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THE EFFECT OF SOIL MULCHING AND SPRAYING WITH PLANT EXTRACTS ON THE VEGETATIVE GROWTH, YIELD AND MORPHO-PHYSIO-CHEMICAL QUALITIES OF TOMATO

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ABSTRACT

A field experiment was carried out in the Experimental Station of the Department of Horticulture and Landscaping, College of Agriculture, Diyala University in the spring season 2016to study the effect of three types of soil coverings (without coverage, black polyethylene coverage and white polyethylene coverage) and spraying with plant extracts (*Imperata cylindrical*, *Cyperusrotundus*, *Allium cepa* and *Sorghum halepense*) on the vegetative growth of the tomato plant. The individual and combine effect all these used materials was observed on plant length, stem diameter, number of leaves, leaf area, dry weight of the plant, production kg/ha^{-1}, acidity of fruits and TSS. The experiment was applied according to split-plot in the Randomized Complete Block Design (RCBD) with three replicates. In results, the soil mulching showed a positive effect on all studied vegetative growth properties of tomato crop particularly black color covering. The spraying of the plant extracts separately resulted in a significant and significant reduction in all studied vegetative growth properties. The spray treatment with cyperus extract was characterized by increasing the reduction rate in the measured vegetative growth measurements.

Keywords: mulching, allelopathy, plant extract, tomato.

INTRODUCTION

Tomato (*Solanumlycopersicum* L) is one of the most important and consumed vegetable crop in the world belongs to family Solanumae. It is basically originated from South Americaand due to the increasing demand for fresh consumption, the cultivated areas have increased. China is in top place of its production and it is the second major vegetable after potatoes in the world. In Iraq, it is considered to be one of the main vegetable crops for its nutritional importance. It is cultivated at 3475 ha with production rate of 22.187mt /hectareuntil 2014, although its productivity is still low as compared to neighboring countries [1] (FAO, 2014). In recent times, its cultivation has expanded greatly in Iraq particularly in Basra and Najaf provinces.

Tomato is an important source of minerals, vitamins (A, B1, B2 and B3), protein, carbohydrates and antioxidants which are essential in resisting prostate cancer [2] (Takeoka *et al.,* 2001). In order to increase the production of this crop, many methods have been followed. The most important method is the use of soil cover with different types of plastic. The covers protect the soil from various environmental factors and leads to early ripening and reduce the growth of weeds that compete with main crop for growth requirements and reduce the loss of water and fertilizers [3] (Garza, 2001). It also improves plant growth and productivity by influencing the physio-biological activities of soil and the root environment. In general, the date of cultivation of this crop coincides with the growth of many associated weeds, which have a clear effect on the reduction of productivity. Furthermore, the method of fertilization followed also contributes to the growth and density of different types of weeds. The adverse effect by sorting different chemicals, either by roots, leaves, stems and even fruits are the main issues which inhibit the growth of the crop completely and known as “Alleopathy”.

In addition, the weed residues in the field ay also contain antimicrobial compounds which released and often causing inhibition or stimulating the crop growth after decomposition with water [4] (Elia *et al.,* 1998). Keeping the importance of the subject in terms of economy and lacking of the studies on the allopathic effect of weeds on the tomato crop, the present study has been devised. The main object of the study is to investigate the effect of botanical extracts of vegetative and root plant parts of three permanent weeds including *Imperata cylindrical* L, *Cyperusrotundus* L, *Allium cepa* L and *Sorghum halepense* L. These weeds coexist with the tomato crop as well as the extract of onion crop, which is cultivated before the crop of tomato, as well as study the effect of different types of soil cover and determine the best in the growth of the plant.

MATERIAL AND METHODS

Field preparation and soil covering

The experiment was carried out in the fields of Horticulture and Landscaping, College of Agriculture, University of Diyaladuring spring season 2016. The tomato seedlings of 10-15 cm high with 3-4 mm in diameter were transferred to the field. However, the cultivation process was carried out in the middle of the substrate and the distance was 40 cm between plants in a mixed clay soil with 18 plants in each experimental unit. The crop was irrigated at regular intervals and all other agronomical practices were

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same as recommended. In order to know the effect of quality covers used in covering the soil, three different covering such a without cover (M1), black plastic cover (M2) and white plastic cover (M3) were placed within the main planks. For soil analysis, samples were randomly taken from different soil fields before planting at a depth of 0-30 cm to observe the physical and chemical properties of the soil. They were well mixed to be homogenous. A sample was extracted and dried under the sun and then passed through a sieve.

Preparation of plant extracts

The crop was sprayed with four different plant extracts such as onion (S1), blady grass (S2), Johnson grass (S3) and Cyperus (S4) separately at the recommended dose of 50 g/lit and compared to spraying with water as a control treatment (S5). The plant samples (the vegetative part and the root group) were collected from near agricultural vicinity and brought into nylon bags to the laboratory; where the collected samples were washed with distilled water twice to remove dust and mud in the roots. Later, these were cut into small pieces and dried in an oven at 70 ° C for 72 hours and stored in paper bags in a dry place until use. The dry samples were grinded with an electric grinder and the powder kept in the refrigerator at 4 ° C until use. Similar method as described by [5] Gülçin *et al.* (2004) was used in the preparation of the extract by taking 25 g of the powder and adding 500 ml of boiling distilled water. The mixture stirred well using a hot plate and magnetic stirrer for 30 minutes and kept at 4° C. Then, the hot mixture was left to settle for half an hour. The mixture was filtered using three layers of medical gauze to separate the powder from the leachate. Later, it was concentrated with a Rotary Vacuum Evaporator under 40°C. The process was repeated several times in order to obtain an adequate amount of it and the product was put in the dark bottles and kept in the refrigerator at a temperature of 4°C until use.

The observed plant characteristics

Five plants were selected at the end of the growing season from the center of the experimental unit to measure the growth characteristics of plant length (cm), number of leaves (leaf/plant), leaf area (cm^2/plant). The leaf area was measured by measuring the area of one paper (the fourth leaf of the plant top) by using leaf area meter (Aser area meter model 45X, made in Japan) and then multiplied by the number of leaves [6] (Tekalign and Hammes, 2005). It was calculated by taking a random sample of the fruits of each experimental unit then filtered. The juice was de-colored using charcoal then took 10 ml of juice and curing with sodium hydroxide (N 0.1) after adding 1 mL of Phenolphthalein reagent. The findings were estimated on the basis that the predominant acid is citric acid [7] (Ranganna, 1977) and the percentage of total dissolved solids (T.S.S) was obtained.

DATA ANALYSIS

The experiment was applied according to Split-plot design and randomized complete block design RCBD with three replicates under the influence of two factors. All the collected data were statistical analysis using Statistical Analysis Software (SAS ver. 9.2) and the means were separated through Duncan Multi-Range Test for comparison at a probability level of 0.05.

RESULTS AND DISCUSSIONS

Before sowing tomato plants, physical and chemical properties of the soil and qualitative chemical examination of plant materials (weeds/grasses and onion) were observed and their results are as mentioned in Table-1 and Table-2.

Plant length (cm)

A significant difference ($p< 0.05$) between the means of the mulching coverage used in the experiment for plant height was observed (Table-3). The highest plant heights of 87.33 cm followed by 79.22 cm were observed in M2 and M3, respectively. The effect was prominent because of different coverings those increased the permeability of the soil and equally increased the concentration of carbon dioxide in the environment of the plant. These also emitted holes around the plant, which displayed their imperative role in increasing the growth of the plant as it directly affects the growth and processes of phytochemical and other chemical plants [8] (Taub, 2010). These finding are in accordance with the [9] James *et al.* (2013) who also previously observed the effect of different mulching on growth of plant. However, spraying with weed extracts and onion also executed a significant effect ($p< 0.05$) on plant height. In general, spraying with all the plant extracts led to the inhibition of the plant length; meanwhile the lowest length of 66.77 cm was observed in S3 as compared to other treatments. The interaction of extract M1 and S3 achieved the lowest length of 56.66 cm in tomato plant whereas the M2 and S1 interaction achieved the highest plant length of 103.33 cm, respectively. [10] Merise and Singh (1987) indicated that the high concentrations of Chrysanthemum led to an increased adverse effect in soybean inhibition due to containment of inhibitory compounds as also found in present study (Table-2). These findings are also consistent with [11] Abou El-Ghit (2016) who showed that the onion extract and garlic cloves inhibited the length of pea plant and inhibited the growth in addition to weight.

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Table-1. Chemical and physical properties of the soil of experiment field.

Property	Value	
Organic material	1.72 %	
Carbonate equivalent	197.24 g/kg	
Soil residues		
Clay	36.34 %	
Silt	19.76 %	
Sand	43.60 %	
Structure type	Mixed clay	
Minerals		
Nitrogen	21.02 mg/kg	
Phosphor	5.11 mg/kg	
Potassium	130.87 mg/kg	
Electric conductivity (EC)	6.9 dcm/m	
PH level		
Positive solved ions		
Calcium	16.5 mmol/l	
Magnesium	16.9 mmol/l	
Potassium	1.980 mmol/l	
Sodium	8.68 mmol/l	
Negative solved ions		
Chloride	6.7 mmol/l	
Sulfate	28.2 mmol/l	
Carbonate	Nil	
Bicarbonate	6.1 mmol/l	

Table-2. The results of the qualitative-chemical examination of the plant extracts.

S. No.	Chemical Compounds	Blady grass	Cyperus	Onion	Johnson grass
1	Phenols	+	+	+	+
2	Flavonoids	+	+	+	+
3	Glycosides	-	+	-	+
4	Tannins	+	+	+	+
5	Resins	-	-	+	+
6	Sapindales	+	+	-	+

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Table-3. The effect of soil covering and plant extracts spraying and theirinteraction on the length (cm) of tomato plants.

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M_1	82.44 d	63.66 i	56.66 k	74.44 f	59.31 j	67.30 C
M_2	103.33 a	84.11 cd	75.44 f	95.55 b	78.22 e	87.33 A
M_3	95.44 b	74.83 f	68.22 h	85.72 c	70.44 g	79.22 B
Mean	93.74 A	74.12 C	66.77 E	85.24 B	69.32 D	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

The number of leaves (leaf/plant)

A significant difference ($p< 0.05$) between the means of the mulching coverage used in the experiment for number of leaves was observed (Table-4). A maximum number of 88.82leaves/plant was noticed in M2 followed by M3. The increase in the number of leaves covered with black plastic is attributed to their role in raising the temperature of the soil in the early stages of the plant life, which leads to increased root growth and more absorption of nutrients that increase vegetative growth and the number of leaves [12] (Mc Craw, 2003). However, the spraying of weed extracts and onions also displayed a significant ($p< 0.05$) effect on the number of leaves. Spraying with all plant extracts decreased the number of leaves; whereas the lowest numbers of 68.92 leaves /plant were recorded with spraying of Cyperus extract (S3). The roots and vegetative groups of the studied plants (plant extracts) contain several high-solubility aliphatic and chemical compounds with water astracedin qualitative detection (Table-2) which have an effect on the division of cells and their elongation may be toxic that may result in number of decreased leaves. In addition, the interaction of mulching and spraying indicated that M1 and S3 treatments achieved the lowest number of 57 leaves; whereas the M2 with S1 registered the maximum number 99.66 of leaves / plant.

Table-4. The effect of soil covering and plant extracts spraying and their interaction on the number of leaves (leaf/plant)in tomato plants.

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M1	82.44 d	63.66 i	56.66 k	74.44 f	59.31 j	67.30 C
M2	103.33 a	84.11 cd	75.44 f	95.55 b	78.22 e	87.33 A
M3	95.44 b	74.83 f	68.22 h	85.72 c	70.44 g	79.22 B
Mean	93.74 A	74.12 C	66.77 E	85.24 B	69.32 D	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

Leaf area (dm^2/plant)

A significant difference ($p< 0.05$) between the means of the mulching coverage used in the experiment for leaf area was observed (Table-5). The highest leaf area of 484.5 (dm^2/plant) was recorded in M2 followed by M3. The spraying with weed extracts and onion had a significant effect ($p< 0.05$) on the leaf area of the plants. The spraying with Cyperus extract (S3), the lowest leaf area of 245.5 was observed. However, the interaction of M1 with S3 treatments achieved the lowest leaf area of 187.6 and the highest leaf area of 738.1was respectively recorded in M2 with S1 treatments. The role of positive coverage in limiting and controlling the growth of the weeds reduce the competition between them. In other way, the main crop as tomatomay lead to reduce nutrients uptake which are important for plant growth and development and ultimately decrease the yield of plants. A strong root mass capable of securing the plant's need for important elements and transferring them to the higher parts, thus obtaining a rich and powerful vegetative group which result in an increase in leaf area [13] (Whiting *et al.,* 2005). The leafy area of the plant is directly affected by the aliphatic compounds at high

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concentrations, affecting cellular compounds and thus affecting the physiological and biochemical processes of the plant as well as important metabolic processes [14] (Friedjung *et al.,* 2013).

Table-5. The effect of soil covering and plant extracts spraying and their interaction on the leaf area (dm^2/plant) in tomato plants.

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M1	242.6 cd	271.1hij	187.6 j	342.7eh	270.0 hij	302.8 C
M2	738.1 a	403.2cde	300.9hij	587.9 b	392.4cf	484.5 A
M3	589.4 b	380.0dg	248.0 ij	474.6 c	312.4fi	401.1 B
Mean	590.0 A	351.7 C	245.5DE	468.4 B	325.0C	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

The dry weight of the plant (gm/plant)

The results regarding mean dry weight of tomato showed a significant difference ($p<0.05$) between treatments. The highest dry weight of 251 (gm/plant) in M2 and the lowest of 177 in M1 was recorded (Table-6). Similarly, spraying with weed and onion extracts also showed a significant effect ($p< 0.05$) on dry weight of tomato plant. Spraying with Cyperus extract (S3) showed the lowest dry weight of 203 gm/plant as compared to other treatments. However, the interaction of treatments particularly M1with S3 achieved the lowest weight of 160 gm/plant and the highest dry weight of 288 gm/plant in M2 with S1 was achieved. The use of soil coverings has a great effect on improving vegetative growth of the plant by increasing the readiness of the elements necessary for plant growth, reducing moisture loss, increasing the penetration of roots in the soil and reducing the harmful effect of the competition on the elements ready for soil absorption.

The plant extracts contain chemical compounds and most of which have water solubility and inhibitory effect which makes their uptake by the plant possible and possess an effect on cell division. It inhibits the plant growth through photosynthesis thus weak growth reflected in the quality of the fruits. [15] Kamal and Bano (2008) also found similar profound effects on different plants. The difference in effect between distinct types of extracts was due to the different compounds those contained in each plant in the present study. Meanwhile, the amount of production is affected by various environmental factors and the extent of the plant response and genetic structure [16] (Khan *et al.,* 2015).

Table-6. The effect of soil covering and plant extracts spraying and their interaction on dry weight (gm/plant) of tomatio plant.

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M_1	217 d	166 e	160 e	180 e	164 e	177 C
M_2	288 a	239 bd	232 cd	261 abc	236 cd	251 A
M_3	270 ab	215 d	216 d	233 cd	217 d	230 B
Mean	258 A	207 C	203 C	224 B	206 C	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

Effect of soil between covering and spraying with plant extracts and their interaction in plant value per hectare (ton/ha)

The results regarding effect of different covering and spraying and their interaction showed a significant difference ($p< 0.05$) between and among selected treatments (Table-7). The crop in which soil with coverage of black polyethylene (M2) showed the highest plant value of 7746.9 and the lowest of 6280.9 observed in white covering (M1). The spraying with plant extracts also

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showed a significant effect ($p< 0.05$) on the yield. Spraying treatment with all plant extracts reduced the total yield however the spraying with Cyperus extract (S3) gave the lowest yield of 6367.3 (ton/ha) and effect was also prominent on total fruit yield. The interaction result showed that the combination of black polyethylene coverage and spraying with water only (M2 with S1) showed the highest plant value of 8564.8 ton/ha.

Table-7. The effect of soil covering and spraying with plant extracts and their interaction on plant yield per hectare (ton/ha).

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M_1	7060.2cde	6172.8fgh	5748.5h	6558.6ef	5864.2gh	6480.9C
M_2	8564.8a	7638.9bc	7060.2cde	8101.9ab	7368.8cd	7746.9A
M_3	7600.3bc	6790.1def	6288.6fgh	7175.9cde	6481.5efg	6867.3B
Mean	7741.8A	6867.3C	6365.7D	7278.8B	6571.5CD	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

Several studies indicated the role of cover in improving the physical and chemical properties and providing the nutrients necessary for plant growth and filling its needs during the various phases of plant growth which is the positively reflected on the outcome and its characteristics [17] (Bayer *et al.,* 2015). Covering the soil with plastic may increase vegetative growth and root development that leads to increase the number of fruits because it helps to generate a moderate environmental condition for plant to grow. In addition, the role of cover in reducing the growth of the weeds which eventually reduce the competition with main crops is also quite imperative. The nutrients, soil-ready elements and retention of moisture are also main factor that helps the plant to develop more and it was achieved with covering the soil [18, 19] (Gudugi *et al.,* 2012; Pinder *et al.,* 2016). Few other researchers like [20] Hedau (2010) and [21] Nikolic *et al.* (2012) also reported that the soil cover showed the greatest increase in the number of fruits and it achieved by improving the plant growth and improving the environmental conditions in the plant canopy particularly in the early stage of crop. Early flowering and budding before summer temperatures rise that may affect the formation of buds and flowers. This increase may be due to the role of these covers in preserving the soil water, which is the main factor of plant growth, production and development. It does not onlyhelp to create a favorable conditions for obtaining a strong vegetative and root development but also increasing the efficiency of photosynthesis process as well as increase the efficiency of absorption of nutrients [22, 18] (Agrawal *et al*., 2010; Gudugi, 2012).

As for the inhibitory effect of plant extracts in reducing the fruit qualities of the tomato plant, it is due to the chemical compounds found in the weed extracts and onion which have an inhibitory effect possibly on cellular division or the synthesis of some important compounds in photosynthesis. It also shown that the extract of the bushes was the additional inhibitory as compared to the onion extract. This was due to the fact that bush plants contain more inhibitors. It was also further confirmed by the results of the chemical detection of the aliphatic compounds. [23] Chung and Miller (1995) found that the Johnson grass had more than nine species of weed in inhibiting germination and growth of Alfalfa. The aliphatic compounds in the Cyperous and Johnson weed extracts have reached the effective concentration. The onion and Blady grass extracts have not yet reached the effective concentration. This is in line with [24] Blum (1998) which stated that some aliphatic compounds do not show their effect until they reach the effective concentration. The decrease in the yield might be due to role of allopathic compounds as they decrease the ability of the plant to absorb the nutrients especially the potassium component. As potassium has a large role in controlling the closure and opening of the stents. However, the nitrogen has a role in the process of photosynthesis and also in the construction of the molecule of chlorophyll. Thus, it decreases the carbohydrate metabolic which is the main source of energy and necessary for the growth and composition of the plant.

The effect of soil covering and spraying with plant extracts and their interaction on the percentage of total acidity intomato plant

The results in Table 8 indicated that there were significant differences between the mean of the coverage treatments used in the experiment. The coverage of black and white polyethylene was significantly higher as compared to no coverage; however the highest meanof 0.688 observed in M2. There were no significant differences between the M1 and M2 covers in the ratio of acidity. The spraying with plant extracts had a significant effect on the percentage of total acidity in the fruit as the spraying treatments with plant extracts inhibited the acidity of the fruits. The treatment with the extract of Cyperus (S3)

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gave the lowest rate of 0.578% as compared with the treatment of water spray only (S1) which was 0.731%. The results also showed that the interaction between the different coverage and spraying with plant extracts had a significant effect on the percentage of acidity of tomato fruit. The overlap between the coverage of black polyethylene and water spraying alone (M2 with S1) reached the highest rate of 0.795%. The non-cover and spray treatment with M1 with S3 extract achieved the lowest ratio of 0.424%.

Table-8. The effect of soil covering and spraying with plant extracts and their interaction on the percentage of total acidity in tomato plant fruit.

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M_1	0.643cd	0.470e	0.424e	0.498e	0.430e	0.493B
M_2	0.795a	0.689ad	0.675bcd	0.760ab	0.682bcd	0.720A
M_3	0.755abc	0.645cd	0.635 d	0.727ad	0.681bcd	0.688A
Mean	0.731A	0.601C	0.578C	0.662B	0.598C	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

The effect of soil covering and spraying with plant extracts and their interaction on the percentage of total soluble solids in tomato fruits

The results in Table-9 showed the significant differences between the mean of the coverage treatments used in the experiment. The treatment of covering with black polyethylene M2 was significantly higher with the highest TSS ratio of 4.980% and 53.41% higher than the M1 treatment which is the lowest mean of 3.246%. The same table showed that the spraying with plant extracts has a significant effect on the percentage of total dissolved solids in fruits. The treatment with plant extracts reduced the ratio of soluble solids in fruit. The spray treatment with Cyperusextract (S3) gave the lowest rate of 3.022% as compared with the treatment of water spray only (6.111%). The results regarding interaction between the different coverage treatments and spraying with the plant extracts had a significant effect on the percentage of soluble solids in the fruits. The overlap between polyethylene and water spray treatment (M2 with S1) was the highest at 7.133% and the lowest ratio of 2.066% between M1 with S3 was observed, respectively.

Table-9. The effect of soil covering and spraying with plant extracts and their interaction on the percentage of total soluble solids in tomato fruits (%).

Coverage						Mean
	S_1	S_2	S_3	S_4	S_5	
M_1	5.133c	3.033 hi	2.066j	3.500fgh	2.500ij	3.246 C
M_2	7.133a	4.901cd	4.000fgh	4.700cde	4.166def	4.980 A
M_3	6.066b	3.966fgh	3.000hi	4.133def	3.233ghi	4.080 B
Mean	6.111A	3.966B	3.022C	4.111B	3.300C	

The values followed by the same letters for each feature are not significantly different from each other at $p<0.05$.
M = Mulching (M1= No covering, M2= Black covering and M3=White covering); S= Spraying (S1= Spray with water only, S2 = Spray with Blady grass extract, S3 = Spray with Cyperus extract, S4= Spray with onion extract and S5 = Spray with Johnson grass extract).

The increase in the quality characteristics of tomato fruits was observed due to the importance of polyethylene covers (black and white) those improved the quality of fruits by increasing the concentration of CO_2. The increased concentration of CO_2 in the plant environment activated well the process of photosynthesis as CO_2 entered the Calvin cycle through Ribulose 1-5 bisphosphate which caused the RUB enzyme to increase the correlation with CO_2 rather than O_2. It positively reflected the increase in photosynthesis yields and increased the carbohydrates and other materials fruits [22] (Agrawal *et al.*, 2010). The coverage also showed a role in preserving the moisture of the soil which encouraged the absorption of nutrients and their availability in the form of ready-made plants and

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provided a more suitable environment for the growth of the plant and the formation of a strong root. It also prevented the growth of weeds that normally compete with the main crop within the space.

In addition, it also increases the activity of microorganisms in soil and increases the degradation of soil organic matter. These results are in accordance to [25] Sun (2015) who also reported the significant importance of covers in order to increase microbial activities inside the soil. [3] Garza (2001) also mentioned that the coverage is essential in improving quality traits such as vitamin C, acidity and TSS in tomato plants. Similar results were also recorded in the present study in which the effect of the extracts in order to reduce the concentration of vitamin C, acidity and total solids were observed. This is due to the fact that the plant extracts contain chemical compounds and most of which have water solubility and inhibitory effect. This caused the inhibition of plant growth through the effect on photosynthesis and thus weak growth resulted [15] (Kamal and Bano, 2008). The difference in effect between different types of extracts was due to the different compounds contained in each plant. Several studies have indicated that each type of plant contains different compounds and different concentrations. The quantity of its production is affected by various environmental factors and the extent of future plant response and genetic structure [16] (Khan *et al.,* 2015). Thus, the allopathic compound's inhibition of ascorbic acid is important in the process of photosynthesis.

CONCLUSIONS

All the morph-physio chemical properties of tomato crop were observed better under mulching. The black covering plastic displayed more effective in order to enhance all characteristics of tomato crops as it increased well the permeability of the soil and equally improved the concentration of CO_2 in the environment of the plant. However, the spraying of all plant extracts decreased almost all recorded plant characters particularly spraying with Cyperus extract as these plant extracts contain several high-solubility aliphatic and chemical compounds which showed adverse effect on the division of cells and their elongation may be toxic that may result in number of decreased leaves.

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