Effect of Some Weed Control Treatments on Yield and Fruit Quality of Balady Mandarine Trees

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Abstract: This study was undertaken during 2016/17 and2017/18 on Balady mandarin trees grown into sour orange citrus root stock. This study consisted of the following twelve treatments Unweeded control, Devo, Devo followed by Round up, Dinimic, Dinimic followed by Select super, Roundup, Roundup twice, life line, Goal twice, mulching with (white and black polyethene) and hand hoening twice. The scope of this investigation was evaluating the efficacy of some single or combinations of pre-residual and postemergence herbicides, manual hoeing as conventional method techniques and plastic mulch as new alternative technique on weeds, and their effects on growth, yield and it components as compared with unweeded check in Balady mandarin orchards Economical study for the promised treatment was calculated. Controlling weeds by using different herbicides manual hoeing and mulching with white and black polyethylene sheets had a material effect on killing the weeds and improving yield and both physical and chemical of the fruits compared with unweeded control. Mulching especially with plastic sheet considerably surpassed the other treatments in controlling weeds and promoting productivity of the trees. For prolonged weed control of the total annual + perennial weeds species which include hard weed combination to kill, It is suggested to use mulching by black plastic sheets or Devo followed by Roundup, or Roundup twice as alternative to control total annual + perennial weeds and to to improve the productivity and fruit quality of Balady mandarin trees grown under middle Egypt conditions Net profit of one feddan previous promised treatment for over the control treatment reached 37825 LE and 43250 LE during both seasons, respectively.
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1. Introduction

There are many biotic and abiotic stresses which endanger mandarin orchard productivity especially weeds which fight with trees for nutrients, water and light etc. resulting in stressed plants and poor fruit quality and yield. Some researchers as **(Khan et al 2015)** mentioned that weeds also cause problems contributing to increase arthropod pest problems, interfering with cultural operations, and the long length of the critical periods of weed competition as a result of increase of weed density in kinnow mandarin.

The strategies to overcome weed problem in mandarin orchard in many European countries as Spanish is using conventional weed control tactics as cultivation and annual application of residual herbicides in the inter rows, as well as repeated use of glyphosate on weeds which are grown in soil surface between trees rows with avoiding herbicide drift which harm the trunk or leaves of the trees, or to use alternative technique as white or black polyethylene mulch **(Verdu and Mass, 2007).**

The natural weed flora classification which infest mandarin orchards is the stand point of weed control which based on life cycle into annuals and perennials and subclass classification into monocotyledons (grasses or grass – like weeds as sedges) and dicotyledonous (broad-leaf species).

For these reasons, the successful of weed control methods in mandarin orchards is to control the aboveground portions, prevent seed production of annual weeds and destroy of underground vegetative organs of perennial weeds.

Leaving different weeds in the various fruit crop orchards' resulted in adverse effects on growth, tree nutritional stratus, yield and fruit quality of the fruits **(Buker, 2005; Abouziena *et el*, 2008; Sharma *et el*, 2008; and Khan *et el*, 2015).**

Controlling weeds in the fruit orchards had advantages and disadvantages. The advantage of using herbicides is controlling the weeds, however the disadvantages is polluting our environment as well as reducing the productivity and fruit quality **(Franck *et el*, 2009; Singh, et el 2013; Hossaini and Dianat 2014; Futsh *et el*, 2016; and Martinelli, *et el* 2017).**

Mulching is responsible for controlling weeds and improving productivity of fruit crops **(Shirgure *et el* 2003; Verdu and Mass 2007 and Khan *et el* 2015).**

Pervious studies showed that hand hoeing is beneficial in controlling weeds and improving productivity of fruit crops **(Khan *et el* 2015; and Futch *et el*,2016**)

Thus, the scope of this investigation was to evaluate the efficacy of some single or combinations of pre-residual and post emergence herbicides, manual hoeing as conventional methods techniques and plastic mulch as new alternative technique on weeds, and their effects on growth, yield and its components as compared with unweeded check in Balady mandarin orchards.

2. Materials and Methods

Two field experiments were conducted during two consecutive experimental 2016/17 and 2017/18 seasons in uniform in vigour ninety six 10- years old Balady mandarin (*Citrus reticulata* L. Blanco) which spaced at 5X5 meters apart at Mallawy Research, Station which located at Minia Governorate (about 300 km southern Cairo), In which weeds were naturally infested with weeds. Plot size was (4X9 meter) and contained two trees. The soil of the orchard field was well drained with clay texture with a water table more than two meters depth. Suface irrigation system was carried out using Nile water. Soil analysis was done according to ***Wilde et al.* (1985)** and the obtained data are shown in Table (1).

The experimental design was a randomized complete block design (RCBD) with four replicates each contained two trees Horticultural practices such as fertilization (with manure was added at the mid. of Jan.2016,600 kg ammonium nitrate (33.5 % N) 600kg potassium sulphate (48 % K2O) and 600 Kg calcium superphosphate (15.5 % P2O5) perfed, irrigation, as well as insect and disease control were carried out as normal.

Table (1) Physical and chemical properties of the experimental soils at 2016/17 and 2017/18seasons

Parameters	2016	2017
Physical Properties		
Sand (%)	9.1	8.9
Silt (%)	26.5	30.2
Clay (%)	73.5	69.2
Textural grade	clay	clay
Chemical analysis		
pH soil- water suspension (1:2.5)	8.15	8.24
Organicmatter (%)	1.6	1.8
Ca++(%)	6.97	7.15
Mg+(%)	1.76	1.90
K+(%)	0.89	0.87
Na+(%)	0.25	0.28
CaCO3(%)	1.24	1.32
Fe (ppm)	1390	1450
Zn (ppm)	45	50
Mn (ppm)	450	480
Available N (ppm)	18.2	17.2
Available P (ppm)	6.2	7.85
Available K (ppm)	360	343

Table (2) Dates of agricultural practices

NO	Treatments	season	
		2016	2017
1	General hoeing for the whole experiments Experimental beginning	15/3/2016	1/4/2017
2	Pre-emargence herbicides application	27/3/2016	15/4/2017
3	Covering with black or white plastic sheet.	27/3/2016	15/4/2017
4	Early post- emergence herbicide appliction.	26/4/2016	17/5/2017
5	Late post -emergance herbicide application.	1/6/2016	20/6/2017
6	Plastic removal	25/5/2016	10/6/2017
7	First hoeing	14/4/2016	5/5/2017
8	Second hoing	21/5/2016	10/6/2017

Each field experiment included the follwing twelve weed control treatments arranged as follows:

1-Unweeded check (control).

2-Diuron which are known commercially as "Devo 90 % Df" used at 2.5kg./faddan. applied on soil surface after general cultivation and before first irrgation immediately (pre-emergence).

3-Diuron used at 2.5kg./fed. applied as, followed by Glyphosateisopropylammonium which is known commercially as "Round up 48 % WSC" at 2.5L./fed applied as post weed emergence at 30 days experimental biginng 4-Amicarbazone which are known commercially as "Dinamic 70 % WG" used at 700g/fed, applied as PRE.

5-Amicarbazone which are known commercially as "Dinamic 70 % WG" at700g/fed, applied as PRE followed by clethodim which is known commercially as "Select super 12.5 % EC" at 1L/ fed. applied as post emergence.

6-Glyphosate-isopropylammonium which is known commercially as "Round up 48 % WSC" at 2.5L./fed. applied as post emergence.

7-Glyphosate-isopropylammonium which is known commercially as "Round up 48 % WSC" at 2.5L./fed. applied as post emergence twice at 30 and 60days from the general cultivation.

8-Glufosinate ammonium which is known commercially as "life line 28 % SL" used at1.5L./fed. applied as post emergence twice at 30 and 60days from the general cultivation as post emergence (Post).

9-Oxyflurofen which is known commercially as "Goal 4F 48 % SC" used at 1L./fed. applied as post emergence twice at 30 and 60days from the general cultivation.

10-Mulching with the white polyethylene (80 micron thickness.) to 60 days from the general cultivation.

11-Mulching by the black plastic which made by polyethelene with 80 micron thickness. to 60 days from the general winter cultivation.

12-Hoeing twice at 30 and 60 days the general cultivation.

Each treatment was replicated for times, two trees per each herbicides were applied after general cultivation, before irrigation as pre–emergence (PRE) and post emergence at 30 and 60 days application from beginning of experimental at March (POST) using "Knapsack hand sprayer CP3 20 liter" equipped with one nozzle even flat fan calibrated to deliver spray volume of 200 L/fed. to herbicides (diuron, amicarbazone, clethodim, oxyflurofen and glufosinate ammonium) and by Knapsack hand sprayer CP3 20 liter" equipped with one nozzle TK1 calibrated to deliver spray volume of 125 L/fed. to herbicide glyphosate isopropyl ammonium.

Mulches were applied to plots during the last week of March and the second week of April for two months periods from cultivation in the 1st and 2nd seasons respictively.

Recorded data:

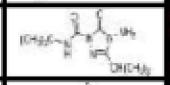
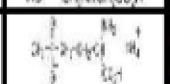
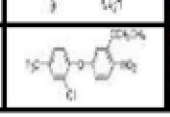
1. On weeds:

Samples of weeds from one square meter were hand pulled radomly at 75 days post the first irrigation from each plot and identified into the species according to **Tacholm- Vivi (1974)**), then separated into two groups i.e. annual weeds (broad – leaved and grassy weeds), perennial weeds (broad – leaved and grassy weeds). The number of weed/m2 and fresh weight of each weed species within each group (g/m2) was recorded, and the dry weight of each group (g/m2) was recorded. Weed control %(WC%) was determined depending on the reduction on numbers of weeds in the treatments than numbers of un treated check or the reduction on the fresh weight of the treatments than the fresh weight of un treated check as follow:

$$WC\ \% = \frac{W\ NC - WNT}{WNC} X\ 100;$$

Where,
WC = Weed control;
WNC = Weed number in control;
WNT= Weed number in a treatment.

Table (3) Common, trade, chemical name, chemical group and mechanism of action of herbicides

NO	*Trade name	Common name	Chemical group	Chemical name	Chemical formula	**Mechanism of action
1	Devo.	Diuron	Urea	N'-(3,4-dichlorophenyl) -N,N-dimethylurea.		**Photosystem II inhibitors:** Inhibit photosynthesis by binding to the QB-binding niche on the D1 protein of the photosystem II complex in chloroplast thylakoid membranes.
7	Dinamic.	Amicarbazone.	Triazolinone	4-amino-N-(1,1-dimethylethyl)-4,5-dihydro-3-(1-methylethyl)-5 -oxo-1H-1,2,4-triazole-1-carboxamide		**Photosystem II inhibitors:** Inhibit photosynthesis by binding to the QB-binding niche on the D1 protein of the photosystem II complex in chloroplast thylakoid membranes
7	Select super.	Clethodim.	Cyclohexanedione oxime.	2-[(1E)-1-[[(2E)-3-chloro-2-propen -1-yl] oxy] imino] propyl]-5-[2-(ethylthio] propyl]-3-hydroxy-2-cyclohexen-1-one.		**Acetyl CoA Carboxylase (ACCase) Inhibitors:** Inhibit the enzyme acetylCoA carboxylase (ACCase), the enzyme catalyzing the first committed step in de novo fatty acid.
9	Round up.	Glyphosate-isopropylammonium.	Glycines	N-(phosphonomethyl) glycine.		**Enolpyruvyl Shikimate–Phosphate (EPSP) Synthase Inhibitors:** Inhibit 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase which produces EPSP from shikimate-3-phosphate and phosphoenolpyruvate in the shikimic acid pathway.
10	Life line.	Glufosinate-ammonium	Phosphinic acid.	Ammonium (±)-2-amino-4- (hydroxymethylphosphinyl)butanoate.		**Glutamine Synthetase Inhibitors** Inhibit activity of glutamine synthetase, the enzyme that converts glutamate and ammonia to glutamine. Accumulation of ammonia in the plant destroys cells and directly inhibits photosystem I and photosystem II reactions.
14	Goal 4F.	Oxyfluorfen	Diphenyl ether.	2-chloro-1-(3-ethoxy-4-nitrophenoxy) -4-(trifluoromethyl) benzene.		**Protoporphyrinogen Oxidase (PPG oxidase or Protox) Inhibitors:** that appear to inhibit protoporphyrinogen oxidase (PPG oxidase or Protox), an enzyme of chlorophyll and heme biosynthesis catalyzing the oxidation of protoporphyrinogen IX (PPGIX) to protoporphyrin IX (PPIX)...

* pesticides manual (2012)

**Weed Science Society of America (WSSA) classification.

$$WC\ \% = \frac{WF\ C - WFT}{WFC} X\ 100;$$

Where,

WC = Weed control;

WFC = Weed fresh wieght in control;

WFT = Weed fresh wieght in a treatment.

Weed species susceptibility were measured by the reduction in fresh weight of weed species of the treatment than of the unweeded check according to Fransis and Talbert (1977) where:-

T=tolerant (> 60% weed control).

MT= modrate tolerant (60 – 79 % weed control)

MS= modrate susceptabile (79 – 89 % weed control)

S=susceptabile (99 – 100 % weed control)

2- Measurements of vegetative growth characters:

Ten new shoots from spring growth cycle were chosen on the four labeled branches on the four main directions on the bases of four shoots/ branch for measuring the following growth aspects:-

1. Shoot length (cm)
2. Number of leaves /Shoot
3. Leaf area (cm2), Twenty mature leaves of a seven months age from the non fruiting were taken from the Middle parts of the shoots of the Spring flush taken from each replication to measure the leaf area according to **Ahmed and Morsy (1999)** using the following formula:

Leaf area (cm)2 =(0.46 (max. length of leaf x max. width of leaf) + 1.81) then averages were estimated.

3- Measurements of plant pigments:

One month after the last treatment samples of five mature fresh leaves from Spring growth cycle (last week of August) per each replicate were extracted in 95% methanol alcohol and determined according to **(Mackinney, 1941).** A known weight of fresh leaves (0.5g) from different plants in each tree was macerated in 10 ml methanol overnight in the dark into a test tube covered by aluminum foil. Read the absorbance of this solution at wave length (λ) of 650 665 nm against the solvent (methanol) blank using Milton Roy spactronic 601 spectrophotometer. Calculate the amount of chlorophyll presented in the extract and Total Carotenoids at 452.5nm (mg chlorophyll per g tissue) using the following equations:

$$\text{Chlorophyll a} = (16.5 \times E665) - (8.3 \times E650)$$

$$\text{Chlorophyll b} = (33.8 \times E650) - (12.5 \times E665)$$

$$\text{Chlorophyll (mg/g fresh weight)} = \frac{\text{Chlorophyll content} \times \text{volume of methanol}}{1000 \times \text{weight of sample (g)}}$$

$$\text{TotalCarotenes} = (4.2 \times E\ 452.5) - (0.0264 \times \text{Chlorophyll a}) - (0.496 \times \text{Chlorophyll b})$$

$$\text{Carotene (mg/g fresh weight)} = \frac{\text{Chlorophyll content} \times \text{volume of methanol}}{1000 \times \text{weight of sample (g)}}$$

4 - Yield and its components

Harvesting was done in the first week of January during both seasons, the number of fruits per tree was counted and then the yield per tree was calculated and then calculated the yield per faddan (tons). Fruits were harvested when SSC/acid ratio reached to 8- 12, according by **El-Shereif et al (2017**).

Measurements

Fruit physical characteristics:

Samples of 10 fruits/tree were collected at harvesting time from each treatment (five fruit from each tree) to determine some fruit physical characteristics such as 1-Avarage fruit weight (g) and dimensions (height and diameter in cm) by using vernier caliper. fruit shape was estimated by dividing height by diameter fruit.

2-Fruit peel weight % 3- Fruit peel thickness (cm)

Fruit chemical characteristics:

1-Total soluble solids (T.S.S. %) of the fruit was determined by using hand refractometer.

2-Total acidity (%) (as g citric acid/100ml juice) by titration against 0.1N sodium hydroxide (NaoH) using phenolphthalein (ph Ph) as indicator **(A.O.A.C, 2000).**

3-Total soluble solids/acid ratio was calculated from the values of total soluble solids divided by values of total acids.

4-Ascorbic acid (Vitamin C) was calculated as mg/100 ml juice according to **(A.O.A.C, 2000).**

5- Percentage of total and reducing sugers were determined according to **Lane and Eynon (1965), (A,O,A,C,2000).**

Statistical analysis

All data were statistically analyzed according to technique of Analysis of Variance (ANOVA) for the randomized complete block design with four replications two trees per each as mentioned by **(Gomez and Gomez 1984)**,. Duncan's Multiple Range Test (DMRT) was used for comparing treatment means **(Duncan,1955 and Mead et el 1993).**Treatment means were compared using New L.S.D at 5% parameter.

3. Results and Discussion

1-Effect of weed control treatments on weeds:

Table (4) show that weed flora community which infested experimental mandarin fields in both seasons was consisted of nine weed species in both

seasons were classified according to its life cycle as annual or perennial weeds or sub classes to monocotyledonous and dicotyledonous species according to **Tacholm- Vivi (1974)** as follow:

1- Annual grassees namely *Dinebra retroflexa, Vahl* (Viber grass), *Echinochloa colonum* L (Jungle rice) and *Brachiaria reptans, L* (Signal grass).

2-The annual broad leaf species *Portulaca oleracea*, L (purslane),, *Trianthema portulacastrum* L (desert horse purslane) and *Euphorbia geniculata*, Ortega (Mexican fire plant spurge).

3- Perennial grasses on *Cynodon daclyloan* (Bermuda grass).

4-Perennial sedges: *Cyperus rotundus* (purple nutsedge). 5-Perennial broad leaf weeds: *Convolvulus. arvensis* (field bindweed).

Table (4) Family, scientific, common, Arabic names for weeds recorded in mandarin orchard experimental feilds during 2016/17 and 2017/18 season.

No	Family	Scientific name	Common name	Arabic name	Life cycle	Sub classes
1	Poaceae	*Brachiaria reptans*,L	Signal grass	حشيشـــة الارانـب	Annual	monocotyledonous
2	Poaceae	*Echinochloa colonum* L	Jungle rice	ركبـــه أبـو	Annual	monocotyledonous
3	Poaceae	*Dinebra Retroflexa,* Vahl	Viber grass	النمـر نجيـل	Annual	monocotyledonous
4	Aizoaceae	*Trianthema portulacastrum,*L	desert horsepurslane	أفـــرنجي رجلـه	Annual	dicotyledonous
5	Portulacaceae	*Portulaca oleracea,L*	common purslane	رجلـه	Annual	monocotyledonous
6	Euphorbiaceae	*Euphorbia geniculata,*Ortega	Mexican Fire plant Spurge	شـــربه	Annual	monocotyledonous
7	Poaceae	*Cynodon dactylon,*L	Bermuda grass	البلـــدى النجيـــل	Perennial	monocotyledonous
8	Cyperace	*Cyperus rotundus,*L	purple nut sedge	سـعد	Perennial	monocotyledonous
9	Convolvulaceae	***Convolvulus arvensis,***L	field bindweed	معمر عليـــق	Perennial	dicotyledonous

2- Effect of weed control treatments on numbers of weeds /m2 at 75 days from herbicide application:-

The effect of various weed control treatments on the number of weeds/m2of various categories at the second survey (75 Days) in the 1st and 2nd seasons are presented in table (5) All weed control treatments caused statistically significant reduction on number of different weed categories /m2 in both seasons. Treatments of herbicidal combination (Devo followed by Roundup and Dinimic followed by Select super, application Roundup twice, Plastic mulches (white and black) gave the highest suppressing reduction of number of annual narrow leaf weed/m2 by 100,100 and 100%, and the single herbicide Devo also gave same highest effectiveness by percentage (98.6%) in the first season and by percentage (93.8, 89.9. 91.5, 83.3, 95.9%) as compared with unweeded check in the second season, respectively.

Table (5) Effect of weed control treatments on numbers of annual narrowleaf, annual broadleaf, perennial weed and the total weeds number at 75 days from during 2016/17and 2017/18 seasons.

No	Treat	rate	Time of appliction	annual Narrow leaf weed. 2016/17 g/m²	Controlling %	2017/18 g/m²	Controlling %	annual broad leaf weed 2016/17 g/m²	Controlling %	2017/18 g/m²	Controlling %	Total annual weeds 2016/17 g/m²	Controlling %	2017/18 g/m²	Controlling %	Perennial narrow leaf weed 2016/17 g/m²	Controlling	2016/2017 g/m²	Controlling %
1	Control			54.00 a	0.0	76.50 a	0.0	79.00 a	0.00	89.00 a	0.0	133.00 a	0.0	165.50 a	**0.00**	21.25 a	0.00	56.00 a	0.00
2	Devo	2.5kg	PRE	0.75 d	98.6	1.00 c	98.7	1.5 d	98.10	5.75 d	93.56	2.25 ef	98.3	6.75 f	95.9	18.25 B	14.12	51.8 a	8.00
3	Devo+ Round	2.5kg+2.5L	PRE+POST	0.00 d	100	4.75 c	93.8	0.0 d	100.00	4.75 cd	94.68	0.00 f	100	9.50 ef	94.3	00.00 D	100.00	4.5 d	92.00
4	Dinimic	700g	PRE	45.30 b	10.6	41.00 b	45.4	4.25 d	94.62	8 cd	91.01	52.50 b	60.5	49.00 c	70.27	18.25 B	14.12	41.3 ab	26.25
5	Diminic +Select	700g+1L	PRE+POST	0.00 d	100	4.75 c	89.9	7.25 cd	90.82	14.3 cd	84.03	7.25 d-f	94.5	22.00 d-f	86.7	10.25 bc	51.76	32.3 bc	42.32
6	Roundup	2.5L	POST	16.8 c	69	40.25 b	47.4	17.25 b	78.16	29.8 b	66.67	34.00 c	74.4	70.00 b	57.77	0.00 D	100.00	1.50 d	97.33
7	Round twice	2.5L+2.5L	POST+ POST	0.00 d	100	6.50 c	91.5	4.5 d	94.30	9.5 d	89.36	4.50 d-f	96.6	16.00 d-f	90.4	0.00 D	100.00	0.50 d	99.11
8	Life line twice	1.5L+1.5L	POST+ POST	4.50 d	91.7	4.50 c	94.2	6.75 d	91.46	11.3 d	87.39	11.25 de	91.5	15.75 d-f	90.5	3.75 D	82.35	3.50 d	93.78
9	Goal twice	1L+1L	POST+ POST	4.50 d	91.7	8.25 c	89.2	4.5 d	94.30	4.25 d	95.24	9.00 d-f	93.2	12.50 d-f	92.5	15.75 B	25.88	33.00 bc	41.33
10	White plastic	80microl thickness		0.00 d	100	12.75 c	83.3	0 d	100.00	14.3 cd	84.03	0.00 f	100	27.00 de	83.7	0.00 D	100.00	6.75 d	88.00
11	Black plastic	80microthickness		0.00 d	100	3.50 c	95.4	0 d	100.00	1.00 d	98.88	0.00 f	100	4.50 f	97.3	0.00 D	100.00	2.25 d	96.00
12	Hoeing twice	At 30and 60 days		2.50 d	95.4	14.75 c	80.7	11.25 bc	85.76	18.5 c	79.27	13.75 d	89.7	33.25 cd	79.9	7.75 c	63.53	16 cd	71.56
LSD 0.05				5.74		14.76		8.96		7.48		9.7617		19.48		11.56		15.71	
				Perennial broad leaf weed				Total perennial				Total weed							
1	Control			12.25 a	0.00	19.00 a	0.00	33.50 A	0.00	75.00 a	0.00	167.75 a	0.00	241.00 z	0.00				
2	Devo	2.5kg	PRE	8.50 b	30.6	7.75 a	59.2	26.75 Ab	20.15	59.5 a	20.93	29.00 c	82.6	68.00 c	61.2				
3	Devo+ Round	2.5kg+2.5L	PRE+POST	0.00 c	100	0.00 c	100	00.0 g	100.00	4.5 d	94.02	0.00 d	100	14.00 ef	91.8				
4	Dinimic	700g	PRE	8.75 b	28.6	8.50 a	55.3	27.00 cb	19.40	49.8 a	16.22	79.5 b	52.3	108.00 b	55.18				
5	Diminic +Select	700g+1L	PRE+POST	6.50 b	46.93	10.00 a	47.4	16.75 cd	50.00	42.3 ab	28.9	24.00 cd	85.69	64.3 cd	62				
6	Roundup	2.5L	POST	0.00 c	100	0.00 c	100	0.00 g	100.00	1.5 d	98.01	34.00 c	79.6	71.5 c	59				
7	Round twice	2.5L+2.5L	POST+ POST	0.00 c	100	0.00 c	100	0.00 g	100.00	0.5 d	99.34	4.50 de	97.3	16.5 ef	90.4				
8	Life line twice	1.5L+1.5L	POST+ POST	0.00 c	100	0.00 c	100	3.75 g	88.81	3.5 d	95.35	15.00 e	91	19.3 ef	89.3				
9	Goal twice	1L+1L	POST+ POST	0.00 c	100	0.00 c	100	15.75 ef	52.99	33 bc	56.15	24.75 cd	85.1	45.5 d	74.3				
10	White plastic	80microl thickness		0.00 c	100	0.00 c	100	0.00 fg	100.00	6.75 d	91.03	0.00 d	100	33.8 de	82.5				
11	Black plastic	80microthickness		0.00 c	100	0.00 c	100	0.00 g	100.00	2.25 d	97.01	0.00 d	100	6.75 f	93.1				
12	Hoeing twice	At 30and 60 days		2.50 c	79.6	0.00 c	100	10.25 ed	69.40	16 cd	78.74	24.00 cd	85.6	49.3 cd	68.7				
LSD 0.05				3.04		4.45		13.98		26.00		11.01		22.73					

With respect to the effect on treatments on number of annual broadleaf weeds /m2 Devo followed by Round up followed by), plastic mulches (White and Black) and Devo gave 100,100,100 and98.1 % in the first season and by 93.6, 84.03and 98.88and 93.56%. in the second season, respectively. as compared with unweeded check. All other weed control treatments gave reduction control percentage in number of annual broad leaf weed /m2by more than 90% in the first season and by 89% in the second season except treatments Roundup alone and hoeing twice gave control percentages less than 90% control in the first and second seasons, respectively. as compared with unweeded check.

As the effect of weed control treatments on number of total annual weeds /m2 the same trend as abovementioned results where the herbicides combination Devo followed by Roundup and mulches by (white and black plastic) gave the highest percentage of reduction on number of annual total weed /m2 which estimated by 100% in the first season and by 99.3, 83.1, 97.3% in the second season than of untreated respectively. Treatments of Roundup application twice Dinimic followed by Select super, Goal twice, life line twice come in the second rank by reduction percentages 96.6, 94.5, 93.2 and 91.5%.

As compared with unweeded check in the first season and with respective reduction percentages by 90.4, 86.7, 92.5 and 90.5% in the second season and Dinimic treatments gave the lowest reduction percentage in number of total annual weed /m2 in the both seasons.

Table (6) Weed species susceptibility in mandarin fields to weed control treatments at 75 days during 2016/17and2017/2018 seasons

No	Treat	Rate/fed	Time of appliction	Dinebra Retroflexa, Vahl		Echinochloa colonum L		Brachiaria Reptans,L		Portulaca oleracea,L		Trianthema portulacastrum,L	
				2016/17	2017/18	2016/17	2017/18	2016/17	2017/18	2016/17	2017/18	2016/17	2017/18
1	Control			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Devo	2.5kg	PRE	100.00 S	100.00 S	95.64 S	98.61 S	100.00 S	100.00 S	98.66 S	96.64 S	95.72 S	98.64 S
3	Devo+ Round	2.5kg+2.5L	PRE+POST	100.00 S	100.00 S	100.005	95.41 S	100.00 S	93.48 S	100.00S	96.64 S	100.00S	97.96 S
4	Dinimic	700g	PRE	32.73 T	46.23 T	39.37 T	58.81 T	19.78 T	58.48 T	93.20 S	87.77 MS	90.58 S	100.00S
5	Dinimic +Select	700g+1L	PRE+POST	100.00 S	100.00 S	100.005	90.99 MS	100.00 S	87.90 MS	86.96 MS	87.34 MS	83.21 MS	93.96 S
6	Roundup	2.5L	POST	80.16 MS	78.36 MT	74.96 MT	83.03 MS	68.67 MT	75.41 MT	73.22 MT	82.90 MS	82.73 MS	83.30 MS
7	Round twice	2.5L+2.5L	POST+ POST	100.00 S	100.00 S	100.005	98.05 S	100.00 S	96.78 S	88.90 S	95.70 S	100.00S	95.81 S
8	Life line twice	1.5L+1.5L	POST+ POST	100.00 S	100.00 S	87.64 MS	96.88 S	94.88 S	98.18 S	83.30 MS	95.91 S	100.00S	94.58 S
9	Goal twice	1L+1L	POST+ POST	100.00 S	100.00 S	95.90 S	88.10 MS	89.02 MS	99.20 S	91.76 S	96.38 S	100.00S	100.00S
10	White plastic	80microl thickness		100.00 S	99.02 S	100.005	88.59 MS	100.00 S	89.89 S	100.00S	95.67 S	100.00S	89.79 S
11	Black plastic	80microlthickness		100.00 S	100.00 S	100.005	98.10 S	100.00 S	98.91 S	100.00S	100.00 S	100.00S	98.64 S
12	Hoeing twice	At30 and 60 days		94.58 S	98.60 S	93.59 S	84.86 MS	100.00 S	95.20 S	96.48 S	79.40 MT	85.92 MS	89.69 S
				Euphorbia geniculata ,Ortega		*Cynodon dactylon* L		*Cyperus rotundus*,L		*Convolvulus arvensis*,L			
1	Control			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		
2	Devo	2.5kg	PRE	97.05 S	77.42 MT	39.53 T	26.91 T	51.02 T	56.91 T	12.34 T	46.40 T		
3	Devo+ Round	2.5kg+2.5L	PRE+POST	100.00 S	100.00 S	100.00S	98.00 S	84.03 MS	93.81 S	100.00S	100.00 S		
4	Dinimic	700g	PRE	100.00 S	100.00 S	10.65 T	11.32 T	25.67 T	39.35 T	7.37 T	36.48 T		
5	Dinimic +Select	700g+1L	PRE+POST	99.53 S	92.24 S	100.00S	93.59 S	0.91 T	2.72 T	100.00S	30.55 T		
6	Roundup	2.5L	POST	100.00 S	75.40 MT	100.00S	100.00S	95.21 S	96.62 S	100.00S	100.00 S		
7	Round twice	2.5L+2.5L	POST+ POST	100.00 S	85.84 MS	100.00S	100.00S	95.03 S	99.23 S	100.00S	100.00 S		
8	Life line twice	1.5L+1.5L	POST+ POST	100.00 S	100.00 S	92.81 S	100.00S	93.99 S	92.88 S	100.00S	100.00 S		
9	Goal twice	1L+1L	POST+ POST	100.00 S	100.00 S	63.16 MT	100.00S	28.44 T	45.29 T	100.00S	100.00 S		
10	White plastic	80microl thickness		100.00 S	81.61 MS	100.00S	100.00S	79.63 MT	77.15 MT	100.00S	100.00 S		
11	Black plastic	80microlthickness		100.00 S	100.00 S	100.00S	100.00S	94.49 S	96.24 S	100.00S	100.00 S		
12	Hoeing twice	At30 and 60 days		100.00 S	93.07 S	75.38 MT	73.63 MT	68.76 MT	83.82 MS	90.06 S	100.00 S		

T=tolerant (> 60% weed control) MT= modrate tolerant (60 –79 % weed control) MS= modrate susceptabil (99 – 99 % weed control) S=suscepptabil (90 – 100 % weed control)

Mulching treatments with white and black plastic, Devo followed by Roundup, Roundup as single and Roundup applying twice had better performance against number of perennial weeds which reduced number of narrow perennial weed /m2 by 100,100,100,100,100 and 100% control percent in the first season and by 88, 96, 92, 97.33 and 99.4 % in the second season, respectively, and life line have good efficiency in both seasons which estimated by 82.35 and 93.75% in weed control treatments 100% percentage efficiency of reduced number of broad perennial weed /m2 except Devo, Dinimic and hoeing twice in the first season, and expect Devo, Dinimic, Dinimic followed by select in the second season, For the effect of weed control treatments on number of total perennial weeds /m2, sequence herbicides application of Devo followed by Roundup, Roundup alone and twice application and mulches with white and black plastic were the most efficient in reducing the number of total perennial weeds /m2 by 100,100,100,100and100% in the first season and by 94.2, 98.01, 99.39, 91.03 and 97.01 in the second season and Life line herbicide ranked in second category after those treatments by 88.81 and 98.35%

control in both seasons respectively, As for the effect of weed control treatments on total number weed /m2 the percentage of control, the highest weed control treatments can be arranged in descending order in first season as follows Devo + Round, white and black plastic and by (100, 100, 100, 97.3). Life line, hoeing twice and Goal by (99, 85.6 and 85.1%), in the second season the descending order were black plastic, Devo + Round, Round twice, life line, white plastic, Goal and hoeing twice by (93.1, 91.8, 90.4, 89.3, 82.5, 74 and 68.7%), respectively.

3- Weed species susceptibility to different weed control treatments:-

Data in Table (6) show that all weed species were in general cosidered susceptible (S) to use treatments, meanwhile annual weeds were tolerant to Dinimic (T) and perennial weeds were tolerant to Devo or Dinimic up till 75 days from starting from application of herbicidesor mulching treatments.

4- Effect of some weed control treatments on fresh weight (g/m2) at 75 days from application:-

Results in Table (7) declared that the efficacy of various weed control treatments either sole pre or post emergence herbicides or some herbicidal combination, and plastic mulches, hoeing twice treatments depending on its effect on the fresh weight of weeds (g/m2) on controlling annual narrow weeds can be arranged in descending order in 2017, which gave 100% control white plastic 100%, black plastic 100%, Devo followed by Roundup 100% Roundup twice 100%, meanwhile Dinimic gave the lowest value 29.5 in 2016/2017 season and Devo, black plastic mulch life line twice and Roundup twice in 2017/2018 season similar trend as in the first season. the highest controlling % for annual narrow leaf weeds were obtained by Devo 99.5%, black plastic 98.8% life line 98.1% Roundup twice 98.1%, Goal twice 95.2% hand weeding 92.1% in2017/18 seasons.

Table (7) Effect of weed control treatments on fresh weed of annual narrowleaf, annual broadleaf, perennial and total weed (g/m2) at 75 days from during 2016/17 and 2017/18 spring seasons.

No	Treat	Rate/fed	Time of appliction	annual Narrow leaf weed.				annual broad leaf weed				Total annual weeds				Perennial narrow leaf weed			
				2016/17		2017/18		2016/17		2017/18		2016/17		2017/18		2016/17		2016/2017	
				g/m^2	Controlling %	g/m^2	Controlling %	g/m^2	Controlling %	g/m^2	Controlling %	g/m^2	Controlling %	g/m^2	Controlling %	g/m^2	Controlling	g/m^2	Controlling %
1	Contro			555.25 a	0.0	777.15 a	0.0	681.70 a	0.0	785.05 a	0.0	1236.95 a	0.0	1562.20 a	0.0	383.13 a	0.0	404.08 a	0.0
2	Devo	2.5kg	PRE	7.45 d	98.7	4.08 d	99.5	16.40 c	97.6	17.63 de	95.23	23.85 de	98.1	21.70 c	97.4	210.93 c	44.9	250.48 c	38.0
3	Devo+ Round	2.5kg+2.5L	PRE+POST	0.00 d	100.0	33.75 d	95.7	0.00 c	100.0	35.17 de	97.36	0.00 e	100.0	68.92 c	96.5	28.83 e	92.5	14.35 f	96.4
4	Dinimic	700g	PRE	391.33 b	29.5	342.90 b	55.9	39.60 c	94.2	102.48 c	92.61	430.93 b	65.2	445.38 b	74.2	315.20 b	17.7	316.43 b	21.7
5	Dinimic +Select	700g+1L	PRE+POST	0.00 d	100.0	64.05 cd	91.8	74.65 bc	89.0	43.43 c-e	89.78	74.65 d	94.0	107.48 c	90.8	182.20 c	52.4	161.80 d	60.0
6	Roundup	2.5L	POST	144.90 c	73.9	163.70 c	78.9	124.40 b	81.8	173.78 b	76.4	269.30 c	78.2	337.48 b	77.7	8.65 e	97.7	5.05 f	98.8
7	Round twice	2.5L+2.5L	POST+ POST	0.00 d	100.0	15.75 d	98.0	40.20 c	94.1	36.83 de	94.71	40.20 de	96.8	52.58 c	96.3	8.98 e	97.7	1.15 f	99.7
8	Life line twice	1.5L+1.5L	POST+ POST	32.63 d	94.1	14.78 d	98.1	60.50 bc	91.1	41.45 c-e	95.94	93.13 d	92.5	56.23 c	97.0	25.43 e	93.4	10.65 f	97.4
9	Goal twice	1L+1L	POST+ POST	31.70 d	94.3	37.35 d	95.2	29.85 c	95.6	47.25 c-e	97.81	61.55 de	95.0	84.60 c	96.5	203.83 c	46.8	81.83 e	79.8
10	White plastic	80microl thickness		0.00 d	100.0	66.58 cd	91.4	0.00 c	100.0	63.55 c-e	92.49	0.00 e	100.0	130.13 c	92.0	36.78 e	90.4	34.18 ef	91.5
11	Black plastic	80micron thickness		0.00 d	100.0	8.98 d	98.8	0.00 c	100.0	3.08 e	99.6	0.00 e	100.0	12.05 c	99.2	9.95 e	97.4	5.63 f	98.6
12	Hoeing twice	at 30 and 60 days		19.60 d	96.5	61.70 cd	92.1	35.10 c	94.9	79.60 cd	83.83	54.70 de	95.6	141.30 c	88.0	106.28 d	72.3	91.33 e	77.4
LSD 0.05				45.72		106.1		72.86		55.61		65.21		122.7		64.14		58.37	

				Perennial broad leaf weed				Total perennial				Total weed			
1	Control			212.15 a	0.0	133.63 a	0.0	595.28 a	0.0	537.70 a	0.0	1832.23 a	0.0	2099.90 a	0.0
2	Devo	2.5kg	PRE	172.55 a	12.34	71.63 b	46.40	383.48 b	35.5	322.10 c	40.1	407.33 c	79.1	343.80 c	82.6
3	Devo+ Round	2.5kg+2.5L	PRE+POST	0.00 b	100	0.00 c	100	28.83 f	94.7	14.35 f	97.3	28.83 gh	98.4	83.27 e	96.7
4	Dinimic	700g	PRE	200.50 a	7.37	84.88 b	36.48	515.70 a	14.7	401.30 b	25.4	946.63 b	49.9	846.68 b	61.6
5	Dinimic +Select	700g+1L	PRE+POST	45.25 b	100	92.80 b	30.55	227.45 cd	66.2	254.60 d	52.7	302.10 c-e	85.5	362.08 c	81.0
6	Roundup	2.5L	POST	0.00 b	100	0.00 c	100	8.65 f	98.4	5.05 f	99.1	277.95 de	84.4	342.53 c	83.2
7	Round twice	2.5L+2.5L	POST+ POST	0.00 b	100	0.00 c	100	8.98 f	98.3	1.15 f	99.8	49.18 gh	97.2	53.73 e	97.2
8	Life line twice	1.5L+1.5L	POST+ POST	9.13 b	100	0.00 c	100	34.55 f	95.3	10.65 f	98.0	127.68 fg	93.3	66.88 e	97.3
9	Goal twice	1L+1L	POST+ POST	63.00 b	100	0.00 c	100	266.83 c	62.2	81.83 e	84.8	328.38 cd	85.1	166.43 de	93.5
10	White plastic	80microl thickness		14.10 b	100	0.00 c	100	50.88 ef	93.2	34.18 ef	93.6	50.88 gh	97.9	164.30 de	92.4
11	Black plastic	80micron thickness		1.50 b	100	0.00 c	100	11.45 f	98.2	5.63 f	99.0	11.45 h	99.4	17.68 e	99.2
12	Hoeing twice	at 30 and 60 days		35.43 b	90.06	0.00 c	100	141.70 de	77.4	91.33 e	83.0	196.40 ef	90.1	232.63 cd	86.7
LSD 0.05				69.39		26.34		93.16		56.52		104.2		132.4	

* folenote: Means had the same alphabetical letter were not differ significa ntly according to: Duncan multiple range test (Duncan 1955)

All weed control treatments caused statistical significant difference on reduceing fresh weight of annual broad (g/m2) in both seasons, Treatments can be arranged in their efficacy in descending order based on the highest percentage of weed control compared to the unweeded check as follows black plastic, white plastic Devo followed by Roundup, Devo, Goal application twice, Hoeing twice, Dinimic, Round up twice and Life line twice which gave 100,100,100,97.6, 95.6, 94.9, 94.2, 94.1,91.1% control percent in 2016/2017 season respectively with corresponding values by 99.6, 92.49, 97.38, 95.23, 97.81, 83.83,%19.59,17.19, %16.29 in 2017/18 respectively, the highest weed control for perennial narrow Round up alone, Round up twice, black plastic, life line, Deve followed by Roundup white plastic by control percentage 97.7,97.7,97.4, 93.4,92.5 and 90.4% in the first season and 98.8,99.7,98.6,97.4,96.4 and 91.5 in the second season. With respect to perennial broad weed control, black plastic can be ranked in descending order in both season, Roundup alone, Round up twice, Lifeline, Devo followed by Roundup, Goal twice and white plastic and hoeing twice 100%, respectively, for the the effect of weed control treatment on fresh weight of total perennial, weed control treatments can be ranked in descending Round Up single, Roundup twice, black plastic, lifeline Devo followed by Roundup and white plastic

by 98.4,98.3,98.2,95.3,94.7 and 93.2% in 2016/17 season and 99.1,99.8,99.98,97.3 and 93.6% in 2017/18 season.

Excellent weed control for total (annual +perennial). weeds were achieved by applying black plastic mulches, Devo + Roundup followed by, White plastic mulches, Roundup twice, life line and exceeded hoeing twice which gave 99.4%,, 98.4,, 97.9,, 97.2,, 93.3, and 90.1%, control in 2016/17 season and 99.2, 96.7, 92.4, 97.2, 97.3 and 86.7%, in 2017/18season, respectively.

5- Effect of some weed control treatments on some vegetative growth aspects.

It is clear from the obtained data in Table (8) that controlling weeds by herbicides, mulching with white and black plastic and hand hoeing significantly was accompanied with stimulating length and thickness of shoot, leaf area and number of leaves /shoot relative to unweeded treatment (control). Hand hoeing was significantly superior than Chemical weeding with Dinimic in enhancing these growth aspects. Chemical control of weeds by using herbicides namally.

Devo, Devo followed by Round up, dinimic followed by select super, Round up once, Roundup twice, life line twice and goal twice, respictvely, significantly enhanced these growth aspects than hand hoeing.

Mulching with black plastic was significantly superior than hand hoeing and chemical control in enhancing these growth aspects. The best chemical herbicide was using Devo followed by Round up. Dinamic herbicide ranked the last position on any the tested herbicides in this respect. Controlling weeds by using Round up twice occupied the second position. The maximum values of growth aspects was recorded when weeds were controlled by mulching with black plastic. Unweeded control gave the lowest values. These results were true during both seasons.

Table (8): Effect of some weed control treatments on some vegetative growth aspects and yield /tree of Balady mandarin trees during 2016/2017 and 2017/2018 seasons

Treatments	Rate/fed	Time of appliction	Spring shoot length (cm)		Spring Shoot thickness (cm)		Leaf area $(cm)^2$		No. of leaves / shoot	
			2016/ 2017	2017/ 2018	2016/ 2017	2017/ 2018	2016/ 2017	2017/ 2018	2016/ 2017	2017/ 2018
control			9.9	9.7	0.20	0.19	4.89	4.95	10.0	11.0
Devo	2.5kg	PRE	13.1	12.9	0.26	0.25	5.84	5.90	11.0	12.0
Devo followed by Roundup	2.5kg+2.5L	PRE+POST	15.4	15.2	0.30	0.28	6.45	6.51	11.0	12.0
Dinimic	700g	PRE	10.5	10.3	0.22	0.21	5.05	5.11	11.0	12.0
Dinimic followed by Select super	700g+1L	PRE+POST	13.8	13.6	0.28	0.27	6.04	6.10	11.0	11.0
RoundUp	2.5L	POST	12.0	11.8	0.24	0.23	5.44	5.50	11.0	11.0
Roundtwice	2.5L+2.5L	POST+ POST	15.0	14.9	0.30	0.29	6.24	6.30	11.0	11.0
Life line twice	1.5L+1.5L	POST+ POST	14.5	14.3	0.29	0.28	6.34	6.40	11.0	11.0
Goal twice	1L+1L	POST+ POST	12.6	12.4	0.26	0.25	5.69	6.75	11.0	12.0
White plastic	80microl thickness		11.5	11.3	0.24	0.23	5.31	6.37	11.0	12.0
Black plastic	80micronthickness		16.8	16.6	0.34	0.33	7.01	7.08	11.0	12.0
Hoeing twice	At 30and 60 days		11.0	10.8	0.22	0.21	5.18	5.25	11.0	11.0
New L.S.D. at 5%			0.4	0.4	0.02	0.02	0.06	0.08	NS	NS

6- **Effect of some weed control treatment on photosynthetic pigments**

Data in table (9) obviously reveal that controlling different weeds chemically handly or with mulching had significant promotion on chlorophylls a & b, total chlorophylls and total corticoids relative to the control. Mulching with black plastic for controlling weeds was significantly superior than chemical and hand hoeing in enhancing chlorophylls a & b total chlorophylls and total carotenoids. Chemical control of weeds by the investigated herbicides except.

Dinimic significantly enhanced these photosynthetic pigments than hand hoeing The best herbicides in enhancing these pigments, in descending order were Devo followed by Round up, Round up twice, Life line twice, Dinimic followed by seclect super, Devo, Goal twice, Round up once and Dinimic, The highest values of pigments were recorded when weeds were controlled by mulching with black polyethylene. The unweeded control produced the minimum values. These results were true during both seasons.

7- Effect of some weed control treatment on the yield per tree and per feddan:-

It is evident from the obtained data in Table (9) that all weed control treatment (mulching and

chemical and hand hoeing) significantly improved the yield per tree and per feddan. As a general mulching with black plastic was significantly superior than chemical and hand hoeing in improving the yield per tree and per feddan. Controlling weeds by Dinimic herbicide gave the lowest values all over the weed control treatments. Carrying out chemical control or mulching for preventing weeds was significantly favorable in improving the yield than hand hoeing. The best chemicals management for controlling weeds and improving the yield were Devo followed by Round up, Roundup twice, Life line twice, Dinamic followed by select super and Devo, in descending order. The highest yield per feddan (12.3 & 12.1) was recorded when the weeds were controlled by mulching weeds with black plastic as compared with unweeded control which gave the lowest values of yield/ feddan (4.0 & 2.4) during both season, respectively. The prsentage of increment of the yield of the promised treatment (mulching with black plastic) over the unweed control reached 207.5,404.1% during both season, respectively.

Table (9): Effect of some weed control treatments on photosynthetic pigments as well as yield per tree and per Feddan of Balady mandarin during 2016/2.017 and 2017/2018 seasons

Treatments	Rate/fed	Time of appliction	Chlorophyll a (mg/gFW)		Chlorophyll b (mg/gFW)		Total Chlorophyll (mg/gFW)		Total carotenoids (mg/gFW)		Yield/Tree (Kg)		Yield/faddan (ton)	
			2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
control			6.9	6.7	1.9	1.8	8.8	8.5	2.3	2.2	24.0	14.3	4.0	2.4
Devo	2.5kg	PRE	10.1	9.9	3	2.9	13.1	12.8	3.4	3.3	44.5	35.0	7.5	5.8
Devo followed by Roundup	2.5kg+2.5L	PRE+POST	12.4	12.2	3.7	3.7	16.1	15.9	4.1	4.1	60.2	59.5	10.1	10.0
Dinimic	700g	PRE	7.5	7.3	2.1	2.0	9.6	9.3	2.5	2.4	32.1	32.0	5.4	5.6
Dinimic followed by Select super	700g+1L	PRE+POST	10.8	10.6	3.2	3.1	14.0	13.7	3.6	3.5	51.1	50.0	8.6	8.4
Roundup	2.5L	POST	9.0	8.8	2.6	2.5	11.6	11.3	3.0	2.9	37.2	36.5	6.3	6.1
Roundup twice	2.5L+2.5L	POST+ POST	12.0	11.9	3.8	3.6	15.8	15.7	4.0	4.0	54.4	53.3	9.1	9.0
Life line twice	1.5L+1.5L	POST+ POST	11.5	11.3	3.4	3.4	14.9	14.7	3.8	3.8	53.8	53.3	9.1	9.0
Goal twice	1L+1L	POST+ POST	9.6	9.4	2.8	2.7	12.4	12.1	3.2	3.1	41.4	40.5	7.0	6.8
White plastic	80microl thickness		8.5	8.3	2.4	2.4	10.9	10.7	2.8	2.8	36.4	36.4	6.1	6.1
Black plastic	80micronthickness		13.8	13.3	4.2	4.0	18.0	17.3	4.6	4.4	73.3	72.5	12.3	12.1
Hoeing twice	At 30and 60 days		8.0	7.8	2.3	2.2	10.3	10.0	2.3	2.2	32.7	31.8	5.5	5.3
New L.S.D. at 5%			0.5	0.5	0.3	0.3	0.6	0.4	0.2	0.2	1.7	1.8	0.31	0.29

Table (10): Effect of some weed control treatments on some physical characteristics of the fruits of Balady mandarin trees during 2016/2017 and 2017/2018 seasons

Treatments	Rate/fed	Time of appliction	Av. Fruit weight (g)		Av. Fruit diameter (cm)		Av. Fruit height (cm)		Fruit peel weight (%)		Fruit peel thickness (cm)	
			2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
control			116.0	115.1	6.0	5.9	5.1	5.0	31.1	31.1	0.18	0.19
Devo	2.5kg	PRE	136.0	135.1	7.5	7.3	6.5	6.4	28.7	28.8	0.10	0.11
Devo followed by Roundup	2.5kg+2.5L	PRE+POST	150.0	149.1	8.3	8.3	7.3	7.2	27.0	27.1	0.06	0.07
Dinimic	700g	PRE	119.9	119.0	6.2	6.1	5.2	5.1	30.7	30.8	0.16	0.17
Dinimic followed by Select super	700g+1L	PRE+POST	140.3	140.0	7.7	7.6	6.7	6.6	28.2	28.3	0.09	0.10
RoundUp	2.5L	POST	129.0	128.1	7.0	6.9	6.0	5.9	29.6	29.7	0.12	0.12
Roundtwice	2.5L+2.5L	POST+ POST	147.0	146.1	8.1	7.0	7.1	7.0	27.3	27.3	0.07	0.08
Life line twice	1.5L+1.5L	POST+ POST	143.0	142.1	7.9	7.8	6.9	6.8	27.7	27.7	0.08	0.09
Goal twice	1L+1L	POST+ POST	133.0	132.1	7.3	7.2	6.3	6.2	29.1	29.1	0.11	0.11
White plastic	80microl thickness		125.8	125.0	6.7	6.7	5.7	5.6	30.0	30.1	0.13	0.13
Black plastic	80micronthickness		152.1	152.1	8.5	8.4	7.5	7.4	26.5	26.5	0.06	0.07
Hoeing twice	At 30and 60 days		122.0	121.1	6.5	6.4	5.5	5.4	30.3	30.3	0.14	0.15
New L.S.D. at 5%			2.1	1.8	0.2	0.2	0.2	0.2	0.4	0.3	0.02	0.02

8- Effect of some weed control treatment on some physical and chemical characteristics of the fruits:-

It is clear from the obtained data in Tables (10 & 11) that controlling weeds by all the investigated methods was significantly very effective in improving both physical and chemical characteristics of the fruits in terms of increasing fruit weight and dimensions (highet and diameter), T.S.S %, total and reducing sugars%, vitamin C and decreasing fruit peel weight and thickness and total acidity% relative to the control. Chemical control of weeds except the use of Dinimic was significantly preferable than hand hoeing in promoting fruit quality.

The best chemical treatment was the application of Devo followed by Round up, followed by using Round up twice. Using Dinimic herbicide occupied the last position among all chemical agents. Mulching with black plastic was significantly accompanied with enhancing fruit quality compared with using white plastic. The best results with regard to fruit quality were obtained due removing weeds by mulching with black plastic. Unfavorable effects on fruit quality were attributed to unweeded control treatments.

Table (11): Effect of some weed control treatments on some chemical characteristics of the fruits of Balady mandarin trees during 2016/2017 and 2017/2018 seasons

Treatments	Rate/fed	Time of appliction	T.S.S. %		Total sugars %		Reducing sugars %		Total acidity %		Vitamin C (mg/100ml juice)	
			2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control			13.0	12.8	10.1	9.8	3.11	3.08	1.349	1.351	29.3	30.0
Devo	2.5kg	PRE	14.8	14.6	11.8	11.6	3.95	5.90	1.235	1.240	42.9	43.0
Devo followed by Roundup	2.5kg+2.5L	PRE+POST	15.6	15.4	12.6	12.4	4.71	4.70	1.170	1.175	52.0	52.1
Dinimic	700g	PRE	13.3	13.0	10.3	10.0	2.20	3.18	1.330	1.335	31.5	31.6
Dinimic followed by Select super	700g+1L	PRE+POST	15.0	14.8	12.0	11.8	4.11	4.08	1.220	1.226	45.0	44.9
RoundUp	2.5L	POST	14.4	14.2	11.4	11.2	3.71	3.70	1.275	1.280	40.0	39.8
Roundtwice	2.5L+2.5L	POST+ POST	15.5	15.3	12.5	12.3	4.61	4.60	1.184	1.188	49.2	49.1
Life line twice	1.5L+1.5L	POST+ POST	15.2	15.0	12.2	12.0	4.41	4.40	1.200	1.203	47.0	46.9
Goal twice	1L+1L	POST+ POST	14.6	14.4	11.6	11.4	3.89	3.80	1.255	1.260	45.0	44.8
White plastic	80microl thickness		14.0	13.8	11.0	10.8	3.55	3.54	1.282	1.285	37.5	36.9
Black plastic	80micronthickness		15.7	15.5	12.7	12.5	4.92	4.90	1.150	1.154	55.0	54.9
Hoeing twice	At 30and 60 days		13.6	13.4	10.6	10.4	3.33	3.30	1.300	1.301	34.3	34.3
New L.S.D. at 5%			**0.2**	**0.2**	**0.2**	**0.2**	**0.03**	**0.04**	**0.013**	**0.014**	**1.9**	**2.2**

11- Economical study for the Recommended treatments during 2016/17 se and 2017/18asons:-

It is clear from the data Table (12) that profit of the recommended treatment (black poly ethylene sheets) reached 45825 and 41750 LE during 2016/17 and 2017/18 seasons, respectively, The profit for the unweeded trees reached 8000 and -1500 LE during the same periods. Net profit of one feddan previous promised treatment for over the control treatment reached 37825 and 43250 during both seasons, respectively

Table (12) Economical study for the Recommended treatments during 2016/17 and 2017/18seasons

a-Recommended treatments	2016/17	2017/18
CostsoftotalHort.Practies (LE) Costofplastic (LE) Total costs (lE) Yield/Feddan (ton) Price of selling (LE) Profit (LE)	12.000 36.75 15675 12.3 61500 45825	13.500 5250 18750 12.1 60500 41750
B- Control (untreatedtrees)	2016/17	2017/18
CostsoftotalHort.practies (LE) Yield/Feddan (ton) Price of selling (LE) Profit (LE)	12.000 4.0 20000 8000	13500 2.4 12000 -1500
Nt profit overcontrol	37825	43250

4. Discussion

Concerning Devo +Roundup followed by Roundup application twice or Life line twice and black plastic mulch had wide spectrum to control those nine weed species (annual or perennial). These results a in agreement with those obtained by **verdu and Mass (2007), Abou Zeina et al (2008) and Khan et al (2015)** they mentioned that mulches by black plastic were very effective in controlling weeds and considered as an excellent alternative to the use of Roundup twice or Devo followed by Roundup. Many researchers mentioned weed control in mandarin need to apply glyphosate twice than one spray through the season **and Martenilli et al (2017).** Such results confirm the results obtained by **Tucker and Singh (1993)** mentioned that spray of glyphosate or more a year wear required to control difficult species including vine, shrubs and perennial grasses**.**

The mode of action of these treatments vary from one treatment to another, Devo herbicide works as soil acting herbicide, Roundup act as nonselective translocated herbicide and Life line as acontact herbicide, meanwhile single application of Roundup can't continue in its efficacy as in the early because other weed flushes can germinate after that and this herbicide had no residual effect for weed control still from the first application. Black plastic can kill all germinated weeds without any selectivity on these weed species. Dinimic alone can't continue after that for all annual narrow leaf weed and perennial weeds as for broad leaf weeds which were susceptible to moderate susceptible except *Trianthema portulacastrum*, L which were moderate tolerant to Dinimic. But Dinimic followed by Select super had a wide spectrum to control some against existed weed species. Many researchers as**. (Abu Irrmiala 1994)** mentioned that the role of black plastic mulch come mainly from preventing light penetration and photosynthesis decay and finely weed diefound that soil solarization mulch almost complet weed control in newly established fruit treea and increased seedling growth of a lmon, olive and grape and **Rubin and Benjamin (1984)** found that the rhizomes of *Cynodon dactylon*, L pers and *Sorghum halepeuse*, L pers are sensitive to solarization by black plastic mulching to 2 months, meanwhile Roundup which work as systematic translocated herbicide can control all germinated and growing weed species as post emergent as non-selective herbicide on another hand the use of Devo (diuron) as substituted urea which work as acting soil residual herbicide which stop hill reaction and consequently photosynthesis and kill germinated weed seedlings of both annual grassy and broadleaf weed species which work for long periods in orchard fields and integrated with Roundup as post emergence herbicides for controlling perennial weeds as *Cynodon daclylon*, L, *Convolvulus arvensis* and *Cyperus rotundus*…etc.

According to these results the best treatments from view point of weed control of annual + perennial weeds associated with balady mandarin orchard fields, the use black plastic mulch 80 M thickness for two month can be used as excellent alterative to chemical control or by spray Roundup twice at 2.5 + 2.5 liter/ faddan at one month interval between the first and second spray.

Also Devo at 2.5kg/faddan followed with one spray by Roundup at 2.5 liter/faddan or life line with repeat application as contact herbicide. All of these treatments can be used successfully as alternative to hoeing twice to control annual + perennial weeds for more than three months intervals and these treatments can be come apart of integrated weed control strategy in mandarin orchard fields.

All herbicides have a label that states the use requirements, application rates, weeds controlled and personal protective equipment required during mixing and/or application. Remember the label is the law and must be followed according to **Futch and Singh (2016) Thomas et al (2000)** Diuron residues were found mainly in upper 20 cm of soil; residue concentration decreases exponentially with time. less than 1% of initial concentration after application.

Weeds compete with trees, particularly young trees, for water, nutrients and light, with climbing trees easily covering larger trees if left uncontrolled. Weeds in the orchards fight with trees for nutrients, water and light resulting in stressed plant and poor fruit quality and yield. Good vegetative growth and the attainment of early productivity is partially attributed to the timely elimination of weed competition. Weed growth around tree trunks and canopy creates favorable conditions for the development of fungus diseases such as footrot and brown rot (on fruit). Preemergence herbicides are most effective before germination and early seedling growth stages. Post-emergence herbicides can be further divided into systemic or contact. Systemic herbicides are translocated within the target plant, killing the foliage and root system. Contact herbicides kill only the plant parts which are contacted by the spray application. All herbicides used in citrus are selective in that they kill some plants (weeds) without significantly injuring other plants (citrus tree) if applied at the correct rate and manner. Successful herbicide programs start with selecting the right herbicide or herbicide mixtures. **Futch and Singh (2016).**

These results were true during both seasons. according to. **Hyun et al. (1993)** who Found that acidity was lowest with black polyethylene mulch (0.53%) followed by grass mulching (0.63%). Highest acidity (0.65%) was observed in no mulch treatment in

Satsuma mandarin. **Shergill (1993)** found that diuron and oxadiazon or post-em.

Glyphosate and Diuron applied singly at 4, 5 or 6 kg/ha in kinnow mandarin. The fruit yield and TSS were significantly higher with the use of the herbicides; two sprays diuron at 6 kg/ha was the most effective treatment, with 11 and 18% increase in yield, over the control, for the two seasons, respectively. Diuron herbicide application had no significant effect on leaf nutrient content but slightly increased the sugar (both reducing and nonreducing) and ascorbic acid contents of the juice. The acid and phenolic contents of fruits,, were slightly reduced by herbicide application**.**

Mohanty et al (2002) found that in Nagpur mandarin, the black polyethylene sheet was the most efficient in controlling weeds, which completely eliminated all weed species due to non-penetration of sunlight and recorded the highest vegetative growth and fruit yield, but acidity was least and highest under other control treatment, **Borah et al (2002)** found that glyphosate increasing fruit yield and fruit quality (TSS) and profit over control **Buker (2005**) mentioned that weed density can affect the vegetative growth, fruit yield. **Abouziena et al (2008)** found that uncontrolled weeds in the weedy control caused significant reduction in yield and fruit quality and decreased the yield/tree by 62% than with hand hoeing treatment in citrus fields. **Abouziena et al (2008)** found that plastic mulch at 80 mm increased the quantity and quality yield of mandarin trees by 119% compared with the unweeded plot. **Shirgure et al (2003)** found that The fruit weight was medium in white polyethylene (135 g) **Sharma *et el* (2008)** found the samaller canopies of younger trees allow more light to reach orchard floor, promoting weed growth, which can lower yield by 23-33% compared to mature groves in citrus orchards.

Conclusion

For prolonged weed control of the total annual + perennial weeds species which include hard weed combination to kill, It is suggested to use mulching by black plastic sheets or Devo followed by Roundup, or Roundup twice as alternative to control total annual + perennial weeds and to improve the productivity and fruit quality of Balady mandarin trees grown under middle Egypt conditions. Net profit of one feddan treated with previous promised treatment over the control treatment reached 37825 and 43250 Egyptian pounds during both seasons, respectively.

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