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EFFECT OF DIFFERENT CONTROL METHODS ON *CUSCUTA CAMPESTRIS*, AND GROWTH AND PRODUCTIVITY OF EGGPLANT (*SOLANUM MELONGENA*)

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Abstract

A field experiment was conducted in Al-Qizuina district-province of Najaf during the 2017 growing season in order to control parasitizing dodder (*Cuscuta campestris*) on eggplants through increasing plant growth and inducing plant resistance using nutrients and herbicide. The experiment arranged within RCBD with three replicates. Results showed significant differences between treatments. Among all the treatments, Boric acid resulted in the highest values of leaf number, leaf area, plant height, fresh and dry weight of shoot and root, thickness of bark, epidermis and petiole cortex of the leaf, and shorter time to fruit maturity as well as no infection was detected. While, Na_2SiO_3 resulted in higher values of stem diameter, earliness in first flower formation and higher of fruit set, number of fruit per plant, fruit weight and plant productivity, early (13.84 $ton.ha^{-1}$)and total yield (69.24 $ton.ha^{-1}$). The herbicide Sulfosulfuron was effective to control dodder resulted in filaments decease and prevented its flowering compared to the mechanical control and the other infected treatments in which dodder not only reduced the eggplants vegetative growth but also affected the quality and quantity of early (5.82 $ton.ha^{-1}$) and total yield (44.39 $ton.ha^{-1}$). These results confirm the using of high efficient treatments in to control dodder which can be practically applied in the integrate management program of this pest.

***Key words*:** Dodder, boric acid, Na_2SiO_3, Sulfosulfuron, mechanical control.

Introduction

Eggplant (*Solanum melongena*) is the fifth most important crop in the solanaceae family from the economic point of view the tropical and subtropical regions (FAO, 2014). Its varieties have a very wide diversity in different form, sizes and colors (San José *et al*., 2016). In 2017 (KNOEMA) indicated that the global cultivated area of eggplant was estimated 1.793 million ha, with a productivity of 51,288 million tons. In Iraq the cultivated area was 8,356 thousand hectares, with a productivity of 102,452 thousand tons, which was significantly lower than the previous three-year average in which the cultivated area was 18,204 thousand hectares and average productivity of 363, 133 thousand tons. Eggplant is more exposed than other vegetable crops to many pests and diseases such as weeds (dodder, blady grass, purple panic-grass, and field bind weed) that affect production (Medakkerand Vijayaraghavan, 2007).

In Iraq, eggplant is considered as a most common plant of solanaceae, which is affected by *C. campestris*, and among farmers in Najaf, Karbala and Babylon *C. campestris* is known as dodder, cancer and troublesome weed because of its control difficulty, and involvement in yields reduction of the solanaceae. Dodder (*C. campestris*) has negative impacts on biomass of plant, carboxylation efficiency, CO_2-saturated rate of photosynthesis, thus imposing physiological stresses on host, leading to stunting, preventing flowering and fruiting, loss of yield, and sometimes death of the host plants (Nickrent and Musselman, 2010; Smith *et al*., 2013). Sulfosulfuron was effective in controlling field dodder with high selectivity in tomatoes (Goldwasser *et al*., 2012). But in Iraq there was no real control of it, due to the lack of knowledge, and the absence of selective herbicide to control dodder without damaging host plant (eggplant). Farmers need improved varieties for sustainable production to overcome bio-stress and eco-stress (Medakker and Vijayaragh-avan, 2007). The increase in production and quality of eggplant is directly proportional to the participation of nutrients (Fageria, 2005). Soil in Iraq has a degree of pH as high to reduce the absorption of mineral elements by plant is very low, so the process of foliar spraying for mineral elements to increase the efficiency of physiological processes in eggplant, and then increase of yield and quality (Husseinand Muhammed, 2017). Plant nutrients may have significance roles in stimulating plant defense mechanisms against dodder, or increasing tolerance (Farah, 2007).

The aim of the current study is to stimulate the growth and increase production in eggplant to prevent the growth and development of dodder and reduce its spread in field. To support an integrated dodder management program in order to improve plant health in eggplant fields in Iraq.

Materials and Methods

Diagnosis of *C. campestris*

C. campestris samples were collected from infected eggplant in Najaf, at the complete growth-stage (flowers and seeds). *C. campestris* was diagnosed the phenotypically by anatomical microscope according to the classification key suggested by Spaulding, (2013), and molecular diagnosis of *C. campestris* was recorded as a new strain at the National Center for Biotechnology Information (NCBI) under the new accession number (MG669312).

Experimental Procedure and Treatments

The experiment was performed during the summer agricultural season in month of March 2017 in a private farm in Kufa, located 18 km north of Najaf province in the Al-Qizuina region. Random samples of field soil were taken before planting and after planting, to estimate some of their chemical and physical properties (Table 1). The process of preparing the 250 m^2 field was carried out by removing the plant residues then soil was treated with a fungicide, and nematicide. The field was irrigated from the Euphrates river water by drip irrigation system two days before planting the transplants to humidify the soil. Transplants were planted in the experimental units on each side of the furrow, at a distance of 30 cm between plants and alternately, so that planting 8 transplant per experimental unit (2.5 m^2). The compound fertilizer (under plant lines) was added at rate of 100 g per experimental unit, and the eggplant was fertilized before flowering with 60 g per experimental unit of a mixture of DAP 200 kg and Urea 400 kg ha^{-1}, and during fruits setting 20 g of Urea per experimental unit were added. To reduce insects damages a Pheromone traps were distributed in the field. Eggplant cultivar was selected according to the recommendations of the directorate of agriculture in Najaf governorate. The brand name is a Barcelona hybrid produced by Semillas Fitó of Spain in 2014. Treatments were arranged in Randomized Complete Block Design (RCBD). Thus, the number of treatments were 9, in each of three replicates and the total number of experimental unit was 27. the treatments were as follows:

1- Foliar spray by Boric acid (H_3BO_3), the concentration was 100 ppm.
2- Foliar spray by Calcium chloride ($CaCl_2$), the concentration was 5000 ppm.
3- Foliar spray by Potassium sulphate (K_2SO_4), the concentration was 5000 ppm.
4- Foliar spray by Nitrogen (Urea $CO(NH_2)_2$), the concentration was 5000 ppm.
5- Foliar spray by Sodium silicate (Na_2SiO_3), the concentration was 500 ppm.
6- Foliar spray by herbicide (Sulfosulfuron $C_{16}H_{18}N_6O_7S_2$), the concentration was100 g ai ha^{-1}.
7- Control without treatment, mechanical control of Dodder (hand pulling).
8- Control without treatment, with Dodder.
9- Control without treatment, without Dodder.

Treatments of foliar spray and *C. campestris* (MG669312) infection on eggplant

On 15/4/2017; the growth stage of eggplant was 6-7 true leaves each treatments (Boric acid, $CaCl_2$, K_2SO_4, $CO(NH_2)_2$ and Na_2SiO_3) was mixed with Tween 20 (surfactant) at a concentration of 0.01% sprayed on plant at sunset on the experimental units according to each treatment. At 1/5/2017, the infection was implemented by a fresh weight of 5 g (Dry weight is 0.852 g) of dodder filaments on eggplant. Three weeks after infection the development of the mechanical control treatment was applied on dodder, and the foliar spray of Sulfosulfuron treatment was performed according to treatment. The experimental was concluded in 1/10/2017.

Data Collection

Vegetative growth indicators. Randomly selected three plants from each experimental unit for each treatment and marked to measure their vegetative indices (after the third fruit harvest).

Number of leaves (leaf.plant^{-1}): The number of leaves per plant at harvest was calculated.

Leaf area (dsm^2.plant^{-1}): The leaf area calculation according to Watson and Watson, (1953).

Anthesis of first flower in 50% of plants of the plot (day): The number of days after planting was calculated until the anthesis of first flower has been recoded for 50% of plans per experimental unit.

% Fruit set: Fruit set calculated from the following equation:

% Fruit set = (Number of flowers set / Total number of flowers) × 100

Yield indicators: The harvest was carried out every 5 - 7 days, start of the harvest was on 20/5/2015 and the final harvest was on 28/9/2017. However the number of fruits picking were eighteen for the whole season therefor the experiment was concluded on 1/10/2017.

Days to pick first fruit (day): This was recorded by the time limited from the date of transplanting to the first picking date of fruit.

Number of fruits (fruit.plant^{-1}): This was calculated by dividing the total number of fruits of experimental unit on number of plants.

Average of weight of fruit (g): This was calculated by dividing the total weight of fruits per experimental unit on the number of fruits per experimental unit and then the mean was calculated.

Productivity of plant (kg.plant^{-1}): This was calculated by dividing the total fruit yield of each experimental unit on the number of plants and then the mean was calculated.

Early Yield (ton.ha^{-1}): The amount of early yield was calculated by the total of first three picks per experimental unit, and then according to the hectare was estimated.

Total Yield (ton.ha^{-1}): The amount of total yield was calculated by the total yield of picks per experimental unit, then according to the hectare was estimated, using to the following equation.

Total yield (ton.ha-1) = the yield of experimental unit (ton) × 10000 m^2 .ha^{-1}/the area of experimental unit (m^2)

Unmarketable Yield (ton.ha^{-1}): The unmarketable fruits were including fruit was not identical to the variety where fruit was distorted (small size and brown colour), and then according to the hectare was estimated.

Plant height (cm): It was measured for the main stem from soil surface to apical of the longest productive branch by measuring tape.

Stem diameter (cm): This was measured by using the Vernier at a height of (5) cm from the soil surface of the main stem of plant of each randomly selected plants and then the mean was calculated.

i. Dry weight of vegetative part and root part (g.plant^{-1})

ii. Dry weight of vegetative part and root part was estimated using the oven device, according to Al-Sahaf, (1989b) and then the mean was calculated.

Anatomy of Eggplant

Bark thickness (cm): The stem bark consists of several layers are periderm and remnants of primary epidermis, cortex, cork cambium and phloem (secondary phloem). The removal of the bark using anatomy blade at a height of 10 cm from the soil contact point of the main stem of plant of each selected plants. This was done by using Vernier and then the mean was calculated.

Epidermis thickness and Cortex thickness (µm): The petiole of leaf was dissected according to Al-Naamani, (2012). It was use a compound microscope type of Krüss under the magnification 3-4.5X with 4X in AmScope MD35 USB digital camera microscope was used.

%Infection ratio: After the third harvest, this infection ratio was calculated from the following equation (Number of infected plants/ Total number of plants) × 100

Statistical analysis

Data were analyzed using the ANOVA procedure in the by Statistical Analysis Software "SAS/STAT" (2012). The means were compared according to Least Significant Difference (LSD) at 0.05 probability level, according to the method described by Gomez and Gomez, (1984). To confirm the findings, the experiment was repeated once, but only the first experiment data presented because there were no significant differences between each pair of experiments ($P > 0.05$) using t-test.

Results and Discussion

It is noticeable that mechanical control (hand pulling) of dodder (*C. campestris* MG669312) was not effective as those pulled filaments were able to reinfection the eggplants. Results (Table 2) showed that treatments of boric acid, control without dodder, Sulfosulfuron, Na_2SiO_3, urea and $CaCl_2$ resulted in the higher average of number of leaves per plant and leaf area, respectively.The treatments of control with dodder and the mechanical control had the highest average number of days to the first flower anthesis in 50% of the plants with the lowest percentage of fruit setting compared to treatment of Na_2SiO_3, which had the lowest average number of days of the first flower anthesis and the proportion of fruits. The treatments of Sulfosulfuron and control without dodder showed an increase in the number of fruits and the plant yield. Boric acid was superior to the rest of the other treatments with the lowest number of days for the first fruit pick. The Na_2SiO_3 treatment had the highest number of fruits per plant, average of fruit weight and plant yield.

Boric acid, Na_2SiO_3, Sulfosulfuron and control without dodder resulted in an increase of early and total yield and the lowest unmarketable yield in their plants compared to other treatments (Table 3). The treatment of Boric acid and Sulfosulfuron had the highest dry weight of shoot and root systems and plant height, while $CaCl_2$ and Na_2SiO_3 were the highest in plant stem diameter. $CaCl_2$, K_2SO_4 and Urea have increased the thickness of epidermis, cortex and phloem tissues of their plants (Figure 1), while the same traits were at the highest values in the treatment of Boric acid and Na_2SiO_3, respectively. Plants in treatments of Na_2SiO_3, Urea, K_2SO_4, and $CaCl_2$ had low infection incidence (Table 4).Also, infection was not detected in treatments of Boric acid, control without dodder and Sulfosulfuron. This shows the efficiency of pesticides in the control of dodder. However, treatment of Boric acid was also effective in reducing dodder infection and spread.

As show in table (2, 3, 4) that most of nutrient minerals are in low availability to the plants so foliar application of nutrients is the vital practice to overcome high pH of soil. Foliar spray of Boric acid had a positive effect on the vegetative growth of eggplant which was indicated by the increase in the number of leaves, total leaf area and the low number of days for the anthesis of the first flower. This had an impact in increasing the percentage of fruit set and the speed of fruit maturity which was reflected by increasing yield quantity agreeing with findings of former studies (Abd El-Gawadand Osman, 2015). The foliar spray with boron has an effect on cell membrane integrity, in addition to its roles in the cell division, elongation and increase the number of cells (Brown *et al*., 2002; Dordas, 2008). There was an increase in the thickness of plant stem bark, and the cortex and epidermis of plant petiole. We believe that dodder could not infect the eggplant plants in this treatment may be due to the inability of haustoria to penetrate eggplant tissue as the boron increases the rate of callus and lignin deposition in the plant tissue forming a barrier wall which prevent dodder from permeation (Tighe and Heath, 1982; Nable *et al*., 1997; Werner *et al*., 2001; Camacho-Cristóbal *et al*., 2008), or due to some plant signals preventing dodder filament to attack Boric acid treated plant (Figure 1). The foliar spraying of $CaCl_2$ on eggplant has a clear effect on increasing vegetative growth and abundance of mineral elements in the plant tissues. This is because calcium is involved in regulation of various physiological processes by developing the root mass and thus increasing the absorption level of other mineral elements (Kowalska and Sady, 2012; Michałojćand Dzida, 2012). The foliar spray of calcium had a participation impact in enzymatic processes, which had a clear effect by increasing growth promoting hormones and consequently improve the quality and quantity of fruit production (Sharma *et al*., 1996; Bacha *et al*., 2017). The increase in thickness of stem bark, epidermis and cortex of the petiole was due to the increase in cell division and elongation (Kazemi *et al*., 2011) (Table 2, 3, 4 and Figure 1). The foliar spray of K_2SO_4 substantially increased plant shoot and root growth. Potassium has important roles in photosynthesis, enzymes activation and maintenance of turgidity in the cells (Marschner, 1995). The potassium foliar spray has a role in regulating the physiological processes and increasing the eggplant's vital activities, which had an effect on improving the quantity and quality of fruit production (Golcz *et al*., 2005; Fawzy *et al*., 2007). Faquin and Andrae (2004), noted that potassium has a role in influencing water relations, thickening the cell wall, controlling stomatal opening and closing and providing plant resistance to pests and dehydration. All this has a positive reaction in increasing the thickness of stem bark, epidermis and cortex of the petiole which resulted in reducing the infection ratio (Table 2, 3, 4, and Figure 1). Nitrogen is the main component of amino acid synthesis and chlorophyll in the plant, so the foliar spraying of nitrogen was effective in increasing vegetative growth and eggplant yield quantity andquality as was found in former studies (Bozorgi, 2012; El-Nemr *et al*., 2015). Many scientists and farmers recommend the foliar application of nitrogen to compensate nutrition deficiency and activate enzymes in plant, and this explains the eggplant yield quantity and quality improvement (Villora, 1998). Nitrogen is an effective component in improving the efficiency of photosynthesis, energy transfer and respiration (Grant *et al*., 2001). The higher levels of nitrogen in the plant tissue led to increased cell division and elongation, which resulted in more thickness of the stem bark , epidermis and cortex of the petiole which led consequently to reduced dodder infection incidence (Ingle, 2000) (Table 2, 3, 4, and Figure 1). Sodium silicate (Na_2SiO_3) foliar spraying had a significant effect on increasing several vegetative traits and quality and quantity of eggplant production (Hussein and Muhammed, 2017). Rodrigues *et al*. (2004) noted that silicon has an important role in increasing the synthesis of lignin and callose, this may explain the low of infection rate in eggplant. This study, increase in thickness of stem bark, epidermis and cortex of the petiole were also detected due to silicon foliar spray. This is because silicon can form a physical barrier in the form of amorphous silica and opal phytoliths on the cells' walls, which increases the elasticity of cell wall and cell membrane integrity of the plant tissue (Kvedaras *et al*., 2009). Increases in the thickness of stem bark, epidermis and cortex of the petiole were also detected due to silicon foliar spray. This is because silicon can form a physical barrier in the form of amorphous silica and opal phytoliths on the cells' walls, and thus helps in the expansion of the plant tissue (Mateos-Naranjo *et al*., 2013) (Table 2,3,4, and Figure 1).

In the treatments of control with dodder and mechanical control, plants infected with dodder were highly affected and showed a significant reduction of vegetative growth. This is because dodder affected photosynthesis and Carboxylic efficiency and CO_2 saturation rate in photosynthesis resulting in physiological stress on eggplant (Shen *et al*., 2005). This caused reduction in quality and quantity of eggplant production, as confirmed by previous studies (Nickrent and Musselman, 2010; Smith *et al*., 2013) (Table 2, 3, 4 and Figure 1). Because of the absence of the infection, eggplant in the control without dodder treatment was physiologically and biologically stabilized. However, the reduction of some indicators of plant morphological characteristics in eggplants was due to the absence of a metabolic stimulator compared to the boric acid treatment (Durrant and Dong, 2004) (Table 2, 3, 4 and Figure 1).

In the figure (2) the mechanical control treatment, the removal of dodder's filaments manually (hand pulling) will cause injuries in plant tissue, which will be more vulnerable to be attacked by pests and pathogens. This controlling method can cause a hole or a slit with a length of 198.90-223.60µm in the eggplant epidermis and cortex. Moreover, this method increases the spread of dodder's filaments and reinfection. Current study revealed that mechanical control treatment was not effective as dodder was always able to re-infect the plants. It was noticed that 5-10 cm of dodder filament is capable of causing injury and restore its vitality on the host plant (Parker and Riches, 1993) (Table 2, 3, 4 and Figure 2).

In the figure (3), the effect of the herbicide (Sulfosulfuron) used in this study on dodder's filaments were dried and unable to form flowers. Also, we noticed differences in filament vitality between the herbicide treated dodder and the non-treated. Presence of the sticky substance was observed on the healthy filament but not on the dried filament due to herbicide treatment. Spraying Sulfosulfuron herbicide on eggplant to controlled the dodder infection. As sulfosulfuron accumulated at the top end of dodder's filament (Liu *et al*., 1991) and affects the accumulation of a-Ketobutyrate thus disrupts the transmission of photosynthesis and respiration products and stimulates phytoalxin production (Zhou *et al*., 2007; Das, 2013). The control of dodder by the herbicide was effective and resulted in balance of various vital activities, which led to stability in shoot and root growth and total productivity (Goldwasser *et al*., 2012) (Table 2,3,4, and Figure 3).

Conclusion

Results of current study showed the negative effects of dodder infection of eggplant and the great reduction in vegetative and reproductive indices. However some nutritive treatments were able to control the dodder infection and profile ration such as boric acid and sodium silicate. According these two chemicals could be used instead of any herbicide to control dodder in eggplant field. Other treatments had affected dodder but didn't prevent infection and spreading. Mechanical control (hand pulling) which is widely used by farmer showed to be inactive to control dodder.

Table 1 : The chemical and physical properties of the field soil

Soil characteristics	Pre- Planting	The end of agriculture
$ECdS.m^{-1}$	2.43	2.39
pH 1:1	7.56	7.61
Na^+ $mmol.L^{-1}$	4.1	4.3
K^+ $mmol.L^{-1}$	1.91	1.37
Ca^{++} $mmol.L^{-1}$	2.9	2.6
Cl^- $mmol.L^{-1}$	20.1	19.81
$CO_3^-mmol.L^{-1}$	NiL	NiL
Mg^{++} $mmol.L^{-1}$	4.75	4.25
P ppm	2.1	1.92
N ppm	6.5	5.3
O.M %	2.98	2.19
Soil texture	Clay loam	Clay loam
Clay $g.Kg^{-1}$	68.9	68.4
Silty $g.Kg^{-1}$	20.3	19.5
Sandy $g.Kg^{-1}$	10.8	12.1

Table 2 : Effect of different treatments on (A)number of leaves (leaf.plant^{-1}), (B) leaf area (dsm^2.plant^{-1}), (C) first flowering in 50% of plants (day), (D) % fruit set, (E) Days to pick first fruit (day), and (F) number of fruit (fruit. plant^{-1}).

Treatments	A	B	C	D	E	F
Boric acid	53.00 *	101.50 *	44.30	96.66 *	59.60	13.9 *
$CaCl_2$	44.00 *	68.20 *	42.60	92.42 *	66.60	10.45
K_2SO_4	41.30	63.70	42.30	92.31 *	65.60	10.33
Urea	45.30 *	71.10 *	44.60	93.32 *	68.00	10.37
Na_2SiO_3	48.00 *	80.10 *	40.60	98.06 *	64.00	15.49 *
Sulfosulfuron	49.30 *	90.20 *	53.60	93.50 *	67.00	11.90 *
mechanical control	37.00	46.18	60.60	84.05	79.00 *	6.90
control with dodder	38.60	51.40	61.30	84.66	78.60 *	7.75
control without dodder	50.60 *	92.20 *	45.60	95.07 *	63.30	12.69 *
LSD (0.05) *	3.881	14.39	5.377	4.626	6,380	2.784
Mean Square	22.18247	206.1563	22.79792	40.43604	3814.434	1058.982933
F Value	415.84	2483.29	464.78	3912.29	63009.2	8827.41

(*) Treatment had significant meaning compared to treatments of control with dodder and mechanical control.

Table 3: Effect of different treatments on(G) average weight of fruit (g), (H) productivity of plant (Kg.plant^{-1}), (I) early yield (ton. ha^{-1}), (J) total yield (ton. ha^{-1}), (K) unmarketable yield (ton. ha^{-1}), and (L) dry vegetative weight (g.plant^{-1}).

Treatments	G	H	I	J	K	L
Boric acid	157.13 *	2.22 *	12.60 *	65.42 *	0.52	80.66 *
$CaCl_2$	171.17 *	1.78	9.58	56.76 *	0.81	63.33 *
K_2SO_4	153.82 *	1.52	9.26	57.73 *	0.85	65.66 *
Urea	170.75 *	1.73	8.10	54.52 *	0.80	69.02 *
Na_2SiO_3	186.50 *	2.73 *	13.84 *	69.24 *	0.60	70.66 *
Sulfosulfuron	155.67 *	1.94 *	11.15 *	60.72 *	0.61	72.33 *
mechanical control	134.27	0.93	5.82	44.39	1.52 *	46.33
control with dodder	137.22	0.95	6.79	46.90	1.54 *	45.66
control without dodder	163.65 *	2.04 *	12.07 *	64.25 *	0.55	76.33 *
LSD (0.05)*	10.300	0.983	3.447	3.175	0.0771	11.74
Mean Square	34.93410	1258151.28	126.675	90.7314	1.11855	2545.54417
F Value	1079.28	49926.6	255.72	89.90	233.56	1258.09

(*) Treatment had significant meaning compared to treatments of control with dodder and mechanical control.

Table 4: Effect of different treatments on(M) dry root weight (g.plant^{-1}), (N) plant height(cm), (O) stem diameter (cm), (P) epidermis thickness (µm), (Q) cortex thickness (µm), (R) bark thickness (cm), and (S) infection ratio in eggplants.

Treatments	M	N	O	P	Q	R	S
Boric acid	38.60 *	60.30 *	1.26	49.40 *	595.50 *	0.18	0.00
$CaCl_2$	31.66	46.00	1.34	37.10 *	557.90 *	0.14	49.96
K_2SO_4	33.59 *	46.30	1.24	34.90 *	583.80 *	0.16	39.26
Urea	34.01 *	48.60 *	1.20	46.70 *	570.50 *	0.16	38.86
Na_2SiO_3	34.64 *	52.00 *	1.40	49.30 *	594.20 *	0.17	22.16
Sulfosulfuron	35.03 *	54.30 *	0.93	29.80	529.40	0.11	0.00
mechanical control	26.68	41.60	0.92	28.90	527.10	0.10	88.86 *
control with dodder	25.33	42.30	0.92	29.30	526.60	0.10	94.43 *
control without dodder	36.03 *	57.00 *	0.93	29.70	530.20	0.11	0.00
LSD (0.05) *	5.828	6.147	0.721	3.880	4.180	0.099	18.080
Mean Square	237.4125	0.9966	1647.89	0.00323	56.2587	0.119	18382.2
F Value	3189.1	58.49	44578.3	185.12	228.91	52.65	138161

(*) Treatment had significant meaning compared to treatments of control with dodder and mechanical control. Except for the infection ratio, treatment is significantly higher compared to all the other treatments.

Figure 1: Anatomy of eggplantpetiole tissue with dodder and shows the effect of the treatments on thickness of epidermis and cortex in eggplant petiole tissues.

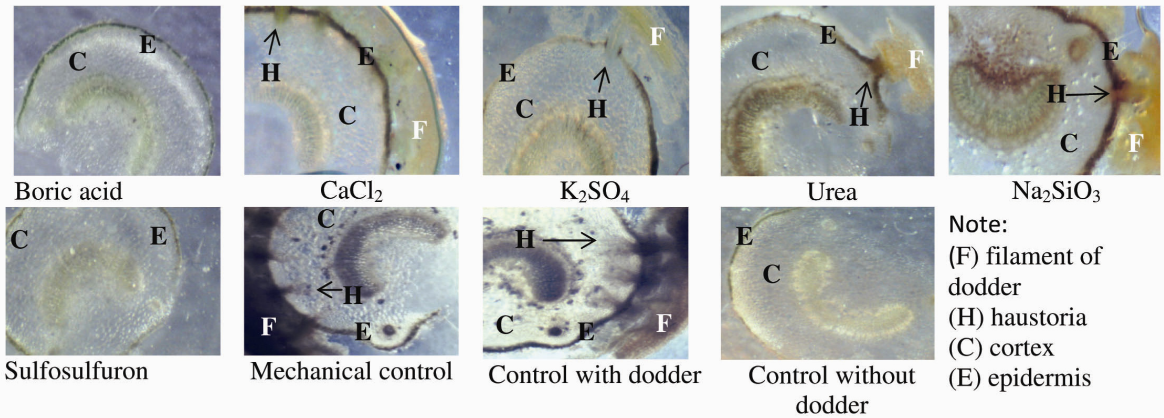
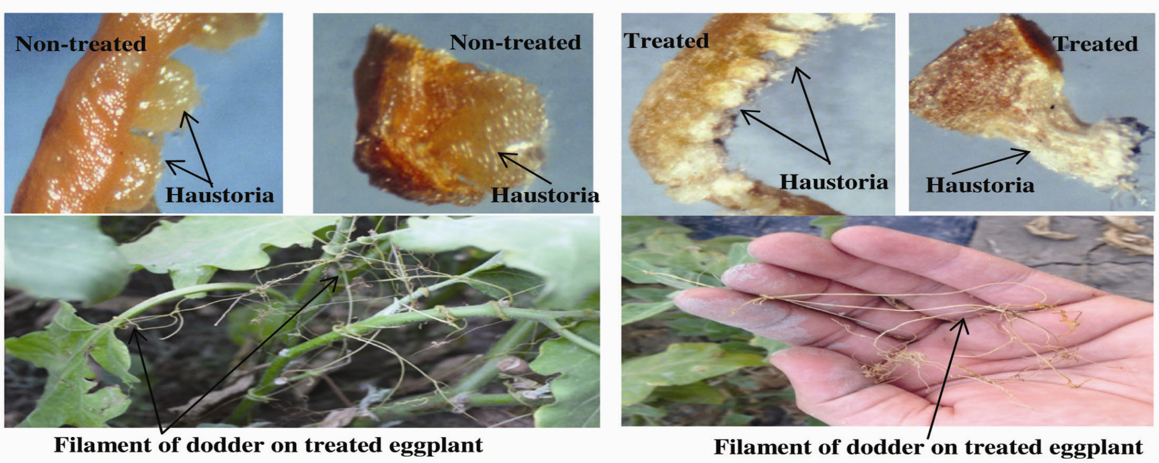


Figure 2: The effect of dodder on eggplant petiole tissues in mechanical control treatment.

Figure 3: The effect of sulfosulfuron on dodder shot in Sulfosulfuron treatment.



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