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# Influence of *Sorghum bicolor* and *Cynodon dactylon* extracts and glyphosate herbicide on the control of *Cuscuta campestris* in *Trifoluim alexandrinum*

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## ABSTRACT

Two field experiments were worked out in the farm of Agricultural Research Station in Sakha district, Kafr El-Sheikh governorate, through 2022/2023 and 2023/2024 winter seasons. The aimed to study the performance of the water extracts of two weeds each alone and or mixed with glyphosate herbicide on controlling the dodder as a holoprasite weed in its host of Egyptian clover. Results indicated that the water extracts of *Sorghum bicolor* at 5, 10, and 15% conc. and *S. bicolor* at 10% and /or plus glyphosate 48% at 50 $cm^3$/fed are promising treatments to control dodder stems infested the Egyptian clover accompanied with increasing the foliage characteristics of clover plants. While, the water extracts of *Cynodon dactylon* at 5, 10 and 15% conc. and / or plus glyphosate 48% at 50 $cm^3$/fed were not satisfactory on controlling dodder stem with some increasing on the foliage characteristics of clover plants. Furthermore, glyphosate herbicides 48% at 100 and 150 $cm^3$ /fed gave good effect of dodder stems control with little reduction of the foliage characteristics of the clover plants. This study explores the use of allelochemicals as sources for new mechanisms of herbicidal action and sustainable weed management alongside recommended herbicides.

Key wards: Glyphosate, *Sorghum bicolor*, *Cynodon dactylon,* water extract,*Cuscuta campestris*, *Trifoluim alexandrinum*

## INTRODUCTION

Clover (*Trifoluim alexandrinum* L) is providing high quality green forage that is rich in protein (15 – 25%), minerals (11 – 19%) and carotene (Priyanka *et al.,* 2018). Returning clover to the soil causes an increase in soil nitrogen and improvement of soil quality (Ross *et al.,* 2004). In present agricultural systems, heavy amounts of synthetic chemicals are being used to control weeds and other pests. However, the adverse impact of these chemicals on the environment has it necessary to search substitute weed control strategies (Khanh *et al.,* 2005; Iqbal *et al.,* 2008). Parasitic weed represent a main component of weed problems facing agriculture and negatively impact agro-ecosystem and environment. They attack plant species of different botanical families, causing a great yield loss (Qasem, 2006). Cuscuta campestris farm the family cuscutaceae is an annual obligate angiosperm parasite with stem golden yellow color (Shen *et al.,* 2005). This parasite twins on other plants with haustorium sucker-like and attacks to the above ground parts and connect to the vascular bundle of a wide range of host plants (Othman *et al.,* 2012). Sorghum (*Sorghum bicolor* (L) Moench), suppressive ability is due to the presence of hydrophilic compounds, phenolic acids and their aldehyde derivatives, as well as hydrophobic substances, such as sorgoleone. About 90% of compounds present in the root exudates (Czarnota *et al.,* 2003). Sorgoleone has been characterized as a potent bioherbicides as it can suppress many weed species (Khamare *et al.,* 2022). *Cynodon dactylon* foliage contained the following phenolic acids: caffeic, ferulic, coumaric, benzoic, vanelic, chlorogenic and cinnamic. The lubers contained hydroxyl, benzoic, caffeic, ferulic, vanelic and chlorogenic (El-Rokick *et al.,* 2010). For clean environment, to avoid health hazards in human and livestock and for development and sustainability of organic / ecological agricultural, adoption of allelopathic strategies in farming are essential. Allelopathy is utilized for improvements in crop production through such mean as discovering eco-friendly herbicides with new sites of action, harmless to crops but toxic to weeds and without formation of dangerous residues (Terry, 2008). Glyphosate herbicide [N-(phosphono methyl) glycine], inhibits the enzyme enol pyruvate shikimate-3-phosphate syntheses (EPSPS), which is a key enzyme in the biosynthesis of aromatic amino acids (Vargas *et al.,* 2014). Also, glyphosate will affect photosynthesis indirectly by inhibit the biosynthesis of carotenoids, chlorophyllus, fatty acid and for amino acids (Fedtke and Duke, 2005). So, influence of the water wastes extracts of *S. bicolor* and *C. dactylon* as two weeds beside glyphosate herbicide (comparison treatment) were studied on controlling the dodder (*Cuscuta campestris* L) with clover crop (*T. alexandrinum*) under field conditions.

## MATERIALS AND METHODS

Two field experiments were conducted on the farm of agric. Res. St. in Sakha district, Kafrelsheikh governorate, during 2022/2023 and 2023/2024 growing winter seasons. The study aimed to evaluate the allelopathic potential of water extracts of two weeds each at alone and / or mixed with glyphosate herbicide, that compared to glyphosate alone on the germination and growth criteria of the field dodder with clover as its host plant.

**Source of the materials:**

- Seeds of Egyptian clover (*T. Alexandrinum* El-Helaly variety) were obtained from Sakha Res. St.
- Sorghum (*S. bicolor* Moench) and small flower umbrella (*C. dactylon*) were collected from Sakha Res. St. farm.
- Glypho Up (glyphosate 48% SL) was obtained from weed Res. Central Laboratory, which followed to Agric. Res. Center (ARC).
- Field dodder (*C. Campestris* ) was presented in naturally infestation of the experimental soil.

**Preparation of water extracts of the studied weeds:**

Foliage stage of *S. bicolor* and *C. dactylon* were dried for two weeks in the shade, then stored at temperature room 30°C. water extracts were obtained by rinsing definite weight (5, 10, and 15 grams) of the ground powder of each weed residues in distilled water (100 mm.) for 24 hrs at 25°c with mechanized shaking. According, the studied concentrations were 5, 10 and 15 % (w/v), the filtration were carried out through muslin cloth and finally through a filter paper (Whatman No. 1). Area of the experimental plot was 6 $m^2$ (3 m length * 2 m width). The twelve treatments of each experiment were arranged in a Randomized Complete Block Design with four replicates as follows:

1- Water extract of *S. bicolor* at 5% conc. (w/v )
2- Water extract of *S. bicolor* at 10% conc. (w/v )
3- Water extract of *S. bicolor* at 15% conc. (w/v )
4- Water extract of *C. dactylon* at 5% conc. (w/v )
5- Water extract of *C. dactylon* at 10% conc. (w/v )
6- Water extract of *C. dactylon* at 15% conc. (w/v )
7- Glyphosate herbicide (48% AS) at 150$cm^3$ / fed.
8- Glyphosate herbicide (48% AS) at 100 $cm^3$ / fed.
9- Glyphosate herbicide (48% AS) at 50 $cm^3$ / fed. plus extract of S. bicolor at 10% conc.
10- Glyphosate herbicide (48% AS) at 50 $cm^3$ / fed. plus extract of *C. dactylon* at 10% conc.
11- Dodder free, which was removed the dodder stems on the foliage clover plants periodical for the whole season.
12- Untreated control, which was naturally infested with dodder stems on foliage clover plants.

- All the treatments were applied after the first clover cuts (45:50 days from sowing), when the length of the clover was 10- 15 cm and / or 2 weeks for the cut.

**Chemical analysis of *S. bicolor* and *C. dactylon* extracts:**

Figures (1 and 2) show the functional groups present in *S. bicolor* and *C. dactylon*, as identified using Fourier Transform Infrared (FTIR) Spectroscopy. The FTIR spectra were recorded in the range of 4000-400/cm, and the characteristic absorption bands were analyzed based on their wavenumber /cm and the corresponding transmittance %or intensity.

**The characteristics taken:**

In each treatment, 1/4 $m^2$ area with four replicats was taken randomly at 30 days from treatments application as follows:

1- Number and fresh weights of dodder in (g/$m^2$).
2- Fresh wt. of clover leavs / stem ratio
3- Number of tillers / plant

At harvest time, the data recorded from the whole plots

1- Clover yield (kg/ from each the whole plot = 6$m^2$)
2- Plant height in (cm)

**Statistical analysis:**

The analysis of variance of Randomized Complete Blocks Design (R.C.B.D). Was carried out according to the procedure by (Gomez and Gomez, 1984). The MSTAS-C statistical soft ware package was used to calculate the clover yield and its components by the LSD at 5%. Which, the number and fresh wt. of the dodder were used Duncan Test.

## RESULTS

The main findings in (Table 1) revealed that water extracts of *S. bicolor* at 5, 10 and 15% conc. , extract of *S. bicolor* at 10% plus glyphosate 48% at 50$cm^3$ / fed and glyphosate 48% at 150 $cm^3$ / fed gave the highest significant reduction percentage on number and fresh wt. of dodder stems / $m^2$by 100%. The following significant reduction percentage (can be calculated using the following equation: ((control - treatment) / control) * 100) was obtained with glyphosate 48% at 100 $cm^3$ / fed by 95.2 and 93.4% respectively. whilst, the aqueous extracts of *C. dactylon* at

different cons. At 5, 10 and 15% and extract of *C. dactylon* at conc. 10% plus glyphosate at 50 $cm^3$/ fed gave the least significant reduction percentage on the number and fresh wt. of dodder stems / $m^2$ by (48.8, 52.7), (80, 97.8), (31.3, 36.7) and (68.9, 66.4%) respectively. these results in the first season. Also, the results obtained in the second season confirm to a great extent these observed in the first season with minor differences. Whilst the water extracts of *C. dactylon* at different conc. at 5, 10 and 15 % and extract of *C. dactylonat* 10% conc. plus glyphosate at 50 $cm^3$ / fed gave the least significant reduction percentage on the number and fresh wt. of dodder stems /$m^2$ by (48.8, 46.8), (80, 100), (31.1, 29.7) and (68.8, 65.9%), respectively. These results in the first season. Also, the results obtained in the second season confirm to agreat extent those observed in the first season with minor differences where the results were as follow water extracts of S. bicolor at 5, 10 and 15% conc. , extract of S. bicolor at 10% plus glyphosate 48% at 50cm3 / fed and glyphosate 48% at 150 $cm^3$ / fed gave the highest significant reduction percentage on number and fresh wt. of dodder stems / $m^2$ by 100%. The following significant reduction percentage was obtained with glyphosate 48% at 100 $cm^3$ / fed by 87 and 93% respectively. whilst, the aqueous extracts of *C. dactylon* at different cons. At 5, 10 and 15% and extract of *C. dactylon* at conc. 10% plus glyphosate at 50 $cm^3$/ fed gave the least significant reduction percentage on the number and fresh wt. of dodder stems / $m^2$ by (100%) respectively. Whilst the water extracts of *C. dactylon* at different conc. at 5, 10 and 15 % and extract of *C. dactylon* at 10% conc. plus glyphosate at 50 cm3 / fed gave the least significant reduction percentage on the number and fresh wt. of dodder stems /m 2 by (47, 47), (100, 100), (30, 29) and (66, 68%), respectively. The results of the 2022/ 2023 and 2023/ 2024 seasons are shown in (Table 2 and 3), for the average fresh wt. and number of foliage clover cuts / plot, dodder free for the whole season, water extracts of *S. bicolor* at 5, 10 and 15 conc.; and extract of S. bicolor at 10% plus glyphosate 48% at 50$cm^3$/ fed in the 2022/ 2023 season gave highly significant increasing values by (64.6, 64.9, 70.0, 61.4), (247.3, 249.3, 240.3, 175.3) and in the 2023/ 2024 season gave highly significant increasing values by (65.2, 65.08, 63.15, 61.13), (262.5, 265.5, 229.75, 188), respectively.

Whilst, water extract of *C. dactylon* at 5, 10, and 15% conc; and the extract of *C. dactylon* at 10% plus glyphosate 48% at 50$cm^3$/ fed gave the least significant increasing values of the average fresh and number of tillers of foliage clover cuts / plot by (58.1, 62.4, 60.3, 61.0) and (199.8, 193.8, 181.5, 173.3), respectively in the 2022 / 2023 season. While in the 2023 /24 gave (59.9, 59.5, 56.4, 55.4) and (196.5, 204, 191.3, 183.5).

**Table 1.** Effect of *S. bicolor*, *C. dactylon* extract, and Glypho Up® treatments to control dodder infestation on dodder number (No.), fresh weight (g/$m^2$) after cutting when 15- 20 cm tall of clover.

| Teatments: | F.W. of dodder g/m² | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2022/23 | rRed. Perc, | 2023/24 | Red. Perc. | 2022/23 | Red. Perc. | 2023/24 | Red. perc. |
| **T1. Glyphosate at 100cm3 / Fed.** | 4 ef | 91 | 6 e | 87 | 2.16 d | 95 | 3.1 e | 93 |
| **T2. Glyphosate at 150cm3 / Fed.** | 0 f | 100 | 0 f | 100 | 0 d | 100 | 0 e | 100 |
| **T3. Extract of *S. bicolor.* at 5% (w/v).** | 0 f | 100 | 0 f | 100 | 0 d | 100 | 0 e | 100 |
| **T4. Extract of *S. bicolor.* at 10% (w/v).** | 0 f | 100 | 0 f | 100 | 0 d | 100 | 0 e | 100 |
| **T5. Extract of *S.bicolor.* at 15% (w/v).** | 0 f | 100 | 0 f | 100 | 0 d | 100 | 0 e | 100 |
| **T6. Extract of *C. dactylon* at 5% (w/v).** | 23 c | 49 | 25 c | 47 | 21.25 bc | 53 | 24.83 c | 47 |
| **T7. Extract of *C. dactylon* at 10% (w/v).** | 9 de | 80 | 0 f | 100 | 1 d | 98 | 0 e | 100 |
| **T8. Extract of *C. dactylon* at 15% (w/v).** | 31 b | 31 | 33 b | 30 | 28.45 b | 37 | 33.45 b | 29 |
| **T9. Glyphosate at 50cm3 / Fed. and extract of *S. bicolor.* at 10% (w/v).** | 0 f | 100 | 0 f | 100 | 0 d | 100 | 0 e | 100 |
| **T10. Glyphosate at 50cm3 / Fed. and extract of *C. dactylon* at 10% (w/v)** | 14 d | 69 | 16 d | 66 | 15.12 c | 66 | 15.12 d | 68 |
| **T11. Dodder infestaion for the whole season. (control).** | 45 a | 0 | 47 a | 0 | 44.96 a | 0 | 46.88 a | 0 |
| **T12. Dodder free for the whole season.** | 0 | 100 | 0 | 100 | 0 | 100 | 0 | 0 |
| **LSD at 0.05** | 7.637 | | 5.193 | | 10.204 | | 5.786 | |

Values with the same alphabetical letter, in a comparable group of means donot differ from each after significantly according to Duncans Multeple Range best at 0.05 level of significance.

**Table 2.** Mean of fresh leaf/stem ratio, and number of tillers of different cuts in *T. alexandrinum* in (2022/2023).

| Treatments | Fresh leaf/stem ratio (%) | | | | | Number of tillers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cut1 | Cut2 | Cut3 | Cut4 | AV. | Cut1 | Cut2 | Cut3 | Cut4 | AV. |
| 1. Glyphosate at 100 cm*3* / Fed. | 57.4 | 56.4 | 57.4 | 54.8 | 56.5 | 166.0 | 188.0 | 186.0 | 195.0 | 183.8 |
| 2. Glyphosate at 150 cm*3* / Fed. | 56.8 | 55.5 | 59.8 | 55.4 | 56.9 | 159.0 | 184.0 | 183.0 | 187.0 | 178.3 |
| 3. Extract of Sorghum at 5% (w/v). | 63.5 | 63.7 | 65.5 | 65.8 | 64.6 | 176.0 | 206.0 | 306.0 | 301.0 | 247.3 |
| 4. Extract of Sorghum at 10% (w/v). | 64.0 | 66.4 | 64.5 | 64.7 | 64.9 | 179.0 | 224.0 | 301.0 | 293.0 | 249.3 |
| 5. Extract of Sorghum at 15% (w/v). | 59.4 | 63.9 | 95.3 | 61.5 | 70.0 | 187.0 | 214.0 | 292.0 | 268.0 | 240.3 |
| 6. Extract of *C. dactylon* at 5% (w/v). | 57.6 | 58.8 | 59.8 | 56.0 | 58.1 | 154.0 | 172.0 | 280.0 | 193.0 | 199.8 |
| 7. Extract of *C. dactylon* at 10% (w/v). | 61.1 | 62.7 | 64.5 | 61.3 | 62.4 | 152.0 | 187.0 | 210.0 | 226.0 | 193.8 |
| 8. Extract of *C. dactylon* at 15% (w/v). | 59.4 | 58.3 | 64.0 | 59.5 | 60.3 | 155.0 | 183.0 | 199.0 | 189.0 | 181.5 |
| 9. Glyphosate at 50 cm3 / Fed. and extract of Sorghum at 10% (w/v). | 58.3 | 59.1 | 65.3 | 63.0 | 61.4 | 161.0 | 167.0 | 194.0 | 179.0 | 175.3 |
| 10. Glyphosate at 50 cm3 / Fed. and extract of *C. dactylon* at 10% (w/v). | 59.7 | 60.5 | 64.0 | 59.6 | 61.0 | 158.0 | 173.0 | 195.0 | 167.0 | 173.3 |
| 11. Dodder free for the whole season. | 64.6 | 66.0 | 69.4 | 66.1 | 66.5 | 201.0 | 228.0 | 310.0 | 337.0 | 269.0 |
| 12.Control | 55.5 | 57.1 | 56.5 | 53.9 | 55.8 | 155.0 | 167.0 | 183.0 | 197.0 | 175.5 |
| LSD at 0.05 | 3.01 | 3.30 | 3.15 | 2.22 | | 7.96 | 11.5 | 8.86 | 9.33 | |

**Table 3**. Mean of fresh leaf/stem ratio, and number of tillers in ***T. alexandrinum*** in (2023/2024)

| Treatments | Fresh leaf/stem ratio (%) | | | | | Number of tillers | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Cut1 | Cut2 | Cut3 | Cut4 | AV. | Cut1 | Cut2 | Cut3 | Cut4 | AV. |
| 1. Glyphosate at 100cm3 / Fed. | 59.3 | 55.5 | 55.4 | 53.4 | 55.9 | 176.0 | 192.0 | 226.0 | 205.0 | 199.8 |
| 2. Glyphosate at 150 cm3 / Fed. | 58.9 | 57.8 | 57.7 | 52.0 | 56.6 | 170.0 | 174.0 | 228.0 | 201.0 | 193.3 |
| 3. Extract of Sorghum at 5% (w/v). | 67.6 | 64.6 | 65.2 | 63.4 | 65.2 | 189.0 | 219.0 | 323.0 | 319.0 | 262.5 |
| 4. Extract of Sorghum at 10% (w/v). | 67.2 | 64.5 | 66.1 | 62.5 | 65.1 | 197.0 | 218.0 | 317.0 | 330.0 | 265.5 |
| 5. Extract of Sorghum at 15% (w/v). | 65.1 | 61.5 | 64.2 | 61.8 | 63.2 | 184.0 | 206.0 | 292.0 | 237.0 | 229.8 |
| 6. Extract of *C. dactylon* at 5% (w/v). | 57.2 | 57.5 | 55.1 | 59.9 | 57.4 | 168.0 | 187.0 | 216.0 | 215.0 | 196.5 |
| 7. Extract of *C. dactylon* at 10% (w/v). | 63.1 | 61.8 | 62.4 | 59.5 | 61.7 | 174.0 | 170.0 | 222.0 | 250.0 | 204 |
| 8. Extract of *C. dactylon* at 15% (w/v). | 61.4 | 57.0 | 57.2 | 56.4 | 58 | 176.0 | 181.0 | 215.0 | 193.0 | 191.3 |
| 9. Glyphosate at 50cm3 / Fed. And extract of Sorghum at 10% (w/v). | 64.3 | 61.6 | 61.4 | 57.2 | 61.1 | 172.0 | 178.0 | 215.0 | 187.0 | 188 |
| 10. Glyphosate at 50cm3 / Fed. And extract of *C. dactylon* at 10% (w/v). | 62.9 | 57.7 | 60.2 | 55.4 | 59.1 | 173.0 | 168.0 | 213.0 | 180.0 | 183.5 |
| 11. Dodder free for the whole season. | 71.3 | 68.3 | 71.6 | 64.8 | 69 | 216.0 | 254.0 | 315.0 | 345.0 | 282.5 |
| 12.Control | 57.1 | 53.7 | 52.5 | 49.1 | 53.1 | 160.0 | 170.0 | 202.0 | 205.0 | 184.3 |
| LSD at 0.05 | 4.026 | 3.350 | 2.999 | 3.214 | | 6.919 | 8.579 | 8.522 | 22.16 | |

Resuls in (Table 4 and 5) indicated that, the water extracts of *S. bicolor* at 5, 10 and 15% conc. And the extract of *S. bicolor* at 10% plus glyphosate 48% at 50cm$^3$/ fed gave significant increasing values of fresh yeild to total four cuts and average of plant heighet by (73.8, 72.4, 65.8, 56.4) and (77.9, 75.9, 74.8, 76.2), respectively, followed by the water extracts of extract of *C. dactylon* at 5, 10, and 15% conc; and the extract of *C. dactylon* at 10% plus glyphosate 48% at 50cm$^3$/ fed gave significant increasing values of fresh yeild to total four cuts by (57.9, 64, 61, 64.6) and (75.3, 76.6, 75.3, 75), respectively. While the results of the second season 2023 /24 were in the same direction as the first season 2022/23. However, the increasing between the two weeds extract and untreated control were littil values on the clover plant height on contrary, glyphosate 48% at both 100 and 150 cm$^3$/ fed gave significant reduction values on clover plant height. It may be due to this herbicide was non-selecttive on plants inspite to the low rates used.

While in the 2023 /24 gave (59.9, 59.5, 56.4, 55.4) and (196.5, 204, 191.3, 183.5).

Resuls in (Table 4 and 5) indicated that, the water extracts of *S. bicolor* at 5, 10 and 15% conc. And the extract of *S. bicolor* at 10% plus glyphosate 48% at 50cm$^3$/ fed gave significant increasing values of fresh yeild to total four cuts and average of plant heighet by (73.8, 72.4, 65.8, 56.4) and (77.9, 75.9, 74.8, 76.2), respectively, followed by the water extracts of extract of *C. dactylon* at 5, 10, and 15% conc; and the extract of *C. dactylon* at 10% plus glyphosate 48% at 50cm$^3$/ fed gave significant increasing values of fresh yeild to total four cuts by (57.9, 64, 61, 64.6) and (75.3, 76.6, 75.3, 75), respectively. While the results of the second season 2023 /24 were in the same direction as the first season 2022/23. However, the increasing between the two weeds extract and untreated control were littil values on the clover plant height on contrary, glyphosate 48% at both 100 and 150 cm$^3$/ fed gave significant reduction values on clover plant height. It may be due to this herbicide was non-selecttive on plant

**Table 4.** Fresh forage yield (FFY) (Kg/plot) and plant height (cm) at different cuts **of *T. alexandrinum*** a season (2022/2023)

| Treatments | Fresh yield (kg/plot (6m²)) | | | | | Plant height (cm) | | | | | Red. Perc. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cut1 | Cut2 | Cut3 | Cut4 | Total | Cut1 | Cut2 | Cut3 | Cut4 | Av. | |
| **1. Glyphosate at 100 cm3 / Fed.** | 14.3 | 14.4 | 9.8 | 17.6 | 56.1 | 61.7 | 69.3 | 45.0 | 61.6 | 59.4 | 74.5 |
| **2. Glyphosate at 150 cm3 / Fed.** | 14.4 | 13.1 | 12.6 | 19.6 | 59.8 | 62.6 | 72.6 | 73.0 | 62.1 | 67.6 | 84.8 |
| **3. Extract of *S. bicolor* at 5% (w/v).** | 15.1 | 19.7 | 15.6 | 23.3 | 73.8 | 61.4 | 75.0 | 87.0 | 88.0 | 77.9 | 97.7 |
| **4. Extract of *S. bicolor* at 10% (w/v).** | 14.8 | 19.9 | 16.7 | 21.0 | 72.4 | 62.1 | 75.0 | 81.3 | 85.0 | 75.9 | 95.2 |
| **5. Extract of *S. bicolor* at 15% (w/v).** | 15.4 | 17.9 | 12.6 | 19.9 | 65.8 | 61.3 | 74.0 | 79.7 | 84.0 | 74.8 | 93.9 |
| **6. Extract of *C.dactylon* at 5% (w/v).** | 14.6 | 13.9 | 11.6 | 17.8 | 57.9 | 62.0 | 74.0 | 81.6 | 83.5 | 75.3 | 94.5 |
| **7. Extract of *C. dactylon* at 10% (w/v).** | 14.5 | 18.6 | 11.9 | 18.9 | 64.0 | 62.3 | 74.0 | 85.0 | 85.2 | 76.6 | 96.1 |
| **8. Extract of *C.dactylon* at 15% (w/v).** | 14.8 | 19.9 | 12.3 | 14.3 | 61.0 | 61.0 | 74.3 | 81.0 | 85.0 | 75.3 | 94.5 |
| **9. Glyphosate at 50 cm*3* / Fed. and extract of *S. bicolor* at 10% (w/v).** | 14.2 | 14.8 | 15.3 | 21.1 | 56.4 | 62.4 | 72.3 | 83.7 | 86.3 | 76.2 | 95.6 |
| **10. Glyphosate at 50 cm*3* / Fed. and extract of *C. dactylon* at 10% (w/v).** | 14.3 | 16.9 | 12.1 | 21.3 | 64.6 | 60.6 | 72.6 | 80.3 | 86.3 | 75.0 | 94.1 |
| **11. Dodder free for the whole season.** | 13.5 | 14.9 | 10.2 | 18.5 | 57.1 | 61.3 | 72.0 | 74.3 | 80.6 | 72.1 | 90.5 |
| **12. Control** | 15.8 | 22.3 | 22.6 | 25.3 | 86.1 | 63.0 | 76.6 | 84.3 | 95.0 | 79.7 | 0 |
| **L.S.D at 0.05** | 0.51 | 0.43 | 1.75 | 1.03 | 2.20 | 0.97 | 1.379 | 2.024 | 2.287 | | |

**Table 5.** Mean of fresh forage yield and plant height in different cuts and ***T. alexandrinum*** yield in season (2023/2024).

| Treatments | Fresh yield (kg/plot (6m²)) | | | | | Plant height (cm) | | | | | Red. Perc. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cut1 | Cut2 | Cut3 | Cut4 | Total | Cut1 | Cut2 | Cut3 | Cut4 | Av. | |
| **1. Glyphosate at 100cm3 / Fed.** | 18.7 | 10.8 | 15.5 | 15.6 | 60.7 | 71 | 55.7 | 65.3 | 62.3 | 63.6 | 80.1 |
| **2. Glyphosate at 150cm3 / Fed.** | 18.3 | 11.3 | 16.2 | 16 | 61.8 | 73.3 | 56.7 | 66 | 63.3 | 64.8 | 81.6 |
| **3. Extract of *S. bicolor* at 5% (w/v).** | 19.3 | 19.8 | 21.2 | 22.8 | 83.1 | 76.3 | 78 | 79 | 81.3 | 78.6 | 98.9 |
| **4. Extract of *S. bicolor* at 10% (w/v).** | 19.3 | 19.7 | 20.6 | 22 | 81.7 | 75 | 77.7 | 79.7 | 82.3 | 78.7 | 99.1 |
| **5. Extract of *S. bicolor* at 15% (w/v).** | 17.9 | 18.5 | 18.8 | 20 | 75.2 | 75.7 | 74.7 | 75 | 76.3 | 75.4 | 94.9 |
| **6. Extract of *C. dactylon* at 5% (w/v).** | 18 | 18.1 | 18.3 | 20.7 | 75.1 | 76.7 | 74.3 | 75.3 | 79 | 76.3 | 96.1 |
| **7. Extract of *C. dactylon* at 10% (w/v).** | 18.6 | 18.6 | 20.5 | 22.4 | 80.2 | 72 | 78 | 78.7 | 80.3 | 77.3 | 97.1 |
| **8. Extract of *C. dactylon* at 15% (w/v).** | 18.5 | 17.4 | 18.1 | 19.4 | 73.4 | 74.3 | 74.3 | 78.3 | 77 | 76 | 95.7 |
| **9. Glyphosate at 50 cm*3* / Fed. and extract of sorghum at 10% (w/v).** | 18.9 | 19.3 | 18.7 | 20.8 | 77.7 | 75.7 | 75.7 | 77.3 | 79.6 | 77.1 | 97.1 |
| **10. Glyphosate at 50 cm³/ Fed. and extract of *C. dactylon* at 10% (w/v).** | 17.6 | 17.5 | 17.7 | 19.5 | 72.3 | 72.7 | 73 | 75.7 | 76.3 | 74 | 93.2 |
| **11. Dodder free for the whole season.** | 17.5 | 17 | 17.7 | 19.8 | 72.7 | 71.7 | 75 | 75.7 | 76.3 | 74.5 | 93.8 |
| **12. Control** | 19.9 | 20.6 | 23 | 24.1 | 87.6 | 77 | 79 | 79.7 | 82 | 79.4 | 00.0 |
| **LSD at 0.05** | 0.7 | 0.73 | 0.85 | 0.87 | | 2.08 | 1.99 | 2.38 | 3.03 | | |

**Sorgoleone structure:**

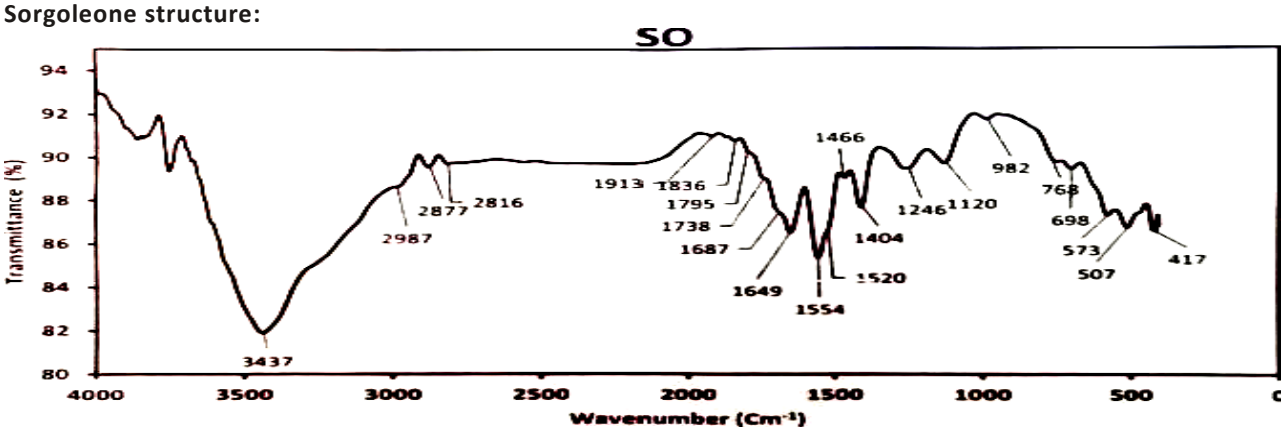


**Fig. 1**. Sorgoleone is a natural allelochemical produced by the roots of Sorghum bicolor for weed suppression Sorgoleone is multi-target including phtosystem Π inhibition, plasma membrane disruption and interference with root hair development (Pan, *et al.,* 2007; Baerson, *et al.,* 2008; Dayan *et al.,* 2009).

All extracts showed the presence of a hydroxyl (0 - H) functional group marked by the presence of a strong, broad peak centered around 3,300-3,200 $cm^{-1}$. The sorghum extracts displayed a weak. singl peak/shoulder at

approximately 3,010 $cm^{-1}$ Indicahve of an aromatic C - H functional group The sharp. strong peakk present in the spectra from 2,957 to 2,848 $cm^{-1}$ are representative of an aliphatic C- H functional group. Within the fingerprint region (1,800-450 $cm^{-1}$) (Hodges *et al.*, 2021).

***C. dactylon* Structure:**


**Fig. 2**. *C. dactylon* have various bioactive compounds that contribute to its allelopathic activity: Ferulic acid Vanillic acid, P. hydoxybenzoic acid, P. coumaric acid and other compounds.

These compounds (Ferulic acid Vanillic acid, P. hydoxybenzoic acid, P. coumaric acid and other compounds) are known to inhibit seed germination and seedling growth of various plant species (Kavitha and Arumugam, 2012). *C. dactylon* powder form, likely derived from a natural plant source demonstrates *a* broader range of peaks with unique characteristics, such as those around 1647 $cm^{-1}$ (indicating C=C stretching, suggesting alkenes or aromatic rings/ and 1738 $cm^{-1}$(C=0 stretching indicating carbonyl groups) This sample seems to contain a mix of plant-derived compounds, suggesting Its organic origin (Bristi, *et al*., 2024).

## DISCUSSION

Glyphosate (T1, T2) effectively suppressed dodder growth, with the highest dose (150 cc/fed) completely eliminating it, as confirmed by (Duke and Powles, 2008; Khan and Siddiqui, 2019). Sorghum bicolor extracts (T3, T4, T5) also showed strong efficacy, confirming their potential as natural herbicides. *C. dactylon* extracts (T6, T7, T8) had mixed results, with 15% concentration being the most effective. these results was consistent with (Muthukumar *et al.,* 2016) Combining glyphosate with plant extracts (T9, T10) enhanced control. These results agreed with (Vargas *et al.,* 2014) said that the Glyphosate herbicide [N-(phosphono methyl) glycine], inhibits the enzyme enol pyruvate shikimate-3-phosphate syntheses (EPSPS), which is a key enzyme in the biosynthesis of aromatic amino acids. Also, glyphosate will affect photosynthesis indirectly by inhibit the biosynthesis of carotenoids, chlorophyllus, fatty acid and for amino acids (Fedtke and Duke, 2005). As found that (Khamare *et al.,* 2022) about 90% of compounds present in the root exudates (Czarnota *et al.,* 2003). Sorgoleone has been characterized as a potent bioherbicides as it can suppress many weed species. *C. dactylon* foliage contained the following phenolic acids: caffeic, ferulic, coumaric, benzoic, vanelic, chlorogenic and cinnamic. So, influence of the water wastes extracts of *S. bicolor* and *C. dactylon* as two weeds beside glyphosate herbicide (comparison treatment) were studied on controlling the dodder (*Cuscuta campestris* L) with clover crop (*T. alexandrinum*) under field conditions. The untreated control (T11) had the highest dodder growth, while the dodder-free treatment (T12) had none. As confirmed by (Marrs and Harper, 1985). Tables indicate that glyphosate and Sorghum extracts effectively control dodder, while *C. dactylon* extracts show variable effects. Combining herbicides with plant extracts may enhance control. These results are in agreement with those obtained by (Liu *et al.,* 2015; Ali and Ahmad, 2021; Hussain, 2021; Abdallah and El-Shahat, 2022;) Multidisciplinary strategies that utilize sorghum plants for weed control can represent a promising alternative, thanks to their secondary metabolites, which may be used in the development of new herbicides through the action of aqueous extracts. These extracts can be applied alone or in combination with half the recommended herbicide dose to help preserve the environment and reduce pesticide pollution. The dodder-free treatment showed the highest leaf/stem ratio and plant height, while glyphosate reduced yield. As found (Vargas *et al.,* 2014). Sorghum extracts improved plant growth more than *C. dactylon* extracts.

Finally, using plant extracts is a promising alternative, and combining them with low-dose glyphosate may balance dodder control and crop yield as confirmed by **(**Liu *et al.,* 2015; Ali and Ahmad**,** 2021**)**. The dodder-free treatment (T12) had the highest fresh forage yield, with Sorghum extracts (T3, T4, T5) also showing high productivity as said (Yuvraj *et al***.,** 2022). Glyphosate (T1, T2, T9, T10) effectively controlled dodder but reduced yield as found **(**Fedtke and Duke, 2005; Vargas *et al.,* 2014). The tallest plants were recorded in the dodder-free treatment, followed by Sorghum extracts, while Glyphosate resulted in shorter plants.

## CONCLUSION

Glyphosate at high concentrations was highly effective in eliminating dodder but had negative effects on crop growth and yield. *S. bicolor* extracts showed strong efficacy in reducing dodder and enhancing plant growth, making them a promising natural alternative. *C. dactylon* extracts produced variable results, with the best performance at 10% concentration. Combining glyphosate with plant extracts improved control efficiency while minimizing negative impacts. The dodder-free treatment achieved the highest yield and plant height. Overall, using plant extracts alone or in combination with low-dose glyphosate offers an effective and sustainable solution for dodder management.

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# تأثير المستخلصات المائية لنباتي السورجم (*Sorghum bicolor*) النجيل البلدى (*Cynodon dactylon*) ومبيد الحشائش جليفوسات على مكافحة حشيشة الحامول (*Cuscuta campestris*) في البرسيم المصري (*Trifolium alexandrinum*)

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تم تنفيذ تجربتين حقليتين في مزرعة محطة البحوث الزراعية بمنطقة سخا، محافظة كفر الشيخ، خلال موسمي الشتاء 2023/2022 و2024/2023. هدفت الدراسة إلى تقييم أداء المستخلصات المائية لنباتين من الحشائش كل على حدة أو عند خلطهما بمبيد الحشائش جليفوسات في مكافحة حشيشة الحامول، باعتبارها حشيشة طفيلية كلية على نبات البرسيم المصري.

أظهرت النتائج أن المستخلصات المائية لنبات السورجم بتركيزات 5%، 10%، و15%، وكذلك خلط السورجم بتركيز 10% مع مبيد جليفوسات بتركيز 48% بمعدل 50 سم³/فدان، تعتبر معاملات واعدة في مكافحة سيقان الحامول المصابة للبرسيم المصري، بالإضافة إلى تعزيز صفات النمو الخضري لنباتات البرسيم. أما المستخلصات المائية لنبات النجيل البلدى بتركيزات 5%، 10%، و15%، سواء منفردة أو مخلوطة مع جليفوسات بتركيز 48% بمعدل 50 سم³/فدان، فلم تكن فعالة بالقدر الكافي في مكافحة سيقان الحامول، رغم تسجيل بعض التحسن في الصفات الخضرية لنباتات البرسيم. علاوة على ذلك، فإن استخدام مبيد جليفوسات بتركيز 48% بمعدلي 100 و150 سم³/فدان أظهر فعالية جيدة في مكافحة سيقان الحامول، ولكنه تسبب في انخفاض طفيف في الصفات الخضرية لنباتات البرسيم.

تسلط هذه الدراسة الضوء على إمكانية استخدام المواد الأليلوباثية كمصادر لآليات جديدة في مكافحة الحشائش، وتدعم أساليب الإدارة المستدامة للحشائش إلى جانب المبيدات الموصى بها.

الكلمات المفتاحية :*جليفوسات*، *Sorghum bicolor, Cynodon dactylon*، المستخلص المائى، حشيشة الحامول، البرسيم