and carotenoids levels between all herbicides or between the two hand hoeing methods compared to unweeded control. In general, some herbicides caused slight increase but not significant of leaf pigments, while others caused non significant decrease of these leaf pigments. Anyway, the highest non-significant increase of chlorophylls was observed in case of s-metolachlor hand hoeing twice, which gave 0.563 and 0.592 for total chlorophyll, in the 1st, respectively. S-metolachlor and hand hoeing twice, on the other hand, provided the largest but not statistically significant rise in carotenoids content, with 1.287 to 1.387 g/gm fresh weight, respectively. Butralin (2L/fed) resulted in the least significant reduction in chlorophyll content, with chlorophyll a and b and total chlorophyll concentrations of 0.271, 0.177, and 0.448, respectively. S-metolachlor, on the other hand, had the lowest but non-significant carotenoids content (1.287).

The data recorded in table (11) showed that a similar result about the effect of weed on leaf pigments of soybean was obtained in the second season (2022). The statistical analysis indicated that none of all treatments caused any significant difference with the control. In spite of all treatments were equal from the statistical point of view it could be concluded that pendimethalin gave the highest non siginficant increase of all pigments since chlorophyll a, b total chlorophyll, and carotenoides which were 0.272, 0.152, 0.424 and 1.840, respectively, while s-metolachlor and hand hoeing twice was the least in this respect. The results shown in tables (11) stated that soybean plants showed no phytotoxic symptoms that can be clearly appeared with the interaction between the tested herbicides and soybean leaf pigments (chlorophyll a, chlorophyll b, total chlorophyll, and carotenoides contents) after 45 days from sowing, which mean that soybean plants were tolerant to the tested herbicides. Similar results were obtained from the work of Novo *et al.,* (1990) who stated that after pre emergence application of metolachlor at 2.52 kg/ha, no differences were found between treated and untreated plots at 30, 50 or 80 days after groundnut germination. the results were in agreement with Tomlin (2001) who stated that clethodim was metabolised to the sulfoxide, sulfone and S-methyl sulfoxide, that groundnuts showed excellent tolerance to clethodim was observed **by [**Ansolabehere and Kvasnicka, 1988].

Excluded, thus the data obtained from table (12) indicated that none of the tested herbicides caused any decrease of carbohydrate , protein content and total phenolic content (%) in soybean seeds in both seasons. On the other hand, all herbicides caused highly significant increase of % of carbohydrate , protein content and total phenolic content (%) in the two succeeding seasons except in the season 2022, since butralin, acetochloro, pendimethalin and s-metolachlor, which gave slight increase of % of total phenolic content (%) but not significant. In general, pendimethalin and butralin, were the most effective herbicide in the two seasons since it gave the highest values for either % of carbohydrate content in soybean seeds or total protein yield in both seasons.

Concerning pendimethalin, the results were not entirely consistent with Fayed *et al.,* (1992), who showed that pendimethalin had no significant influence on oil and protein percentages in peanut seeds. As a result of the enhanced seed production, carbohydrate and protein yields increased dramatically.

In the second season (2022), certain herbicides including butralin, and pendimethalin caused the least significant of % oil content, while S-metolachlor gave the lowest significant increase of amount of oil in kg/fed. The same trend of the effect of acetochloro on amount of protein or its percentage was also noticed in season 2021. Pendimethalin and butralin, showed similar protein seed content (%), and they gave protein yields higher than those obtained with unweeded control, this finding was consistent with Kumar *et al.,* (2004), and in the case of oil and protein yields, the results were consistent with Fayed *et al.,* (1992), who found that weed control treatments greatly enhanced oil and protein yields as a result of seed yield.

Hand hoeing twice had no significant effect on both oil and protein percentages when compared to the control; this result was consistent with Fayed *et al.,* (1983) and Ibrahim (1995), but resulted in higher oil and protein yields in kg/fed than the control but were the lowest when compared to the other weed control treatments, including hand-weeding twice. Hand-weeding twice showed the same trend for the first season (2002), but in the second season, there was a significant increase in both oil and protein percentages compared to the control, which contradicted Fayed *et al.,* (1983) and Ibrahim (1995), who claimed that mechanical weed control (hoeing) had no significant effect on both oil and protein percentages in either soybean or peanut seeds. Hand-weeding twice in both seasons resulted in oil and protein yields in kg/fed higher than the control, since it gave oil yields equal to 668.51, 790.59 kg/fed and protein yields about 303.65 and 357.38 kg/fed compared with 208.96 and 233.65 kg/fed for oil yields and 92.96 and 106.22 kg/fed for protein yield for the control, in seasons 2002 and 2003, respectively.

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Table 1: Characteristics of the tested weed control treatments in soybean fields.

Common name	Trade name	Rate 200L Water/fed.	Time of application	Chemical name According to lUPAC	Source of herbicide sample
Acetachloro	Harness 84% EC	1.0L	Pre-emergence	2-chloro-*N*-ethoxymethyl-6′-ethylaceto-*o*-toluidide	Fine seeds Monsato, Co
Butralin	Amex 96 % EC	2.0L		*N*-*sec*-butyl-4-*tert*-butyl-2,6-dinitroaniline	Wady alniyl liltanmih agricultural Co.
Pendimethalin	Stomp extra 45.5%CS	1.5L		*N*-(1-ethylpropyl)-2,6-dinitro-3,4-xylidine	Basif Co.
S-metolachlor	Gardo 96 % EC	300 ml		A mixture of (*aRS,1S*)-2-chloro-6'-ethyl-*N*-(2-methoxy-1-methylethyl)aceto-*o*-toluidide and (*aRS,1R*)-2-chloro-6'-ethyl-*N*-(2-methoxy-1-methylethyl)aceto-*o*-toluidide	Shoura chemicals
Hand hoeing	-	Twice	21 and 35 (DAS)		

Table 2: Some physical and chemical properties of the experimental soil.

Site	EC (dS/m)	pH	Cations (meq/L)				Anions(meq/L)			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}
Mean	2.26	7.73	5.4	4.15	12.2	.15	0.0	3.15	11.5	7.2

Continued:

Site	SAR (%)	$CaCO_3$ (%)	Particle distribution(%)			Texture
			clay	silt	sand	
Mean	5.44	4.81	51.5	15.5	33.5	Clay

Table 3: The common weed species in soybean crop during this study.

Type of weeds	Vernacular or Arabic names	English names	Scientific names	Family names
Annual broad-leaved weeds	عرف الديك	Livid amaranth	*Amaranthus ascendens,* L.	Amaranthaceae
	ام اللبن	Mexican fire plant, spurge	*Euphorbia geniculata,* Ortega.	Euphorbiaceae
	تيل شيطانى	Bladder hibiscus	*Hibiscus trionum,* L.	Malvaceae
	رجله	Common purslane	*Portulaca oleracea*, L.	Portulacaceae
Annual grassy weeds	أبو ركبة	Jungle rice	*Echinochloa colonum* L.	Gramineae
	خدنى معاك	sandbur	*Cenchrus biflorus,* Roxb	Gramineae
	الصيفية	Green bristle grass	*Setaria viridis,*L.	Gramineae

Table 4: Density and biomass of the annual broad and narrow leaved weeds in the experimental soybean field, during 2021 and 2022 seasons at 60 days.

Scientific name	broad and narrow-leaved weeds season (2021)						broad and narrow-leaved weeds season (2022)					
	Average number m-2	%from each type	%from Total weeds	Average fresh weight (gm-2)	%from each type	%from Total weeds	Average number m-2	%from each type	%from Total weeds	Average fresh weight (gm-2)	%from each type	%from Total weeds
Amaranthus ascendens, L.	9.32	32.22	20.11	2317.92	49.12	25.16	11.52	41.68	26.7	2213.2	40.64	26.67
Euphorbia geniculata, Ortega.	7.87	27.2	16.98	1137.6	24.11	12.35	4.62	16.71	10.71	1112.4	20.43	13.41
Hibiscus trionum, L.	3.21	11.1	6.926	126.75	2.686	1.376	3.81	13.78	8.83	632.41	11.61	7.622
Portulaca oleracea, L.	8.53	29.48	18.4	1136.1	24.08	12.33	7.69	27.82	17.82	1487.9	27.32	17.93
Total broad leaved weeds		28.93			4718.44			27.64			5445.95	
Echinochloa colonum L.	7.98	45.81	17.22	2867.21	63.8	31.12	4.21	27.14	9.757	1118.1	39.21	13.48
Cenchrus biflorus, Roxb	5.32	30.54	11.48	493.98	10.99	5.362	6.74	43.46	15.62	1201.3	42.13	14.48
Setaria viridis,L.	4.12	23.65	8.889	1132.6	25.2	12.3	4.56	29.4	10.57	532.21	18.66	6.414
Total narrow leaved weeds		17.42			4493.84			15.51			2851.64	
Total broad and narrow-leaved weeds		46.35			9212.28			43.15			8297.59	

Table 5: Efficacy of weed control treatments on fresh weight (g.m^{-2}) of annual broad leaved weeds, as well as, the calculated percentage of control of these weeds (Season, 2021) in soybean crop.

Treatments	Rate/fed	*Amaranthus ascendens*, L.		*Euphorbia geniculata*, Ortega.		*Hibiscus trionum*, L.		*Portulaca oleracea*, L.		Total annual broad leaved-weeds	
		Weight	% Control	Weight	% Control	Weight	% Control	Weight	% Control	Weight	% Control
Acetachloro	1.0L	78.76	96.6	113.32	90.04	12.31	90.28	131.64	88.41	336	92.88
Butralin	2.0L	0	100	98.54	91.34	0	100	78.65	93.07	177.2	96.24
Pendimethalin	1.5L	89.93	96.12	170.75	84.99	0	100	141.8	87.51	402.5	91.47
S-metolachlor	300 ml	54.31	97.66	123.32	89.16	18.56	85.35	218.16	80.79	414.4	91.22
Hand hoeing	Twice	212.87	90.82	164.54	85.54	22.15	82.52	222.15	80.44	621.7	86.82
Untreated		2317.92	0	1137.65	0	126.75	0	1136.12	0	4718	0
L.S.D at 5 % level		31.65		11.25		7.54		22.72			

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Table 6: Efficacy of weed control treatments on fresh weight (g.m-2) of annual broad leaved weeds, as well as, the calculated percentage of control of these weeds (Season, 2022) in soybean crop.

Treatments	Rate/ fed.	*Amaranthus ascendens*, L.		*Euphorbia geniculata*, Ortega.		*Hibiscus trionum*, L.		*Portulaca oleracea*, L.		Total annual broad leaved-weeds	
		Weight	% Control	Weight	% Control	Weight	% Control	Weight	% Control	Weight	% Control
Acetachloro	1.0L	0	100	168.51	84.85	33.12	94.76	166.21	88.83	367.8	93.25
Butralin	2.0L	48.75	97.8	101.39	90.89	0	100	89.32	94	239.5	95.6
Pendimethalin	1.5L	53.21	97.6	382.5	65.62	51.61	91.84	288.81	80.59	776.1	85.75
S-metolachlor	300 ml	298.5	86.51	0	100	69.21	89.06	196.41	86.8	564.1	89.64
Hand hoeing twice	Twice	354.87	83.97	245.12	77.97	23.71	96.25	265.32	82.17	889	83.68
Untreated		2213.2	0	1112.4	0	632.41	0	1487.9	0	5446	0
L.S.D at 5 % level		26.72		38.13		9.81		43.12			

Table 7: Efficacy of weed control treatments on fresh weight (gm-2) of annual narrow leaved weeds, as well as, the calculated percentage of control of these weeds (Season, 2021) in soybean crop.

Treatments	Rate/fed.	*Echinochloa colonum* L.		*Cenchrus biflorus*, Roxb		*Setaria viridis*,L		Total annual narrow leaves-weeds	
		Weight	% Control	Weight	% Control	Weight	% Control	Weight	% Control
Acetachloro	1.0L	75.26	97.38	0	100	54.63	95.18	129.9	97.10
Butralin	2.0L	23.53	99.18	0	100	0	100	23.53	99.47
Pendimethalin	1.5L	319.06	88.87	0	100	102.31	90.97	421.4	90.62
S-metolachlor	300 ml	123.84	95.68	18.13	96.33	0	100	142	96.84
Hand hoeing twice	Twice	286.18	90.02	121.83	75.34	122.54	89.18	530.6	88.19
Untreated		2867.21	0	493.98	0	1132.6	0	4494	0
L.S.D at 5 % level		32.70		9.15		14.63			

Table 8: Efficacy of weed control treatments on fresh weight (gm-2) of annual narrow leaved weeds, as well as, the calculated percentage of control of these weeds (Season, 2022) in soybean crop.

Treatments	Rate/fed.	*Echinochloa colonum* L.		*Cenchrus biflorus*, Roxb		*Setaria viridis*,L		Total annual narrow leaves-weeds	
		Weight	% Control	Weight	% Control	Weight	% Control	Weight	% Control
Acetachloro	1.0L	43.65	96.1	0	100	67.12	87.39	110.8	96.12
Butralin	2.0L	40.12	96.41	18.32	98.47	19.45	96.35	77.89	97.27
Pendimethalin	1.5L	62.12	94.44	36.21	96.99	71.41	86.58	169.7	94.05
S-metolachlor	300 ml	158.5	85.82	189.12	84.26	68.54	87.12	416.2	85.41
Hand hoeing twice	Twice	213.25	80.93	187.37	84.4	77.25	85.49	477.9	83.24
Untreated		1118.12	0	1201.3	0	532.21	0	2852	0
L.S.D at 5 % level		11.12		11.31		8.54			

Table 9: Effect of weed control treatments on yield and yield component of soybean crop at harvest (season, 2021)

Treatments	Rate/fed.	Number of Pods / plant	pods weight (g)/ plant	Number of seeds /pod	100-seeds weight (g)	Number of seeds /plant	soybean yield (ton/fed.)	
							seed yield	Straw yield
Acetachloro	1.0L	37.21	22.43	2.34	18.83	61.76	1.6	2.81
Butralin	2.0L	42.62	24.81	2.87	19.56	68.98	1.81	3.28
Pendimethalin	1.5L	33.32	21.54	2.12	15.23	57.21	1.35	2.31
S-metolachlor	300 ml	35.21	21.87	2.21	15.76	54.12	1.51	2.54
Hand hoeing twice	Twice	33.12	21.12	2.34	14.98	51.32	1.47	2.41
Untreated		18.51	12.12	1.65	11.12	35.32	0.97	1.87
L.S.D at 5 % level		6.87	0.98	0.20	0.17	5.82	0.12	0.31

Table 10: Effect of weed control treatments on yield and yield component of soybean crop at harvest (season, 2022)

Treatments	Rate/fed.	Number of Pods / plant	pods weight (g)/ plant	Number of seeds /pod	100-seeds weight (g)	Number of seeds /plant	soybean yield (ton/fed.)	
							seed yield	Straw yield
Acetachloro	1.0L	32.13	23.65	2.17	16.45	54.98	1.76	2.87
Butralin	2.0L	43.76	25.76	2.76	17.09	58.65	2.01	3.13
Pendimethalin	1.5L	31.65	22.76	1.98	14.43	51.54	1.42	2.65
S-metolachlor	300 ml	31.12	19.65	2.12	16.01	47.98	1.61	2.67
Hand hoeing twice	Twice	34.87	21.54	1.98	14.32	48.87	1.51	2.76
Untreated		15.87	13.21	1.54	11.32	33.54	1.10	1.56
L.S.D at 5 % level		4.82	0.38	0.21	0.15	6.65	0.21	0.31

Table 11: Effect of weed control treatments on soybean leaf pigments after intervals periods 30 days from sowing (season, 2021(A) and 2022 (B)).

Treatments	Rate/ fed.	Chlorophyll a (mg/g fresh weight)		Chlorophyll b (mg/g fresh weight)		Total chlorophyll (mg/g fresh weight)		Carotenoides (ug/g fresh weight)	
		A	B	A	B	A	B	A	B
Acetachloro	1.0L	0.283	0.309	0.191	0.174	0.47	0.48	1.43	1.67
Butralin	2.0L	0.271	0.420	0.177	0.233	0.448	0.65	1.33	2.40
Pendimethalin	1.5L	0.260	0.272	0.197	0.152	0.457	0.42	1.88	1.84
S-metolachlor	300 ml	0.341	0.288	0.223	0.158	0.563	0.44	1.28	1.71
Hand hoeing twice	Twice	0.360	0.291	0.232	0.161	0.592	0.45	1.38	1.57
Untreated		0.241	0.260	0.179	0.149	0.420	0.40	1.31	1.38
L.S.D at 5 % level		0.006	0.005	0.004	0.005	0.008	0.009	0.11	0.05

Table 12: Effect of weed control treatments on soybean leaf pigments after intervals periods 30 days from sowing (season, 2021(A) and 2022 (B)).

Treatments	Rate/fed.	Total carbohydrate (%)		Protein content (%)		Total phenolic content (%)	
		A	B	A	B	A	B
Acetachloro	1.0L	16.52	17.27	16.17	15.07	0.392	0.380
Butralin	2.0L	17.19	19.93	15.86	18.13	0.551	0.461
Pendimethalin	1.5L	18.55	17.57	17.20	15.47	0.438	0.487
S-metolachlor	300 ml	16.88	16.80	13.83	15.17	0.544	0.481
Hand hoeing twice	Twice	17.07	16.70	15.45	13.80	0.397	0.470
Untreated		16.60	16.07	13.10	12.85	0.372	0.373
L.S.D at 5 % level		0.3264	0.4592	0.451	0.358	0.0214	0.007

كفاءة بعض مبيدات الحشائش قبل الانبثاق على الحشائش المصاحبة لمحصول فول الصويا

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الملخص العربى

اجريت التجارب الحقليه خلال موسمى (2020-و 2021م) على محصول فول الصويا صنف جيزة 111 بمزرعة محطة البحوث الزراعيه بإيتاى البارود محافظة البحيرة, تضمنت الدراسه تقييم كفاءة أربعة من مبيدات الحشائش المطبقه قبل الزراعه وبعد الرى مثل اسيتوكلورو EC %84 (هارنس) ,بيترالين EC %96 (اميكس) ,بينداميثالين 45.5%CS (سطومب اكسترا) و اس ميتاكلورو EC % 96 (جاردو) وكذلك العزيق مرتين (بعد 21 و35 يوم من الزراعه) مقارنة بالكنترول لمكافحة الحشائش العريضه وضيقة الأوراق والكلية في حقول فول الصويا بعد 60 يوم من الزراعة . أوضحت النتائج أن كل طرق مبيدات الحشائش المختبره خفضت من معنوية الوزن الرطب للحشائش العريضه والرفيعة والكلية جم /م^2 بعد 60 يوم من الزراعه مقارنة بالغير معامل وكذلك الزيادة في مكونات المحصول خلال موسمى الدراسه كانت معنويه . أعلى معدل زياده في وزن المحصول كان بيترالين يلية اسيتوكلورو, وكذلك كان اعلى تاثير لهذة المركبات على مكونات الورقه والحبوب . وجد أن محتوى الأوراق من كلوروفيل أ ، ب ، الكلورفيل الكلى (مجم/جرام وزن غض)، الكاورتين (ميكروجرام/جرام) و المحتوى من البروتين الخام (%)، و الكربوهيدرات الكلى (%) قد ازداد فى حين أن محتوى الأوراق من المركبات الفينولية الكلية قدانخفضت فى كلا الموسمين. و فى كلا الموسمين لم تؤثر أى معاملة لمكافحة الحشائش سلبياً على أى مكون تم دراسته من المعايير البيوكيماوية و الصبغات لأوراق

الكلمات الاسترشادية: فول الصويا, مكافحة الحشائش, المحصول.