

Effect of some weed control methods on growth and fruiting of (western schley & whichita) pecan cultivars

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ABSTRACT

This study was conducted in naturally infested pecan orchard with weeds at Horticulture Research Station, El-Kanater El-Khyria, Qalyobia Governorate during 2007 and 2008 seasons, to study the effect of two cultivars of pecan (Western Schley & Whichita) and five weed control methods (hand hoeing, mulching with black plastic sheets, mulching with banana leaves, Roundup herbicide and unweeded check) on weed control. Growth, fruiting and fruit quality of pecan, in addition to the changes of microbiological populations in the soil. Obtained results indicated that cultivars had no significant effect either on weeds or changes of microbiological populations in the soil. However, Whichita gave was the better cultivar in growth, fruiting and fruit quality than that of Western Schley during 2007 & 2008 seasons. All tested weed control treatments significantly decrease the weeds and increasing growth, fruiting and fruit quality of pecan comparing with unweeded treatment. Glyphosate (Roundup 48 % WSC at a rate of 4 liter/fed.) and mulching with black plastic sheets were superior for controlling weeds, tree growth (area and dry weight of leaflet, shoot length and thickness); nut physical characteristics, i.e., nut and kernel weight, kernel percentage and nut oil content. Results indicated that Roundup foliar application showed higher counts of bacteria, fungi and actinomycetes than that recorded with the other treatments.

Key words: pecan – weed control – microbiological – physical characteristics.

INTRODUCTION

Pecan is a proising nut crop which grow successfully under Egypt condition. It's fruits characterized by high nutritional and economic values. Weed competition is one of production problems which affects growth and fruiting of many fruit crops (**Abou Syed et al. 2005 and Jordan 1981**). Hoeing, mulching and chemical herbicides used in weed control in fruit orchard. Each method different in its efficiency (**Sinble et al., 1997; El-Kholy and Salim, 2004**). **Trabue et al., (2001)**. **Singh et al., (2005)** revealed that there were many soil microorganisms capable of pesticides degradation when they were used as soil application.

Haney et al., (2002) found that roundup ultra significantly stimulated soil microbial activity as well as soil microbial biomas.

Wander et al., (2003) and **Vijay et al., (2006)** reported that some pesticides are readily degraded by microorganisms, other have proven to be recalcitrant. A diverse group of bacteria were able to metabolize pesticides. Although, there are many factors affect the persistence of pesticides in soil, herbicides, temperature, pH, water content and others. But, soil microorganisms appeared to play a major role in the degradation of pesticides. Roundup increased generation time of bacteria (**Justyna and Izabella (2007)**). Moreover, **Zaghloul et**

al., (2007) found that the treated soil with diazinon, inoculated with bacteria and cultivated with tomato plants gave higher of dehydrogenase activity as compared with the uncultivated soil.

This work is aiming to investigate hoeing, mulching with either black plastic sheets or with banana leaves and Roundup on weed control, growth, fruiting and fruit quality of Western Schley and Whichita pecan cultivars. Also, to investigate the changes that take place in some biological properties of the studied soil due to the above mentioned treatments.

MATERIALS AND METHODS

The present work was carried out during 2007& 2008 seasons at El-Kanater El-Khyria Experimental orchard, Hort. Res. Inst. Agriculture Research center (ARC) to study the effect of Western Schley and Whichita and weed control methods on weeds and growth, yield, fruit quality of pecan and changes of microbiological populations in the soil. Pecan cultivars of 30 years old planted at 7 x 7 m. at clay soil, subjected to flood irrigation, uniform in growth vigor and received the same cultural practices. Thus, the experiment included two cultivars and five weed control treatments as follows:

A- Cultivars

- 1- Western Schley.
- 2- Whichita.

B- Weed control treatments:

- 1- Unweeded check.
- 2- Hand hoeing three times with one month intervals.
- 3- Mulching with black plastic sheets (black plastic) 80 Mu.
- 4- Mulching with banana leaves (banana leaves).
- 5- Glyphosate (Roundup 48%) at 4 liter/fed with 200 liter/fed. (2 %).

The main physical and chemical properties of the tested soil were determined according to **Jackson (1967)** and **Piper (1950)** and presented in Table (1).

Table (1): Physical and chemical analysis of the soil of pecan orchard at (0-30 cm.) depth in 2007 season.

Particle size distribution										
Sand %		Silt %		Clay %		Soil texture		Organic matter %		
29.2		16.5		54..3		Clay		2.1		
Soluble ions (mmolc L ⁻¹)										
SO ₄ ²⁻	Cl ⁻	HCO ₃ ³⁻	CO ₃ ²⁻	K ⁺	Na ⁺	Mg ²⁺	Ca ²⁺	Ec. ds/m	pH (1:2.5)	CaCO ₃
43.2	7.25	0.55	0.00	3.00	8.2	14.1	25.7	4.8	8.01	3.56

Roundup is the commercial name of glyphosate (N-phosphonomethyl glycine) and was applied using knapsack sprayer with 200 L. of water/fed.

The treatments were applied when the weeds reached about 25-30 cm tall in 8/5/2007 and 15/5/2008 in the 1st and 2nd seasons, respectively, whereas, the mulching treatment continued two months later.

The treatments were arranged in a strip plot design in three replicates, each replicate was one tree. The cultivars were arranged in main plots while, the weed control treatments were arranged randomly in sub plots. The sub plot area was 6.25 m² (2.5 m x 2.5 m). The effect of tested treatments was evaluated as follows:

1- Weed characters:

A random samples were taken from one m² from each plot at 3, 6, 9 and 12 weeks from treatments. The sample was classified to annual and perennial weeds species; then dried in the oven 70 °C until constant weight and weighed.

Table (2): The dominant weeds species in the experiment during 2007 and 2008 seasons.

Annual weeds	Perennial weeds
<i>Echinochloa colonum</i> L.	<i>Cynodon dactylon</i> L.
<i>Portulaca oleracaea</i> L.	<i>Cyperus rotundus</i> L.
<i>Xanthium spinosum</i> L.	<i>Convolvulus arvensis</i> L.

2- Microbiological determinations:

- The sample was taken after twelve weeks, total bacteria counts in soil were determined by using the plate method and soil extract agar medium according to **Labeda (1990)**.
- Counts of actinomycetes in soil were determined by using the plate method and starch nitrate agar medium according to **Waksman and Lechevolier (1961)**.
- Counts of fungi were counted on Rose Bengal agar medium by plate method according to **Martin (1950)**.

Dehydrogenase activity in soil was assayed according to **Casida et al., (1964)**.

3- Tree vegetative growth and fruiting parameters:

- **Leaflet area:** Twenty leaflets from the middle of the shoot were measured and their area were estimated using planimeter.
- **Leaflet dry weight:** Twenty leaflet from each replicate were picked on first of October, washed, weighed and dried at 60 °C at electric oven until constant weight and leaflet dry weight was estimated.
- **Shoot length and thickness:** Twenty emerged shoots were randomly labeled for each replicate and at the end of growth season, their length and thickness were measured by meter and a venier caliper, respectively.
- **Fruit set:** Thirty female inflorescence distributed around each tree were selected, tagged and their flowers were counted. Number of developing fruitlets on each inflorescence was also counted and recorded. Fruit set percentage were calculated as follows:

$$\text{Fruit set \%} = \frac{\text{No. of developing fruitlets}}{\text{Total number of flowers}} \times 100.$$

On mid October in every season, the fruits were harvested. Yield per tree as weight (kgs) and number of fruits were determined for each tree. The fruits were curded for one month at room temperature, then the fruit physical characteristics were determined i.e., fresh fruit weight, curded fruit weight, kernel weight and kernel percentage.

- **Kernel moisture and oil content:** kernels were weighed and dried at 70 °C in electric oven until constant weight, then moisture percentage was determined. The previous dried kernels were used for oil content determination as described in the **A.O.A.C (1980)**.

4- Economic evaluation due to weed competition

Economic evaluation due to weed control treatments was calculated according to **Mekky *et al.*, (2005)** as follow:

Gross income = increasing of yield x 30 £.

Gross margin = gross income – total cost.

Statistical analysis:

The obtained data in the two seasons were subjected to statistical analysis according to **Snedocor and Cochran (1980)**. Means were separated using Duncan's multiple range (**Duncan, 1955**).

RESLTUS AND DISCUSSION

1- Dry weight of annual and perennial weeds:

The rate of weed infestation in the experimental site was estimated by (0.84 and 0.68 t), (1.1 and 0.84 t.), (1.5 and 1.1 t.) and (1.86 and 1.47 t. /fed) of dry weight of total weeds in the weedy check for first, second, third and fourth surveys in the first and second seasons, respectively.

Results in (Tables 3 & 4) revealed insignificant differences between the two pecan varieties i.e., Whichita and Western Schley on the dry weight of the annual, perennial weeds and their total in the four surveys in both seasons.

Data in (Tables 3 & 4) showed a significant effect of the four weed control methods on reducing the dry weight of the three weed categories i.e., annual, perennial and their total in the four surveys during 2007 and 2008 seasons. In the first season, in the four surveys, sprayed roundup 4 L/fed. was the superior treatment on reducing the dry weight of annual, perennial and their total g/m by 3.0, 4.1 and 7.1 t in 1st survey, 8.5, 12.6 and 21.1 % in 2nd survey, 19.5, 21.4 and 40.4 % in 3rd survey and 31.6, 36.6 and 68.2 % in 4th survey, while the efficacy of the rest of the weed control methods were in the following in descending order: mulching with black plastic sheets, mulching with banana leaves and hand hoeing at three times compared with untreated control. In the second season the same previous trend was observed as mentioned in the first one. Thus; roundup was the superior treatment on reducing the dry weight of the three weed categories i.e., annual, perennial and their total g/m² by 2.7, 3.4 and 6.1 g in 1st survey, 10.6, 7.5 and 18.1 in 2nd survey, 20.3, 11.4 and 31.7 in 3rd survey and 30.3, 19.2 and 49.5 g/m² in 4th survey.

The efficacy rest of the weed control method were in the descending order in mulching with black plastic sheets, mulching with banana leaves and hand hoeing at three times compared to untreated treatment.

Tables (3 & 4) shows that there are significant interaction between the two pecan cultivars and weed control methods. This was true in the four surveys in both seasons. However, in the previous results indicated that the two factors (cvs and weed control methods) are dependently in the efficiency reducing the dry weight of the weed species in this study, that mean the significant interaction between the two factor is due to the significant effect of weed control method only. Moreover, the efficacy of the interaction between the two varieties and weed control method gave the some arrangement of the weed control treatment in (Table 3) the highest significant interaction occurred between roundup at 4 L/fed with either Whichita or Western Schley.

This results agree with those of **Sary *et al.*, (2008)** who found that glyphosate (Roundup 48 %) at 4.0 l/fed either used once or twice was the superior herbicide for controlling the perennial weeds in the four surveys at 3, 6,9 and 12 weeks in both seasons. Also, **Javkovic (1986)** showed that roundup at 10 liters/ha gave the best control of the most dominant weeds.

Table (3): Effect of some weed control methods on dry weight of weeds of Western Schley and Wichita pecan cvs., 2007 season.

Treatments	1st										2nd											
	Annual					Perennial					Annual					Perennial						
	Whichita	West. Schley	Mean	Whichita	West. Schley	Mean	Whichita	West. Schley	Mean	Whichita	West. Schley	Mean	Whichita	West. Schley	Mean	Whichita	West. Schley	Mean	Whichita	West. Schley	Mean	
Control	87.6a	87.2a	87.4a	107.4a	115.7a	111.6a	195.0a	202.9a	199.0a	127.9a	127.0a	127.4a	138.7a	146.1a	142.4a	266.6a	273.1a	269.8a				
Hoeing	8.9c	14.0b	11.4b	26.3b	29.6b	27.9b	35.2bc	43.6b	39.3b	30.2b	29.9b	30.1b	28.7bc	38.2b	33.5b	58.9bc	68.1b	63.6b				
Muching (B. plastic)	4.9cd	5.7cd	5.3cd	5.2c	6.6c	5.9c	10.1d	12.3d	11.2c	11.5cd	11.5cd	11.5cd	12.7d	16.5cd	14.6cd	24.2de	28.0de	26.1cd				
Mulching (B. leaves)	7.2cd	9.1c	8.2bc	6.7f	10.7c	8.7c	13.9d	19.8cd	16.9c	14.4c	14.0c	14.2c	17.6cd	29.1bc	23.3c	32.0de	43.1cd	37.5c				
2 % Roundup	2.8d	3.1d	3.0d	4.9c	3.2c	4.1c	7.7d	6.3d	7.1c	8.8d	8.2d	8.5d	13.3d	11.8d	12.6d	22.1e	20.0e	21.1d				
Mean	22.3a	23.8a		30.1a	33.1a		52.4a	56.9a		38.6a	38.1a		42.2a	48.4a		80.8a	86.5a					
	3rd																					
Control	192.3a	189.1a	190.7a	173.3a	167.6a	170.4a	365.6a	356.7a	361.1a	238.2a	229.8b	234.0a	215.1a	206.8a	211.0a	453.3a	436.6a	445.0a				
Hoeing	51.7b	51.5b	51.6b	53.6b	46.3b	50.0b	105.3b	97.8b	101.6b	74.3c	73.3c	73.8b	64.5b	62.6b	63.6b	138.8b	135.9b	137.4b				
Muching (B. plastic)	22.6c	24.9c	23.8cd	21.7d	29.0cd	25.4cd	44.3cd	53.9cd	49.2cd	42.3e	36.8ef	39.6d	35.9de	44.9cd	40.4cd	78.2de	81.7d	80.0d				
Mulching (B. leaves)	26.4c	33.1c	29.8c	28.4cd	32.8c	30.6c	54.8cd	65.9c	60.4c	53.5d	51.7d	52.6c	38.8de	53.8bc	46.3c	92.3cd	105.5c	98.9c				
2 % Roundup	18.2c	19.8c	19.0d	19.8d	23.0cd	21.4d	38.0d	42.8cd	40.4d	29.4f	33.7f	31.6e	32.1e	41.0de	36.6d	61.5e	74.7de	68.2d				
Mean	62.3a	63.7a		59.4a	59.7a		121.7a	123.4a.		87.6a	85.1a		77.3a	81.8a		164.9a	166.9a					
	4th																					

Means followed by the same letter (s) is not significantly at 5 % level.

* (B. plastic)= black plastic sheet.

** (B. leaves)= banana leaves.

Table (4): Effect of some weed control methods on some dry weight of weeds of Western Schley and Whichita pecan cvs., 2008 season.

Treatments	1st										2nd																								
	Annual					Perennial					Total					Annual					Perennial					Total									
	Whichita			West. Schley		Mean		Whichita			West. Schley		Mean		Whichita			West. Schley		Mean		Whichita			West. Schley		Mean								
	95.6a	18.8b	4.5d	93.3a	19.1b	4.7d	7.3c	7.8c	2.9d	25.5a	66.7b	13.5c	5.6d	6.2d	3.0d	19.0a	72.3a	14.1c	6.0d	6.5d	3.7d	20.5a	69.5a	162.3b	32.3c	10.1e	14.4d	13.8d	6.6f	44.9a	164.0a	32.8b	10.4d	14.1c	6.1e
Control	175.8a	40.6b	21.3d	174.5a	40.7b	21.4d	175.1a	40.7b	21.4d	105.3a	24.5b	12.3de	14.3cd	11.0e	33.5a	107.7a	25.7b	12.8cd	15.2c	3.7d	20.5a	106.5a	281.1a	65.1b	33.6d	38.8c	31.4d	282.2a	281.6a	65.8b	33.9d	39.4c	6.1e	90.0a	281.6a
Hoeing	175.8a	40.6b	21.3d	174.5a	40.7b	21.4d	175.1a	40.7b	21.4d	105.3a	24.5b	12.3de	14.3cd	11.0e	33.5a	107.7a	25.7b	12.8cd	15.2c	3.7d	20.5a	106.5a	281.1a	65.1b	33.6d	38.8c	31.4d	282.2a	281.6a	65.8b	33.9d	39.4c	6.1e	90.0a	281.6a
Muching (B. plastic)	175.8a	40.6b	21.3d	174.5a	40.7b	21.4d	175.1a	40.7b	21.4d	105.3a	24.5b	12.3de	14.3cd	11.0e	33.5a	107.7a	25.7b	12.8cd	15.2c	3.7d	20.5a	106.5a	281.1a	65.1b	33.6d	38.8c	31.4d	282.2a	281.6a	65.8b	33.9d	39.4c	6.1e	90.0a	281.6a
Mulching (B. leaves)	175.8a	40.6b	21.3d	174.5a	40.7b	21.4d	175.1a	40.7b	21.4d	105.3a	24.5b	12.3de	14.3cd	11.0e	33.5a	107.7a	25.7b	12.8cd	15.2c	3.7d	20.5a	106.5a	281.1a	65.1b	33.6d	38.8c	31.4d	282.2a	281.6a	65.8b	33.9d	39.4c	6.1e	90.0a	281.6a
2 % Roundup	175.8a	40.6b	21.3d	174.5a	40.7b	21.4d	175.1a	40.7b	21.4d	105.3a	24.5b	12.3de	14.3cd	11.0e	33.5a	107.7a	25.7b	12.8cd	15.2c	3.7d	20.5a	106.5a	281.1a	65.1b	33.6d	38.8c	31.4d	282.2a	281.6a	65.8b	33.9d	39.4c	6.1e	90.0a	281.6a
Mean	175.8a	40.6b	21.3d	174.5a	40.7b	21.4d	175.1a	40.7b	21.4d	105.3a	24.5b	12.3de	14.3cd	11.0e	33.5a	107.7a	25.7b	12.8cd	15.2c	3.7d	20.5a	106.5a	281.1a	65.1b	33.6d	38.8c	31.4d	282.2a	281.6a	65.8b	33.9d	39.4c	6.1e	90.0a	281.6a
	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
Control	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
Hoeing	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
Muching (B. plastic)	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
Mulching (B. leaves)	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
2 % Roundup	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
Mean	119.2a	26.9b	13.5c	117.9a	26.9b	13.7c	118.6a	26.9b	13.7c	82.7b	18.3c	10.7d	8.5eF	7.7f	37.0a	84.7a	18.7c	9.9de	9.2d-f	7.3F	26.0a	83.7a	128.8a	65.7b	31.4c	32.5c	30.3c	220.8a	219.8a	65.4b	31.3c	32.4c	30.2c	75.5a	219.8a
	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a
Control	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a
Hoeing	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a
Muching (B. plastic)	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a
Mulching (B. leaves)	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a
2 % Roundup	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a
Mean	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	201.9a	45.2b	24.2c	128.8a	37.9b	19.9c	21.4c	18.8c	121.6a	132.5a	39.2b	21.7c	22.9c	19.7c	62.6a	130.6a	349.6a	103.6b	51.3c	53.9c	49.1c	349.6a	351.2a	38.6b	20.8cd	22.1c	19.2d	47.2a	351.2a

Means followed by the same letter (s) is not significantly at 5 % level.

* (B. plastic)= black plastic sheet.

** (B. leaves)= banana leaves.

2- Dehydrogenase activity (DHA) and microbiological determinations:

Data in Table (5) show that the total counts of bacteria, fungi and actinomycetes were positively affected by weed control treatments as compared with the control treatment. Such results are in accordance with those recorded by Kaul *et al.*, (1986) and Abd El-Rahman (2004). Foliar application of Roundup treatment possessed the highest activity among all treatments while the lowest activity among treatments was in the soil treated with hand hoeing. The effect of treatments was in the following order: Roundup > mulching (B. plastic) mulching (B. leaves) > hand hoeing.

The increases of microbial counts might be due to the activities of a large number of living microorganisms with the foliar application of Roundup treatment which included some nutrients. It is worthy to refer that the microflora populations were negatively affected due to hand hoeing treatment.

Generally, obtained data show that microflora populations were higher in the 2nd season than in the 1st one. Such differences between the two growing seasons may be due to the changes in the climatic conditions.

As for dehydrogenase activity (DHA) Changes in DHA of soil amended with different types of weed control methods are presented in Table (5). Results show, in general, significant positive effects on DHA due to different treatments. The Roundup possessed the highest significant activity among all treatments while the lowest activity was in soil amended with hoeing. The increases of microbial counts due to Roundup treatment might be due to the activities of a large number of living microorganisms with the presence of readily utilizable carbon sources and nutrients given as reported by Aislabie and Lloyd-Jones (1997) and Mulchandani *et al.*, (1999) who mentioned that some pesticides are readily degraded by microorganisms.

Table (5): Effect of some weed control methods on dehydrogenase activity and populations of microflora in rhizosphere of plants.

Treatments	Dehydrogenase activity		Total count of bacteria (x 10 ⁶)		Total count of Actinomycet (x 10 ⁵)		Total count of Fungi (x 10 ⁴)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Control	26.7d	27.2d	43.7a	47.5b	46.8b	47.5c	44.1d	45.0d
Hoeing	29.9c	31.0c	47.5a	50.5a	49.7ab	50.5b	75.2a	76.5a
Muching (B. plastic)	35.2a	35.5a	45.3a	47.0b	52.5a	55.0a	68.5b	68.0b
Mulching (B. leaves)	32.8b	33.6b	42.8a	45.0c	46.3b	45.5cd	63.9c	65.0c
2 % Roundup	36.2a	36.9a	36.9b	39.5d	41.0c	40.5e	33.0e	32.0e

Means followed by the same letter (s) is not significantly at 5 % level.

* (B. plastic)= black plastic sheet.

** (B. leaves)= banana leaves.

3- Vegetative growth, tree fruiting and fruit quality of Western Schley and Whichita pecan cultivars (Table 5).

Leaflet area:

The obtained results show in significant differences between the two cultivar i.e., Whichita cv. or Western Schley during the first season. In second season, Whichita cv. induced higher value (29.3 cm²) than Western Schley cv. (25.0 cm²). The treatment of Roundup 2 % was superior to other treatments (29.9 & 30.2 cm²), followed by black plastic mulching (29.5 & 29.5 cm²) while both hoeing and banana leaves mulching recorded similar values in first season (26.5 & 26.4 cm²), whereas in second season banana leaves was superior (25.5 & 27.7 cm²), the lowermost values exerted by unweed control (23 & 23 cm²). Concerning the interaction, the combination of Whichita x 2 % roundup was superior to others (30.4 & 33.4 cm²), followed by Whichita x black plastic sheets (29.5 & 32.9 cm²) while, the lowermost values came from Western Schley x control (21.3 & 22.4 cm²), other combinations came in between in 2007 and 2008 seasons, respectively.

Leaflet dry weight:

Results of leaflet dry weight indicated that the two cultivars recorded the same values (0.20 & 0.20 g.) during the first season, while in 2nd one Western Schley recorded (0.22 g.) against (0.19 g.) for Whichita cv. During the two seasons of study (2007 & 2008), leaflet dry weight was significantly affected by weed control methods. Anyhow, black plastic mulching or 2 % Roundup recorded the highest values without significant differences between them (0.23, 0.23 & 0.24 and 0.24 g.) respectively, followed by banana leaves mulching (0.18 & 0.21 g.) and by hoeing (0.19 & 0.18 g.). Unweed control came at the last order (0.16 & 0.15 g.) as for the interaction, in the first season, the combinations of the two cultivars behave the same pattern, but in the second one, the combinations of Whichita cv. were superior to those of Western schley.

Shoot length:

It is clear that Whichita cv. produce longer shoots than Western Schley cv. (24.8 & 29.8 cm) in 2007 and 2008 seasons, respectively. Shoot length was significantly affected by the tested weed control methods, 2 % round up induced the highest value (27.6 & 32.2 cm) while, mulching with black plastic sheet came in second order by (26.1 & 31.4 cm) whereas, banana leaves mulching occupy the third order by (24.0 & 27.8 cm), followed by hoeing (21.7 & 23.4 cm.), while unweeding treatment (control) came at last (19.8 & 21.4 cm.). Concerning the interaction between cultivars and weed control

treatments, it was significant, whereas all combinations of Whichita cv. exerted higher values in comparison to analogous ones of Western Schley cv. during 2007 & 2008 seasons.

Shoot diameter:

Western Schley cv. and Whichita cv. pecan cvs. exerted similar values of shoot diameter (0.54 & 0.54 cm.) in first season (2007), while in second one Whichita cv. produced wider shoot thickness (0.56 cm) than Western Schley cv. (0.53 cm). Also, shoot diameter significantly affected by tested weed control methods. However, Roundup 2 % showed the highest values (0.57 & 0.58 cm), black plastic mulching exerted (0.56 & 0.55 cm), followed by banana mulching (0.54 & 0.54 cm) while either hoeing or unweeding control gave similar values (0.53, 0.53 & 0.52 and 0.52 cm) in 2007 and 2008 seasons, respectively. The interaction between cultivars and treatments was insignificant in first season except the combination of Whichita x black plastic mulching which exerted higher value (0.57 cm) against (0.54 cm.) to those of Western Schley. Whereas, in second all combinations of Whichita cv. gave higher values than the analogous ones of Western Schley.

The obtained results of vegetative growth are in harmony with those found by **Duncan *et al.*, (1992)**; **Patterson and Golf (1994)** and **Foshee *et al.*, (1996)** on pecan. Besides, **El-Kholey and Salem (2004)** on banana **Sinble *et al.*, (1997)** on navel orange. They found that black plastic mulching or round up increased vegetative growth parameters.

Fruit set percentage:

Table (6) show that Whichita cv. exerted higher percentage of fruit set (73.7 & 80.9 %) than western Schley cv. (69.5 & 76.5 %) in 2007 & 2008 seasons respectively. Roundup was superior (73.9 & 81.4 %), followed by mulching with black plastic sheets (72.9 & 80 %), followed by mulching with banana leaves (72.1 & 79 %), followed by hoeing (70.2 & 77.6 %), while the lowermost values came from unweeded check (68.8 & 75.6 %). Besides, the interaction between cultivars and treatments was significant in both seasons (2007 & 2008), all combinations of Whichita cv. enhanced fruit set percentage in comparison with analogous ones of Western Schley cv.

Table (6): Effect of some weed control methods on some vegetative parameters of Western Schley and Whichita pecan cvs., (2007 & 2008 seasons)

Characters Treatment	Leaflet area (cm ²)			Leaflet dry weight (g.)			Shoot length (cm.)			Shoot diameter (cm.)		
	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean
2007 season												
Control	21.3e	24.6d	23.0D	0.15c	0.17b	0.16C	19.3d	20.2d	19.8E	0.52d	0.51d	0.52D
Hoeing	27.7c	25.2d	26.5C	0.18b	0.19b	0.19B	20.3d	23.1c	21.7D	0.53b-d	0.52b-d	0.53D
Muching (B. plastic)	29.4b	29.5b	29.5B	0.22a	0.24a	0.23A	25.4b	26.7b	26.1B	0.54b	0.57a	0.56B
Mulching (B. leaves)	27.8c	25.0d	26.4C	0.19b	0.18b	0.18B	22.7c	25.2b	24.0C	0.54b	0.54b	0.54C
2 % Round up	29.4b	30.4a	29.9A	0.24a	0.24a	0.24A	26.4b	28.7a	27.6A	0.57a	0.57a	0.57A
Mean	27.1A	27.0A		0.20A	0.20A		22.8B	24.8A		0.54A	0.54A	
2008 season												
Control	22.4g	23.5f	23.0E	0.14f	0.16e	0.15D	19.4h	23.3ef	21.4D	0.52e	0.53de	0.52D
Hoeing	24.1f	26.8c	25.5D	0.19cd	0.18de	0.18C	22.4f	24.4e	23.4C	0.53de	0.54cd	0.53CD
Muching (B. plastic)	26.1d	32.9a	29.5B	0.26a	0.20cd	0.23A	26.8cd	36.0a	31.4A	0.52de	0.57ab	0.55B
Mulching (B. leaves)	25.3e	30.1b	27.7C	0.22b	0.19cd	0.21B	26.2d	29.3b	27.8B	0.53de	0.55bc	0.54BC
2 % Round up	26.9c	33.4A	30.2A	0.27a	0.21bc	0.24A	28.1bc	36.2a	32.2A	0.56b	0.59a	0.58A
Mean	25.0B	29.3A		0.22A	0.19b		24.6B	29.8A		0.53B	0.56A	

Means followed by the same letter (s) is not significantly at 5 % level.

* (B. plastic)= black plastic sheet.

** (B. leaves)= banana leaves.

Table (7): Effect of some weed control methods on tree fruiting of Western Schley and Whichita pecan cvs., (2007 & 2008 seasons)

Treatment	Character	Fruit set (%)			Number of fruit /tree			Yield (kg/tree)		
		Western Schley	Whichita	Mean	Western Schley	Whichita	Mean	Western Schley	Whichita	Mean
2007 season										
Control		67.9g	69.8e	68.8E	489.9j	634.1e	562.0E	4.80h	6.60e	5.70D
Hoeing		68.8f	71.7d	70.2D	527.6i	654.6d	591.1D	5.40g	7.10d	6.30C
Muching (B. plastic)		70.2e	75.5b	72.9B	571.4g	752.2b	661.8B	6.50e	8.40b	7.50A
Mulching (B. leaves)		69.6e	74.6c	72.1C	556.9h	721.1c	639.0C	5.70f	8.00c	6.90B
2 % Round up		71.1d	76.7a	73.9A	607.2f	792.2a	699.7A	6.50e	8.80a	7.70A
Mean		69.5B	73.7A		550.6B	710.8A		5.80B	7.80A	
2008 season										
Control		74.5g	76.7f	75.6E	547.7g	676.6e	612.2E	5.60h	7.70e	6.60E
Hoeing		76.2f	78.9d	77.6D	639.3f	699.4d	669.4D	6.50g	7.90de	7.20D
Muching (B. plastic)		77.1e	83.0b	80.0B	671.9e	772.8b	722.4B	7.70de	10.00b	8.90B
Mulching (B. leaves)		76.4ef	81.5c	79.0C	645.1f	731.2c	688.2C	6.80f	8.60c	7.70C
2 % Round up		78.4d	84.5a	81.4A	702.3d	887.2a	794.8A	7.90d	10.30a	9.10A
Mean		76.5b	80.9A		641.3B	753.4A		6.90B	8.90A	

Means followed by the same letter (s) is not significantly at 5 % level.

* (B. plastic)= black plastic sheet.

** (B. leaves)= banana leaves.

Number of fruits per tree:

Data clearly show that Whichita cv. produced highest number of fruits/tree (710.8 & 753.4) in comparison with Western Schley cv. (550.6 & 641.3) in 2007 & 2008 seasons, respectively. Roundup 2 % induced highest values (699.7 & 794.8), followed by mulching with black plastic sheets (661.8 & 722.4). Mulching with banana leaves recorded (639 & 688.2) while hoeing treatment produced (591.1 & 669.4) whereas, unweeded check gave (562.0 & 612.2) in 2007 and 2008 seasons, respectively. Anyhow, all treatments of Whichita cv. were superior to analogous ones of Western Schley cv.

Yield (kg/tree).

It is obvious that Whichita cv. gave more yield kg/tree (7.8 & 8.9 kg) than Western Schley cv. (5.8 & 6.9 kgs.) in 2007 and 2008 seasons, respectively. 2 % Roundup and mulching by black plastic sheets induced the higher yield (7.7 & 9.1 kg) and (7.5 & 8.9kg) in comparison to other treatments, while the lower yield came from unweeded check (5.7 & 6.6 kg/tree). In addition, the treatments of Whichita cv. exerted higher yield than those Western Schley cv. in 2007 and 2008 seasons, respectively.

The obtained data of tree fruiting are in concomitant with the findings of **Marks, (1993)** on banana, who found that mulching with black plastic sheet or herbicides treatments increased yield.

Fruit quality:

Fresh fruit weight:

Whichita cv. produced heavier fresh fruits (11.1 & 11.8 g.) than Western Schley cv. (10.4 & 10.7 g.) during 2007 and 2008 seasons, respectively. Meanwhile, mulching by black plastic and 2 % Roundup induced heaviest fresh fruit weight without significant differences between each other during first season (11.1 & 11.2 g.), whereas Roundup induced slight increase in second one (11.8 g.) against (11.6 g.) for mulching by black plastic Besides, mulching banana leaves exerted (10.7 & 11.2 g.) followed by hoeing (10.6 & 10.9 g.). While, the least values came from control (10.1 & 10.8 g.). As for the interaction, fresh fruit weight affected significantly the interaction (cvs. X treatments), in this concern, all the combinations of Whichita cv. induced higher values than those of Western Schley cv. during 2007 and 2008 seasons (Table 9).

Curded fruit weight:

The obtained results behave in the same pattern as that of fresh fruit weight, whereas, Whichita cv. exerted higher values (4.1 & 5.3 g.) than

Western Schley cv. (3.5 & 4.2 g.) in 2007 and 2008 seasons, respectively. The tested weed control methods induced heavier curded fruits as compared with unweeded control. Both black plastic mulching and 2 % Roundup exerted similar effect (4.2, 4.2 & 5.1 & 5.1 g.), while banana leaves mulching recorded (3.8 & 4.6 g.) followed by hoeing (3.6 & 4.6 g.). Whereas, unweed control showed the least values (3.3 & 4.3 g.). Curded fruit weight affected significantly the interaction between cultivars and treatments. In this concern, all combinations of Whichita cv. were superior to those of Western Schley cv in Table (7).

Kernel weight:

The highest values of kernel weight induced by Whichita cv. (2.9 & 4.7 g.) in comparison with Western Schley c.v (2.7 % 3.3 g.) in 2007 & 2008 seasons respectively. The treatment of 2 % Roundup was superior to others (3.2 & 4.5 g.) followed by black plastic mulching (3.1 & 4.3 g.), followed by banana leaves mulching (2.9 & 4.0 g.), while unweeded control recorded the lowermost values (2.4 & 3.5 g.) during the two seasons of study. As for the interaction, the combinations of Whichita cv. exerted higher values than those of Western schley during the two seasons of study.

Kernel percentage:

Whichita cv. recorded higher values of kernel percentage (76.9 & 83.9%) in comparison to Western Schley cv. (72.7 & 81.0 %) in 2007 & 2008 seasons, respectively. All weed control methods increased kernel percentage, black plastic mulching or Roundup 2 % induced similar results (76.5 & 76.8 %) in first season, in the second season black plastic mulching was superior (84 %) to Roundup (83.7 %), where banana leaves mulching recorded (75.1 & 82.6) the hoeing recorded (73.5 & 81.9 %) meanwhile unweed control induced lowermost values (72.0 & 80.1 %). Besides, the interaction cvs. x treatments was significant, the combinations of Whichita cv. exerted higher values than those of Western schley during the two seasons of study.

Kernel moisture percentage:

It is obvious that kernels of Whichita cv. contain more moisture (5.3 & 4.5 %) than kernels of Western Schley (3.3 & 2.9 %) in 2007 & 2008 respectively. In first season weed control by hoeing exerted the highest kernel moisture percentage (4.8 %) whereas, the least value came from control (4.0%). Other methods produced similar values, while in second season hoeing induced the least values (3.2 %) whereas no significant differences were achieved among other methods of weed control. The concerning of interaction between cultivars and treatments all combinations of Whichita cv. induced higher values than those of Western Schley in Table (7).

Table (8): Effect of some weed control methods on fruit physical characteristics of Western Schley and Whichita pecan cvs., (2007 &

2008 seasons)

Characters Treatment	Fresh fruit weight (g.)			Curded fruit weight (g.)			Kernel weight (g.)			Kernel percentage			Kernel moisture (%)			Kernel oil (%)		
	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean	West. Schley	Whichita	Mean
2007 season																		
Control	9.8e	10.4d	10.1C	3.1g	3.4f	3.3D	2.3g	2.4f	2.4E	70.1f	73.9c	72.0D	3.0c	5.0b	4.0A	64.6f	70.4c	67.5D
Hoeing	10.2d	10.9bc	10.6B	3.4ef	3.7cd	3.6C	2.6e	2.6e	2.6D	71.3e	75.7b	73.5C	3.2c	6.4a	4.8A	66.8e	71.3bc	69.1C
Muching (B. plastic)	10.7c	11.4a	11.1A	3.8bc	4.5a	4.2A	3.0c	3.1b	3.1B	74.5c	78.6a	76.5A	3.5c	5.1b	4.3A	68.8d	73.0a	70.9AB
Mulching (B. leaves)	10.4d	11.1b	10.7B	3.5d-f	4.1b	3.8B	2.8d	3.0c	2.9C	72.5d	77.7a	75.1B	3.3c	5.0b	4.1A	68.5d	72.0b	70.2B
2 % Roundup	10.8c	11.5a	11.2A	3.7c-e	4.7a	4.2A	3.0c	3.4a	3.2A	74.9bc	78.7a	76.8A	3.6c	5.1b	4.4A	68.9d	73.4a	71.2A
Mean	10.4B	11.1A		3.5B	4.1A		2.7B	2.9A		72.7B	76.9A		3.3B	5.3A		67.5B	72.0A	
2008 season																		
Control	10.2h	11.3e	10.8E	3.7f	4.8c	4.3C	2.9h	4.1d	3.5E	78.1e	82.1c	80.1D	2.9cd	4.8a	3.8A	64.0e	69.4c	66.7C
Hoeing	10.2h	11.6d	10.9D	4.0e	5.2b	4.6B	3.0h	4.4c	3.7D	80.5d	83.4b	81.9C	2.7d	3.6b	3.2B	65.9d	71.2b	68.5B
Muching (B. plastic)	11.1f	12.1b	11.6B	4.6d	5.5a	5.1A	3.7f	4.9b	4.3B	82.4c	85.6a	84.0A	3.0c	4.7a	3.8A	68.6c	72.9a	70.8A
Mulching (B. leaves)	10.6g	11.9c	11.2C	4.2e	5.1b	4.6B	3.2g	4.8b	4.0C	81.5c	83.7b	82.6B	2.9c	4.6a	3.8A	66.6d	71.3b	69.0B
2 % Roundup	11.3e	12.3a	11.8A	4.5d	5.6a	5.1A	3.8e	5.1a	4.5A	82.4c	84.9a	83.7A	3.0c	4.6a	3.8A	69.1c	73.8a	71.4A
Mean	10.7B	11.8A		4.2B	5.3A		3.3B	4.7A		81.0B	83.9A		2.9B	4.5A		66.8B	71.7A	

Means followed by the same letter (s) is not significantly at 5 % level.

* (B. plastic)= black plastic sheet.

** (B. leaves)= banana leaves.

Kernel oil percentage:

Kernels of Whichita cv. has more oil (72.0 & 71.7 %) than those of Western Schley cv. (67.5 & 66.8%) in 2007 & 2008 seasons respectively. During the two seasons of study Roundup 2 % was superior (71.2 & 71.4 %) to other treatments, followed by black plastic mulching (70.9 & 70.8 %), followed by banana leaves mulching (70.2 & 69.0 %), followed by hoeing (69.1 & 68.5 %) while, unweeded control recorded (67.5 & 66.7 %). As for the interaction between cultivars and treatments, all combinations the corresponding ones Whichita cv. in Table (7).

Results of fruit quality are in the line with those of **Sinbel *et al.*, (1997)** and **Abou Sayed-Ahmed (2005)** on Washington navel orange and **El-Kholey and Salem (2004)** on banana. They found that herbicides or black plastic mulching improved fruit quality parameters.

- Economic evaluation of the effect of weed control on pecan.

Data in Table (9) shows that the effect of weed control methods for pecan on net benefit during 2007 and 2008 seasons Roundup gave highest net benefit by (3750 and 475) in first and second season, respectively followed: mulching with black plastic sheets, mulching with banana leaves and hand hoeing.

Table (9): Economic evaluation of the effect of weed control on pecan yield.

Treatments	2007 season					2008 season				
	Mean yield kg/fed.	Increase of yield (kg/fed)	Gross income £/fed.	Total costs £/fed	Gross margin £/fed	Mean yield kg/fed.	Increase of yield (kg/fed)	Gross income £/fed.	Total costs £/fed	Gross margin £/fed
Control	399	-	-	-	-	462	-	-	-	-
Hoeing	441	42	1260	800	460	504	42	1260	900	360
Mulching (B. plastic)	525	126	3780	504	3276	623	161	4830	546	4284
Mulching (B. leaves)	483	84	2520	600	1920	539	77	2316	700	1610
2 % Roundup	539	140	4200	450	3750	637	175	5250	500	4750

Conclusion

It can be concluded that either Roundup or both mulching by black plastic sheets and banana leaves as alternative treatment for weed control. Mulching with black plastic sheets and banana leaves are considered organic substitute of instead of the herbicides and can be recommended for controlling perennial weeds in gardens.

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الملخص العربى

تأثير بعض طرق مكافحة الحشائش على نمو وإثمار صنفي البيكان

Western schely و Whichita

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أجريت هذه الدراسة خلال الموسمين المتتاليين 2008/2007 على أشجار البيكان صنفى Whichita و Western schely فى أرض طميية منزرعة على مسافة 7 × 7 م وتروى بالغمر بمزرعة محطة بحوث البساتين بالقناطر الخيرية - محافظة القليوبية لاختبار خمس طرق لمكافحة الحشائش هي: (1) الكنترول، (2) العزيق 3 مرات بفاصل شهر بينها، (3) التغطية بأفرخ البلاستيك الأسود 80 مللى ميكرون، (4) التغطية بأوراق الموز، (5) الرش بالراوند أب بمعدل 4 لتر/فدان (2 %).

وقد أوضحت أهم النتائج ما يلى:-

- لم تؤثر الأصناف على الحشائش بينما كان صنف Whichita أكثر استجابة بخصوص النمو الخضرى والمحصول وصفات الجودة.

- جميع طرق مكافحة الحشائش أدت إلى تأثير إيجابى فى مكافحة الحشائش وإلى زيادة محصول البيكان وتحسين صفات جودة الثمار (وزن الثمرة - وزن اللحم - والنسبة المئوية للحم - ونسبة الزيت بالثمرة وزيادة صفات النمو الخضرى (مساحة الورقة - الوزن الجاف للورقة - طول وعرض الفرع). وكانت معاملتى الرش بالراوند أب 2 % والتغطية بالبلاستيك الأسود الأكثر تأثيراً مقارنةً بباقى المعاملات

- أدت معاملات مكافحة الحشائش إلى زيادة المحتوى الميكروبي للتربة وكانت معاملة Roundup هي أكثر المعاملات تأثيراً فى هذا الصدد.

- توصى الدراسة باستخدام التغطية بالبلاستيك الأسود كمكافحة طبيعية للحشائش بمزارع البيكان للحفاظ على البيئة كبديل للمبيدات حيث أن الفروق بينهما (غير كبيرة). كما يمكن استخدام التغطية بأوراق الموز فى مكافحة الحشائش فى أشجار الفاكهة تحت ظروف الزراعة العضوية حيث أن أوراق الموز تستخدم كمادة عضوية تضاف للتربة.