

Influence of Chemicals and Mechanical Control Methods on Parasite Dodder (*Cuscuta planiflora*) Controlling in Clover (*Trifolium alexandrinum* L.) Crops

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ABSTRACT

The goal from these experiments were studied the effect of some chemical and mechanical methods of dodder weed control on the Egyptian clover field. The treatments comprised of spray pendimethalin herbicides (pre-emergence and after sowing) in three concentrations (500,700 and 900 ml/Fed.) and three times application (1, 3 and 7 DAS) followed by spray glyphosate alone after the first cutting in three concentration (50, 70 and 90 ml/Fed.) and three time application (7, 14 and 21 DAS), followed by, studies the influence of addition ammonium sulfate with (1%) on the impact of glyphosate against *C. planiflora* in Egyptian clover in relation to dose and time of application after the first cutting of Egyptian clover. Phytotoxic of application rates and treatment time of glyphosate on Egyptian clover after the first cutting were studied. Results it could be concluded that, use of pendimethalin at 7 DAS was safe for Egyptian clover *T. alexandrinum* emergence as compared to its application as pre-emergence at 1 and 3 DAS and also effective in reducing *C. planiflora* emergence. Moreover, increasing dose of pendimethalin from 500 to 900 ml/Fed. gave significantly decreased in the *C. planiflora* emergence but also caused phytotoxic to *T. alexandrinum* plants and reduced its population significantly. Using glyphosate herbicide at different doses were significantly affected the characteristic of dodder plants infested with clover crops. The fresh and dry weights of survival dodder plants were inversely related to the dose of herbicide. The higher the dose of herbicide used the more damage of dodder plants occurred. The mechanical methods -hand combing- management was the minimum effective in *C. planiflora* control with percent of reduction.

Keywords: chemical, pendimethaline, glyphosate, dodder, Egyptian clove, ammonium sulfate.

INTRODUCTION

(*T.alexandrinum* L.) is the main forage crops grown worldwide. Egyptian clover are extensively grown in irrigated regions through winter period Farah and Al-Abdul Salam, (2004). Dodder weed (*Cuscuta planiflora*), is known to be the major pest attacking the Egyptian clover in Egypt. Most dodder seeds germinate from March to May, one to three years after burial in the soil. Cudney *et al.*, (1992) dodder is capable to cause the most intensive damage in newly formed perennial legume (clover or alfalfa) crops, which are the most frequent targets of dodder parasitism Dawson *et al.*, (1994). Destruction done in these crops involves generally of decreased fresh biomass to crop alfalfa, which may be reach to more than 50% dodder and decreased in seed production by more than 50% of alfalfa. The control of dodder is very major in increasing the quality of alfalfa and yield, and approaches included preventive measures against contamination (Tepe, 2014). Until now there is no clear stratagem in the control of dodder weed. Only traditional or old methods are usually used by the farmers such as herbicides, solarization, trap, resistant varieties and catch crops or cultural methods (distance between plants, sowing delayed etc). Burning is usually used in the case of heavy infestation. Chemicals are used successfully to control dodder plants in some border countries. The flaming and mowing able to management dodder as cultural methods, but these practices have the potential to injure the crop and decrease yield Cudney *et al.*, (1992). Field dodder controlling could be succeeded using combined, chemical, mechanical, cultural and preventive methods that aim at control of existing populations prior to seed production to avoid further dispersal of seeds. Chemical control is the utmost intensively studied method of dodder managements Parker, (1991). Glyphosate can selectively control dodder at rates of 0.075 to 0.150 kg ai/ha in alfalfa Dawson, (1989). The field work described in this study is an attempt to through some light on some chemical method on dodder control moreover the factors which govern the effect of time of application and

different concentrations of pendimethaline and glyphosate on the behavior of dodder weed when the plants growing together with foliage crop (*T. alexandrinum* L).

MATERIALS AND METHODS

Field experiments were conducted at a farmer's field in Faculty of Agriculture Al-Azhar University branch Assiute during successive season 2018, to study the influence of two herbicides (pendimethalin and glyphosate) in field dodder control and its impact on (fresh, dry and length plant) of Egyptian clover cultivars. Other than weed control, usual agriculture practices were done according to Ministry of Agriculture recommended in all the trials. Before sowing of Egyptian clover, fifteen *Cuscuta* seeds/m² were uniformly published adjacent the soil surface (2-3 cm depth) in each plot (Except in *Cuscuta* free plots). The *Cuscuta* free as control and *Cuscuta* infested were also kept for comparison. Egyptian clover (cv. Vardan) was sown by distribution in the first week of October during the year with a seed rate of 30 kg/ha. The amount of water required to provide sufficient spray liquid was found to be 200 liters/fed. The herbicides, glyphosate (Roundup 48%) and pendimethaline (Stomp 0.36%) were sprayed with knapsack sprayer. Number of *C. planiflora* and clover emerged/m² were recorded at 30 days after sowing (DAS). Except *Cuscuta*, all the weeds were removed from the plots by hand combing as and when required. The first cutting was ready at 60 DAS and following two cuttings were done at 30 days intervals when the crop attained the height of around 45 cm from the ground. The cuttings were applied at about 5-7 cm height for well quick growth. A sample of ten plants from dodder and ten plants from clover plants were collected at random from each plot to estimate some of growth characters. The characters which were estimated were: characters (plant length, fresh weight, dry Weight and number of branch). Phytotoxic symptoms on plants were recorded in one week after application of chemicals. Observations for the specific parameters like chlorosis, necrosis, wilting, vein clearing, leaf scorch and redness of

leaf margin were taken using the scale 0: 0-00, 1: 1-10, 2:11-20, 3: 21-30, 4: 31-40, 5: 41-50, 6: 51-60, 7: 61-70, 8:71-80, 9: 81-90, 10: 91-100. Also, phytotoxicity symptoms were recorded under field conditions Venkatarao, (2017). The total fodder yield contains the weight of *Cuscuta* vines as it was hard to remove it from the host plants. In this study certain treatments were used as follows:

- 1-Control (Egyptian clover were infection with *Cuscuta* and not controlling).
- 2-Control or healthy plants (Egyptian clover were not infection with *Cuscuta*).
- 3-Spraying pendimethalin herbicide with three concentrations (50, 70 and 90 ml/Fed.) after sowing and pre – emergence of Egyptian clover and three timing of application 1,3 and 7 days.
- 4-Glyphosate was applied after the first cutting by hand sprayer at three concentrations (50, 70 and 90 ml/Fed.) and three timing of application (7, 14 and 21 days after the first cutting).
- 5-Synergism of glyphosate by addition ammonium sulfate (1%) and Spraying with three concentration of glyphosate (50, 70 and 90 ml/Fed.) and three timing of application (7, 14 and 21 days after the first cutting) by hand sprayer.
- 6-Hand combing (*Cuscuta* removing by hand)
- 7- Phytotoxic of application rates and treatment time of glyphosate on Egyptian clover after first cutting.

The analysis of variance was used for the two experiments (using MSTAT-C) according to Snedecor and Cochran, (1982).

RESULTS AND DISCUSSION

1. Effect of application time and treatment rates of pendimethalin (after sowing and pre-emergence) on emerged number of *Cuscuta* and Egyptian clover.

Results in Table (1) show that, treatments of pendimethalin at 7 DAS was harmless for Egyptian clover *T. alexandrinum* emergence as compared to its application as pre-emergence at 1 and 3 DAS and also successful in decreasing *Cuscuta* emergence. Moreover, increasing dose of pendimethalin from 500 to 900 ml/Fed. produced significantly reduced the *Cuscuta* (*C. planiflora*) emergence but also caused phytotoxic to *T. alexandrinum* crop and reduced its population significantly. These results were fully supported by Mishra (2012) mentioned that, rising concentrations of pendimethalin from 500 to 1000 ml/ha did not appearance affected on the clover plant population, but irrespective of the pendimethalin doses, there was around 50% reduction in clover population as compared to untreated control because of the phytotoxic effect of pendimethalin when applied as pre-emergence

and at 7 DAS. *Cuscuta* emergence decreased significantly with increase in pendimethalin doses. The high emerged number of Egyptian clover at 7 days were 372,305 and 197 while the high emerged number of *Cuscuta* were 110, 62 and 43 for 500,700, and 900ml/Fed. respectively.

Table 1. Effect of application time and treatment rates of pendimethalin (after sowing and pre-emergence) on emerged number of *Cuscuta* and Egyptian clover emerged/m² at 30 DAS.

Time of application (DAS)*	Egyptian clover						Cuscuta		
	Treatments rates								
	500 ml/Fed.	700 ml/Fed.	900 ml/Fed.	500 ml/Fed.	700 ml/Fed.	900 ml/Fed.	500 ml/Fed.	700 ml/Fed.	900 ml/Fed.
1	150	120	90	40	30	20			
3	230	180	153	87	53	32			
7	372	305	197	110	62	43			
Control		70			280.3				
Healthy plants		400			0				

*DAS = days after sowing and pre-emergence.

1. Effect of pendimethalin herbicide concentrations on fresh and dry weight on dodder weed g/m² (after sowing and pre emergence by 7days).

Data in table (2) show the effect of pendimethalin herbicide treatments on fresh and dry weight of Egyptian clover dodder at 15, 30 and 45 days after treatments. The data revealed that the *C. planiflora* was very sensitive to pendimethalin herbicide. All tested concentrations from pendimethalin herbicide caused deleterious effects to *C. planiflora*, but the concentrations differed in these effects. The concentration 900 ml from pendimethaline was superior and the most effective treatments used on dodder followed by 700 and 500ml when used as a spray application (after sowing and pre emergence by 7days). These concentration recorded the highest control after 45 days for fresh weight and dry weight. General average in fresh weight and dry weight were (504.5 and 91.9), (605 and 99.5) and (691.8 and 119.7) to 900,700 and 500 ml/Fed. compared with control (391.8 and 556.7), respectively.

In other hand, the mechanical methods -hand combing- management was the minimum effective in *C. planiflora* control with percent of reduction for fresh weight and dry Weight 3970.2 and 556.7, respectively in compared with control treatment. These results are in agreement with that of Liu *et al.*, (1990) mentioned that, pendimethalin inhibited the cells of germinated *Cuscuta* seedlings and the percent of reduction data of *C. planiflora* were only slightly affected by the hand combing treatment when compared with other experimented herbicides. Therefore, management *C. planiflora* by hand combing was not enough to control *C. planiflora* weeds.

Table 2. Effect of pendimethalin herbicide treatment on dry and fresh weight on dodder weed g/m² (after sowing and pre emergence by 7 days).

Treatments	15 Days		30 Days		45 Days		General average	
	F.W.	D.W.	F.W.	D.W.	F.W.	D.W.	F.W.	D.W.
900 ml/Fed.	580.3	61.2	427.8	91.2	505.4	123.3	504.5	91.9
700 ml/Fed.	698.7	68.3	423.9	97.6	693.5	132.5	605.4	99.5
500 ml/Fed.	763.8	83.6	501.2	117.8	810.4	157.8	691.8	119.7
Hand combing	2138	301.6	23202.1	187.6	3050.4	307.3	9463.5	265.5
Control	3241.5	478.6	3862.3	573.2	4806.7	618.2	3970.2	556.7
Healthy plants	0	0	0	0	0	0		

F.W. =Fresh weight D.W. = Dry Weight

2. Effect of pendimethalin treatments on some growth characters of Egyptian clover (*T. alexandrinum* L.) g/m² (after sowing and pre emergence by 7 days).

Data shown in table (2) effect of three concentrations from pendimethalin on dry weight and plant length at 60, 90 and harvest days (after sowing and pre emergence by 7days). All tested concentrations from pendimethalin increased the dry weight and plant length as compared to the control treatment. General average in plant high and dry weight were (82.1 and 4.3), (75.1 and 3.3) and (68.7 and 3) to 900,700 and 500 ml/Fed. compared with control (51.8 and 1.3), respectively. The

hand combing management was the least effective in *C. planiflora* control with percent of reduction for fresh weight and dry Weight 57.8 and 2.1, respectively in compared to the control treatment. This increasing in dry weight under the infested control treatment might be attributed to the negative effect of different weeds on Egyptian clover plant growth which may be occurred as a result of the competition between Egyptian clover plants and weeds. These results are similar with that obtained by Soliman, (2002) he reported that parasitic weed not only deprives the host plants of nutrients but also inhibits growth.

Table3. Effect of pendimethalin control treatments on some growth characters of Egyptian clover (*T. alexandrinum* L.) g/m² (after sowing and pre emergence by 7days).

Treatments	60 Days		90 Days		At harvest		General average	
	P.H. (cm)	D.W. Plant	P.H. (cm)	D.W. Plant	P.H. (cm)	D.W. Plant	P.H. (cm)	D.W. Plant
900 ml/Fed.	53.3	0.45	81.7	5.7	111.3	6.8	82.1	4.3
700 ml/Fed.	47.1	0.4	79.8	4.3	98.5	5.1	75.1	3.3
500 ml/Fed.	43.6	0.4	71.2	3.8	91.3	4.8	68.7	3
Hand combing	38.7	0.29	61.6	2.59	73.2	3.4	57.8	2.1
Control (infested)	35.1	0.21	55.4	1.41	64.9	2.4	51.8	1.3
Healthy plants	60.5	0.51	94.6	6.2	117.2	7.6	90.8	4.8

D.W. = Dry Weight P.H. =Plant High

2. Impact of glyphosate against *C. planiflora* in Egyptian clover in relation to dose and time of application after the first cutting of Egyptian clover.

Table (4) shows that using glyphosate herbicide at different doses were significantly affected the characteristic of dodder plants infested with clover crops. The fresh and dry weights of survival dodder plants were inversely related to the dose of herbicide. The higher the dose of herbicide used the more damage of dodder plants occurred. Application of glyphosate at 7 and 14 DAS were significantly affected the characteristic of dodder plants infested with clover crops. In spite of, unaffected on characteristic of dodder plants infested at 21 DAS in all concentrations.

Table 4. Impact of glyphosate herbicide against *C. planiflorain* Egyptian clover in relation to dose and time of application after the first cutting of Egyptian clover.

Concentration of glyphosate ml/Fed.	A.P (Days)	F.W. g/plant	D.W. g/plant	L.P. (cm)	N.B. g/plant
50	7	0.65	0.1	15.3	8.6
	14	0.73	0.21	22.5	10.3
	21	2.0	1.3	8.5	2.4
70	7	Zero	Zero	18.3	6.2
	14	0.39	0.13	31.2	6.9
	21	2.2	1.2	8.4	2.3
90	7	Zero	Zero	22.3	5.6
	14	0.149	0.063	36.4	7.1
	21	2.3	1.4	8.6	2.1
Control (infested)		2.1	1.3	8.6	2.3
Healthy plants		-	-	83.2	13.6

F.W. =Fresh weight N.B=Number of branches

D.W. = Dry Weight L.P=Length of Plant

A.P= Age plant after second cutting and appearance dodder in winter

These results were fully supported by Fer, (1983) who reported that using glyphosate high dose was more effect on dodder live plants. Plant height and branch

numbers of clover plants were significantly reduced as the dose of herbicide increased. Also, the time application had a high significant effect on dodder dry Weight, fresh weight, number of branches and length of plant. The fresh weight of dodder plants infested at 7 days after spraying was significantly higher than those treated 14 days durations. Salim,(2011) who reported that glyphosate at 75-150 g/ha and its analong sulfosate (touch-down) control dodder directly and through their systematic movement within the host phloem system. He added that glyphosate can be applied to clover after dodder cutting. Different doses and application of glyphosate used in Egyptian clover Abd-El-Hamid and Shebl, (2000). In contrast our resulting Dawson and Saghir,(1983) they found that the duration time of herbicide application was more effective on the control of dodder particularly 20 days after infestation on clover.

3. Influence of addition ammonium sulfate with (1%) on the impact of glyphosate against *C. planiflora* in Egyptian clover in relation to dose and time of application after the first cutting of Egyptian.

Data presented in table (5) showed that, application of glyphosate with ammonium sulfate with (1%) significantly increased the impact of glyphosate against *C. planiflora* in Egyptian clover than glyphosate alone, in all dose and all time of application after the first cutting of Egyptian clover. This results are in agreement with those of Singh and Sharma, (2001) stat that, the application of ammonium sulfate with glyphosate, significantly increased weed control compared to glyphosate alone. Moreover, the enhancement in bio efficacy depends on both the weed species and the type of the adjuvant. An increase of herbicide ability on perennial horse nettle (*Solanum carolinense* L.) with the addition of ammonium sulfate to glyphosate was also decided by Plineet *al.*, (2000). Glyphosate is often applied with

ammonium sulfate in order to reduce water hardness and enhance herbicide activity De Ruiter *et al.*, (1996) more specifically, common cations, form salts that are not readily absorbed by plants and bind strongly to glyphosate negatively charged molecules, Thelen *et al.*, (1995).

Table 5. Influence of addition ammonium sulfate with (1%) on the impact of glyphosate against *C. planiflora* in Egyptian clover in relation to dose and time of application after the first cutting of Egyptian.

Concentration of glyphosate	A.P (Days)	F.W. g/plant	D.W. g/plant	L.P. (cm)	N.B. g/plant
50 ml	7	0.41	0.01	9.1	6.4
	14	0.56	0.1	15.5	8.2
	21	2.2	1.4	8.9	2.3
70 ml	7	Zero	Zero	Zero	Zero
	14	0.21	0.01	12.2	4.9
	21	2.0	1.1	8.4	2.5
90 ml	7	Zero	Zero	Zero	Zero
	14	Zero	Zero	Zero	Zero
	21	2.0	1.3	8.9	2.4
Control (infested)		2.1	1.3	8.6	2.3
Healthy plants		-	-	83.2	13.6

F.W. = Fresh weight N.B.=Number of branches

D.W. = Dry Weight L.P.=Length of Plant

A.P= Age plant after second cutting and appearance dodder in winter

4. Phytotoxicity of application rates and treatment time of glyphosate on Egyptian clover after first cutting.

Data in table (6) showed that, phytotoxic symptoms on Egyptian clover were seen to redness of leaf margin after application of concentrations (50, 70 and 90 ml/Fed.) at 7 DAS in all concentrations and 14 days in concentrations 90 ml/Fed. Only but this phytotoxic none significantly compare with control. The leaf scorch was founded after application of concentrations (70 and 90 ml/Fed.) at 7 DAS in the two concentrations and 14 days in concentrations 90 ml/Fed. only. The symptoms' chlorosis, necrosis, wilting and vein were not founded in any combination treatments. The leaf scorch was founded at 0.1 for 70 ml only in the same time were, 0.3 and 0.1 for 90ml at 7 and 14 days, respectively. Redness of leaf margin was founded at 0.1 for 50 and 70 ml at 7 days, moreover Redness of leaf margin were 0.3 and 0.1 for 90ml at 7 and 14 days, respectively. This results are in agreement with those of Salim (2011) decided that glyphosate produced a clear damage on dodder plants where as clover plants did not find any sign of damage had less effect on it. In general may be say that, the superiority of herbicide treatments might be attributed to lower weed competition as a result of eliminating weeds and their negative impact on crop plants. Moreover, the all treatments accorded the lowest plant length of Egyptian clover plant as compared to the healthy plant treatment.

Table 6. Phytotoxic of application rates and treatment time of glyphosate on Egyptian clover after the first cutting.

Concentration of herbicide ml/Fed.	A.T. (Days)	Chlorosis	Necrosis	Wilting	Vein	Leaf scorch	Redness of Leaf margin
50	7	-	-	-	-	-	0.1
	14	-	-	-	-	-	-
	21	-	-	-	-	-	-
70	7	-	-	-	-	0.1	0.1
	14	-	-	-	-	-	-
	21	-	-	-	-	-	-
90	7	-	-	-	-	0.3	0.3
	14	-	-	-	-	0.1	0.1
	21	-	-	-	-	-	-
Control		3	5	4	2	5	3
Healthy plants		-	-	-	-	-	-

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استخدام بعض الطرق الكيميائية والميكانيكية في مكافحة طفيل الحامول في محصول البرسيم

ربيع على إمام على

قسم وقاية النبات - كلية الزراعة - جامعة الأزهر بأسبوط

أجريت التجربة خلال الموسم الزراعي لمحصول البرسيم عام ٢٠١٨ لمكافحة نباتات الحامول كاحد الحشائش الرئيسية المتطفلة على نباتات البرسيم والتي تسبب خسائر كبيرة في الحقل. وإشتملت التجربة على أكثر من طريقة للمكافحة. الطريقة الميكانيكية وهي اقلها تأثيرا في مكافحة الحامول والطرق الكيميائية. ومن طرق المكافحة الكيميائية في التجربة هي رش مبيد استومب والمادة الفعالة له هي البنديمتالين قبل الانبات وبعد الزراعة بـ ٧،٣،١ أيام وثلاث تركيزات من المبيد وهي ٩٠٠،٧٠٠،٥٠٠ سم^٢ للفدان. أيضا استخدام مبيد راوند اب والمادة الفعالة له هي الجليفوسات ايزوبروبيل امونيوم بعد الحشة الاولى بفترات رش مختلفة وهي ٧، ١٤، ٢١ يوم من الحشة الاولى بتركيزات مختلفة وهي ٥٠، ٩٠، ٧٠ سم^٢ للفدان من مبيد الجليفوسات. كما تم اضافة كبريتات الالمونيوم بنسبة واحد في المائة للمبيد كعامل منشط لمبيد الجليفوسات مع نفس التركيزات السابقة مع نفس فترات الرش السابقة ايضا. فضلا عن المقارنة بالكنتروا وكذلك المقارنة بالاصابة بالحامول. واخيرا درست السمية النباتية لمبيد الجليفوسات على البرسيم. اوضحت النتائج أن مبيد الاستومب كان فعال في خفض الاصابة بالحامول وكان له تأثير على انبات البرسيم في التركيز العالي. مبيد الجليفوسات سبب تأثير واضح على الحامول ولم يكن له أي ضرر معنوي على البرسيم بعد الحش بـ ٧، ١٤ يوم ولم يكن له تأثير على الحامول اذا استخدم بعد الحش بـ ٢١ يوم كما ادى استخدام كبريتات الالمونيوم الى تنشيط مبيد الجليفوسات على الحامول.