Comparative Study between Some Intercropping System and Methods for Conditions Weeds Association in Superior Vineyards

Asmaa A. Ebrahim[1] and Nagwa R. Ahmed[2]

[1]Viticulture Res. Dept. Hort. Res. Instit, ARC, Giza, Egypt
[2]Field Crops Res, Inst., Agric. Res. Center, Giza, Egypt.
faissalfadel@yahoo.com

Abstract: Weeds spread in the vineyards and cause harmful effects on the production of grapes, and there are many methods for controlling of these weeds. Therefore, two field experiments were carried out with the cultivation of the superior vineyards to control weeds in 2016/2017and 2017/2018 seasons, Superior grapevines were subjected to ten weed control treatments namely unwedded check control, hand hoeing, chemical control by Roundup, intercropping Onion, garlic, faba bean and clover with the vines and some soil mulching with three colored sheets namely (black, green and blue) plastic sheets. The merit was examining the effect of some weed control treatments on controlling weeds and improving productivity of Superior grapevines. Main results show that all weed control treatments exerted significant reduction on fresh weight of weeds and promotion a grape yield and berries quality relative to the untreated check control. Mulching with black sheet gave the highest yield of grapes and less fresh weight of total weeds/g. The best intercrops were onion, garlic, bean and clover, in ascending order. The economic return of output of intercropping faba bean with grape was profitable for growers compared to the sole grape which gave the highest net profit (37.515 & 41.706 L.E) in both seasons economic. The highest values of Land equivalent rati (LER) are (2.11 & 2.227) which obtained by intercropping of grape vines with clover in both seasons. Aggressively (Agg) values of autumn grape were negative (dominated) while those of onion, garlic, bean and clover were positive (dominant) in both seasons. From these results, we can recommend to intercrop faba beans or garlic under the grapevines to get rid of weeds and to obtain highest material economic return of the farms under the conditions of middle Egypt.

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Key Words: Hand hoeing, chemical control Round up, intercropping, soil mulching, color plastic sheets, onion, garlic, faba been and clover.

1. Introduction

Recently, avoiding weeds in fruit orchards was established using non-traditional methods as replacement for chemical control protecting our environmental from pollution. Such methods are soil mulching with for colored plastic sheets or intercropping with different crops as living mulches were evolved.

Mulching of soil is a horticultural practice aimed primarily to conserve moisture in soil and reduce weed intensity of emergence weed flora, and increasing yield and quality of fruit in cultivated plants. In addition, mulching change temperature conditions of the soil and of the air lying immediately above soil.

The advantages of plastic mulch are conservation weed of soil moisture, more uniform soil temperatures, weed control and less soil compaction. These extension and improvement of the Egyptian grape production demands. Successful weed control program depend upon knowledge of the reproductive habits and distribution methods of predominant weed species. However, there are many methods of weed control adapted to specific weed situations.

Chemical weed control in grapevines is widely accepted and continues to increase. Herbicides are applied either before or after weed emergence. Pre-emergence herbicides are soil- active, controlling weeds germinating from seeds for a period of a few weeks to over a year. Post-emergence contact or translocated (systemic) herbicides are foliar – active, controlling each flush of weed growth after emergence. Some herbicides are foliar- and soil-active and can be used to control emerged seedlings and germinating seeds. There is usually no residual activity of contact herbicides for controlling successive crop of weeds**.** For these reasons, the successful of weed control methods in Superior vineyards is to control the aboveground portions, prevent seed production of annual weeds and destroy of underground vegetative organs of perennial weeds. Chemical weeds **(Ross-Olivia, 2010;**

Hosseini and Dianta,2014, Martnelli *et al*, 2017; Nagaty 2018 and Hassan,2018).

Intercropping under trees has been recognized as very common practice in Egypt. Weeds in the field during the growing period of a crop also contributed for the low productivity. Weed infestation posing competition for natural and applied inputs such as space, nutrients and water, these warrens to take care of soil health with sustainability in productivity. The general finding has been that intercropping gives total higher yield as compared to sole crops. Problem of assessing the degree of advantages in terms of productivity, profitability and optimum natural resources utilizing intercropping is the matter of investigation. Improper spatial arrangement under intercropping not only reduces the yield component but also induces high degree of rolling topography. Productivity per unit area could been creased through suitable crops having higher yield stability and adoption of appropriate intercropping patterns. Intercropping will always have an edge over the pure cropping pattern, since they will effectively utilize the available resources. A suitable intercropping provides a yield advantage over sole cropping, because the component crops utilize the natural resources in such a way that they are able to complement with each other. Since no information is available on recommendable row ratio of intercropping with proper weed control technology in this region, the study was initiated to assess the influence of intercropping and effectiveness of weed control methods on productivity, profitability and optimum natural resources utilizing intercropping. Intercropping as a method of sustainable agriculture is the growing of two or more crops during the same season on the same area so as to utilize common limiting resources better than the species grown separately, and hence it is as an efficient resource use method (**Ali *et al.*, 2018**). Insurance against crop failure, low cost of production and high monetary returns to the farmers, improvement of soil fertility through the addition of nitrogen by biologicalfixation, improving yield stability, the intercropping system might be important for intensification of crop production and toincrease economical and biological returns to smallholderfarmers. Intercropping crops with fruit crops **(Band and Grundy, 2001 and Abou-Elial, 2001),** was very effective in controlling weeds and improving yield and fruit quality of different fruit crops.

The target of this study was elucidating the effect of some weed control treatments (hoeing, chemical control, intercropping and mulching) on controlling weeds and improving yield and fruit quality of Superiorgrapevines grown under Minia region conditions.

2. Materials and Methods

This study was conducted duringthe two consecutive experimental 2016/2017 and 2017/2018 seasons on 60 uniform in vigor 10 years old own rooted Superior grapevines which planted at 2x 3 meters (700vine/fed.). Gable supporting system with followed to evaluate the effect of some weed control treatments on yield and quality of Superior grapes and its associated weeds which were naturally infested with weeds in a private vineyard located at El-Hawarta Minia district, Minia governorate. The soil of the orchard field was well drained with clay texture with a water table more than two meter depth. Surface irrigation system was carried out using Nile water. Horticultural practices for Superior grapevines such as fertilization with manure were added at the mid. of Jan. in both seasons 200 kg in the forms of ammonium sulphate (21.6 % N) 200 kg potassium sulphate (48% k_2o) and 100 kg calcium superphosphate (15.5 % p_2o_5) Irrigation, as well as insect and disease control were carried out as normal recommendation.

This experiment included the following ten weed control treatments.

1. Un weeded control
2. Hand hoeing twice at 30 and 60 days after bud burst. General hoeing for the whole experiment 29 and 28 th fiberer in both seasons. First hoeing 11 and 10 th Mareth, second hoeing 11and 10 th May in both seasons respectively.
3. Chemical control using glyophosphate 150 propyl ammonium which is know commercial as Roundup by spraying 48% WSC at 2.5 % L/Fed. Applied as post emergence in the first week of April during both seasons.

4- Intercropping Giza 6 onion with Superior grapevines (last week of Sept. and harvest after 180 days during in the two seasons).

5- Intercropping Seds 40 garlic with Superior grapevines (last week of Sept. and harvest after 195 days during in the two seasons).

6- Intercropping Giza 843 bean with Superior grapevines (last week of Sep. and harvest after 170 days during in the two seasons).

7- Intercropping Egyptian clover with Superior grapevines (last week of Sept. and harvest after 160 days during in the two seasons).

8- Soil mulching by using green plastic sheets with 80 micron thickness at the second week of March for two month periods.

9- Soil mulching by using blue plastic sheets with 80 micron thickness as previously mentioned.

10- Soil mulching by using black plastic sheets with 80 micron thickness as previously mentioned. Plastic removal at the second week of May.

11- Pure stand of onion.

12- Pure stand of garlic.

13- Pure stand of faba bean.

14- Pure stand of Egyptian clover.

15- Pure stand of grapes.

Each treatment was replicated three times, two vines per each. Four ridge intercrops between four vines plot area 6 m^2 and consisted 4 rows with 3 m length and the spacing between rows 0.7 m namely Giza 6 onion, Seds 40 garlic, Giza 843faba bean and Egyptian clover as understory crops with Superior grapevines as the overstory crop were included. The cultural practices for each intercrop was outlined as follows.

Roundup was applied by Knapsack sprayer after general cultivation, before irrigation post emergence at 30 and 60 days application from beginning of experimental March (post) using Kanpsack sprayer cp3 20 liter " equipped with one nozzle TKI calibrated to deliver spray volume of 125 L/fed. to spray Round up. Mulches were applied to plots during the last week of March first season and the second week of April for seasons respectively, from cultivation.

Measurements of weed density:

The scientific English and Arabic names as well as the family of the dominant annual and perennial weeds in the tested vineyard.

Annual weeds:		
Portulacaoleraceae L.	**Common puslane**	**Portylacene**
Corcheusolitorius L.	**Jews mallow**	**Tiliacaeae**
Xanthium strumarium L.	**Broad cocklebur**	**Compositae**
Melvaparviflora L.	**Chees weed mall**	**Malvaceae**
Perennial weeds:		
Cyperusrottundus L.	**Purplenut sedge**	**Cyperaceae**
Cynodondactylon L.	**Bermuda grass**	**Garmineae**
Convolvuiusarvensis L.	**Ind weed**	**Comnvduelaceae**

Egyptian clover seeds were sown broadcasting as the common methods of sowing at a rate of 25 kg seeds/Fed. on the last week 25 and 24 of Sept. during 2016 and 2017 seasons. Phosphorus fertilizer was applied at 22.75 kg (15.5 %) Calcium superphosphate p_2o_5 / fed during preparation of the soil in the form of Calcium superphosphate (15.5% p_2o_5), whereas nitrogen fertilizer 15 kg N/ fed in the form of ammonium sulphate was added in two equal doses, the first half before. Sowing and the rest after the first cut in both growing seasons. All the normal cultural practices of growing clover were conducted in the usual manner followed by the farmers in Minia region. In the two experimental seasons three cuttings were taken for green forage at 60 days after sowing, 50 days after the first cutting, and 40 days after the second cutting.

A sample of 0.25 m^2 from each experimental unit was taken randomly in each cut to estimate fresh forage weight /kg, then transformed into fresh forage yield in tons /fed.

Seeds of faba bean. variety Giza 843were sown in hills 15 cm apart on both sides of the ridges. Ridges were 70 cm apart, planting date was at the end of October. Calcium superphosphate (15.5% p_2o_5) was applied at the rats of 150 kg/fed during soil preparation. All hills were thinned to two plants after four weeks from sowing date. The recommended agronomic practices were used during the two seasons. Seed yield /fed (ardab) and straw yield /fed (tons) were recorded also.

The third intercrop namely onion bulbs of Giza 6 onion were cultivated in hills 10 cm apart on both sides of the ridges. Ridges were 70 cm apart. planting date was at the end of Sept. one fed. required ton bulbs. The preceding crop in the two seasons was Egyptian clover. Mono Calcium superphosphate (15.5% p_2o_5) was added at the rate of 150 kg /fed. during soil preparation. Common horticultural practices were carried out as recommended.

The fourth intercrop namely Seds 40 garlic Cloves (100kg/fed) of Seds 40 garlic were cultivated in hills 10 cm a part on both sides of the ridges. Ridges were 70 cm apart. Planting date was at the end of Sept. during both seasons the preceding crop in the two seasons was Egyptian clover phosphorus fertilizer was applied at 120 kg p_2o_5 /fed. During the source of mono Calcium superphosphate, whease N fertilized at 40 kg, N/fed in the form of ammonium sulphate (20.6 % N) was added in two equal dose at 30 and 60 days later. Usual horticulture practices were carried as recommended. The experimental design was randomized complete block design (RCBD) with three replicated, two vines per each.

Different measurements of overstory Superior grapevines during the two seasons, the following measurements were recorded:

A-Different measurements of vegetative growth characteristics:-

At themiddle of June, the two growth aspects namely number of leaves /shoot and the leaf area (in cm^2**)** were measured the total number of leaves of the ten main shoots / vine (cm.) and then average was recorded. The average leaf area (cm^2) was estimated through picking twenty mature leaves from those opposite to the basal clusters **(Bale et el, 1988).**

Leaf area (cm^2) was measured using the following equation that outlined by **Ahmed and Morsy (1999).**

Leaf area (cm2) 0.45 (0.79 x maximum diameter ^{2}) + 17.77 then average leaf was registered.

B-Measurements of leaf photosynthetic pigments:-

Plant pigments namely chlorophyll a & b and carotenoids were determined as (mg/100 g F.W.). Samples of five mature and fresh leaves from those leaves opposite to the basal clusters on each main shoot were taken on the last week of May in both seasons. The fresh leaves were cut into small pieces and 0.50 g weight from each sample. Acetone (85% v/u) was used as a blank according to **(Fadle and Seri El-Dean,1987).**

The optical density of the filtrate was determined using Carl Zeis spectrophotometer at the wave length of 662,644 and 440 nm to determine chlorophylls a & b and total carotenoids, respectively. Content of each pigments was calculated by using the following equation according to **(Von-Wetstein,1957 and Hiscox and Isralstam,1979)**

Chi.a= (9.784-E 662) – (0.99-E 644) = mg/L.

Chi.b= (21.426-E 644) – (4.65 X E 662) = mg/L.

Total carotenoids = (4.965 x E 440 – 0.268 (chlorophyll a + chlorophyll b)

E= optical density at a given were length. These plant pigments were calculated as mg/100 g. F.W. Also, total chlorophyll was recorded by summation of chlorophyll a and chlorophyll b.

C-Measurements of leaf content of N, P, K:-

Twenty leaves picked from those opposite to the basal clusters (according to **summer, 1985)** for each vine were taken at the first week of June in both seasons. Blades and petioles of leaves were taken at separated where blades were discarded and petioles were saved for determining of the different nutrients. Petioles were oven dried at 70 ^{o} c and grounded then 0.5 g weight of each sample was digested using H_2so_4 and H_2O_2 until clear solution was transfer to 100 ml volumetric flask and completed to 100 ml by distilled water. Thereafter, leaf contents of N, P, K, and Mg (as percentages) and Zn, Fe and Mn (as ppm) for each sample were determined as follows:

1- Nitrogen % was determined by modified microkjeldahl methods as described by **Horneck and Miller (1998).**

2- Phosphorus % was determined by using Olsen methods as reported by **Cottenie *et el.*, (1982).**

3- Potassium % was flame photometrically determined by using the methods outlined by **Cottenie *et el.*, (1982).**

D-Measurements of yield and berries quality:-

1- Yield:-

Harvesting took place when T.S.S /acid ratio in the berries of check treatment reached at least 25:1 (at the middle of July in the two seasons according to **Weaver, 1976)**. The yield of each vine was recorded in terms of weight (kg.) and number of clusters / vine, and then the average weight of cluster was recorded (g.).

2 -Berries quality:-

Five clusters from each vine were taken at random for determination of the following physical and chemical characteristics of the berries:-

1. Cluster determination (length and shoulders, cm).
2. Average berry weight (g).
3. Average of berry determinations (longitudinal and equatorial in cm.)
4. Shoot berries percentage.
5. Percentage of total soluble solids (T.S.S) in the juice by using handy refract meter.
6. Percentage of total sugars in the juice by **Lane and Enyon (1995).** Volumetric methods as described in **A.O.A.C. (2000)**
7. Percentage of total acidity (as g tartaric acid /100 ml juice) by titration against 0.1 NaOH using phenolphthalein as an indicator **A.O.A.C. (2000).**
8. The ratio between total soluble solids and acid.

E-Competitive relationships and yield advantages:

1- Land Equivalent Ratio (LER) according to **(Willey 1979)** using the following formula: LER = yab/ yaa + yba / ybb

Where: Yaa = pure stand yield of species a (grapes). Ybb= pure stand yield of species (b). Yab = mixture yield of a (when combined with b)

Yba = mixture yield of b (when combined with a).

2- Area Time Equivalent Ratio (ATER): Area time equivalent ratio provides more realistic comparison of the yield of intercropping over monocropping in terms of time taken by component crops in the intercrop according to **Hiebsch (1978) and Hiebsch and McCollum (1987 a & b)**. Also we used the method utilized by **Hiebsch (1980)** ATER was calculated by formula area time equivalent ratio.

ATER= (LERb x Dcb+ LERa x Dca) Dt where LER island equivalent ratio of crop, DC is duration (days) taken by crop, Dt is days to intercropping system from planting at harvest.

3- Aggressivity (Agg): This was proposed by **Mc-Gilichrist (1965)** and was determined according to the following formula:

Aab = Yab / yaaxzab - Yba/ ybb x zba. An aggressivity value of zero indicates that the component crops are equally competitive. For any other situations both crop will have the same numerical value but, the high of the dominant crop is positive and the dominated is negative. The greater the numerical value of (Agg), the greater difference in competitive abilities and hence the larger the difference between actual and expected yield. Where Zab representing the sown proportion of intercrop a (onion, garlic, fababean and Egyptian clover) in combination with (grapes) and zba the sown proportion of intercrop b (grapes) in combination with a (onion, garlic, faba bean and Egyptian clover).

4- Competitive ratio (CR) was calculated by the following formula as given by **Willey and Rao (1980).** CR = CRa + CRb

CRa = LERa / LERb X Zba/ Zab

Where: LERa and LERb represent relative yield of a and b intercrops, respectively. Since the CR values of the two crops will in fact be reciprocals of each other. CRa, CRb are the competitive ratio for (a) and (b) intercropping.

Farmer's benefit:

It was calculated by determining the total costs and net return of intercropping culture as compared to recommended solid planting of grapes as follows: Total return of intercropping cultures = Price of grapes yield + price of intercropping pattern yield. To calculate the total return, the average of grapes, onion, garlic, field bean and Egyptian clover prices presented by **Bulletin of Statistical Cost Production and Net Return (2016 and 2017)** was used. Net return per ha = Total return – (fixed costs of grapes + variable costs of onion, garlic, field bean and Egyptian clover according to intercropping pattern). L.E 3000 for ton of grapes; LE 2500 for ton of onion; LE 2000 for ton of garlic; LE 2700 ardab of faba bean + LE 1500 ton starw of faba bean and LE 7200 for 3 cutting of Egyptian clover.

5- Statistical analysis:

All data were statistically analyzed using analysis of variance (ANOVA) with the Statistical Analysis System MSTAT–C Statistical Packing (**Freed 1991**). Probabilities equal to or less than 0.05 were considered significant. If ANOVA indicated differences between treatment means LSD test was performed to accreting to (**Steel and Torrie 1980**).

3. Results

1-The spectrum of annual and perennial weeds infesting the experimental vineyard area before the application of different weed control treatments:-

The spectrum of annual and perennial weeds infesting the experimental vineyard area in (m^2) just before the application of different weed control treatments during 2017 and 2018 seasons was illustrated in Table (1).

It is clear from the data in Table (1) that weeds invaded the tested vineyard were *Cyperusrotundus L., Portulacaoleraceae L., Convolvuiusarvensis L.,* and *Melvaparaviflora L.*

Cyperusrotundus L. occupied the first occupation since fresh weight and percentage of this speies were (703.0 g & 46.6%) in the first season and (710.0g & 45.2%) in the second season. Weed species *Malvaparaviflora L.* ranked the last position. In such weed species fresh weight reached 30.0 & 40.0 g while percentage of such weed spices among all weeds reached 2.0 & 2.5% during both seasons, respectively.

Table (1): Weed density (measured as fresh weight g^{-1} / m^2 as well as percentages in experimental vineyard in2017and 2018 seasons just before treatment.

Weed name	2017 g/m2	%	2018 g/m2	%	Arabic name
Cyperusrotundus L.,	703.0	46.6	710.0	45.2	السعد
Portulacaoleraceae L.,	300.0	19.9	305.0	19.4	الرجلة
Cynodondactylon L.	230.0	15.2	245.0	15.6	النجيل
Corchorusolitorius L.	112.0	7.4	125.0	8.0	الملوخيه
Xanthium strumarium L.	75.0	5.0	80.0	5.1	الشبيط
Convolvuiusarvensis L., Malvaparaviflora L.	60.0	4.0	65.0	4.1	العليق
	30.0	2.0	40.0	2.1	الخبيزة

1- Fresh weight of total weeds:

It is clear from the data in table (2) that fresh weight of weeds was significantly reduced in all treatments in ceding hoeing, herbicide namely Roundup; intercropping and soil mulching) relative to the unweeded control. Significant differences

were detected among the ten weed control treatments regards their effect on fresh weight of weeds. Hand hoeing was significantly responsible for controlling weeds than chemical control using Roundup or intercropping onion.

Soil mulching using coloured sheet namely green, blue and black poly ethylene significantly was favourable in reducing fresh weight of weeds than intercropping onion, garlic, fababean and clover with Superior grapevines, hand hoeing and Roundup. The best intercrops in reducing fresh weight of weeds were onion, garlic, fababean and clover, in ascending order. Using black, blue and green sheets for soil mulching, in descending order was significantly very effective in reducing fresh weight of weeds and controlling weeds. Roundup occupied the last position among the other control treatments in reducing fresh weight of weeds and controlling weeds. Soil mulching with black sheets gave the lowest values. The maximum values were recorded a sun weeded control. These results were true during both seasons.

Table (2): Effect of some weed control treatments on fresh weight of total weeds, leaf area, number of leaves/shoot, wood ripening coefficient, cane thickness and pruning wood weight /vine of Superior grapevines during 2016/2017 and 2017/2018 seasons.

Treatments	Fresh weight of total weeds/g		Leaf area (cm2)		No. of leaves/shoot		Wood ripening coefficient		Cane thickness (cm)		Pruning wood weight/vine (kg)	
	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018
Untreated control	1850.0	1991.0	101.1	101.0	15.0	14.0	0.64	0.61	0.66	0.65	2.11	2.06
Hand hoeing	410.0	405.0	103.0	103.1	17.3	16.0	0.68	0.64	0.71	0.70	2.30	2.29
Round up	618.0	613.0	105.9	106.0	19.3	18.1	0.71	0.66	0.76	0.77	2.41	2.39
Intercropping onion*	500.0	488.0	108.0	107.9	21.9	20.3	0.74	0.70	0.81	0.84	2.52	2.53
Intercropping garlic**	400.0	389.0	109.5	110.0	24.0	22.2	0.77	0.74	0.86	0.99	2.64	2.65
Intercropping bean***	306.0	300.0	112.1	111.7	25.9	24.5	0.81	0.78	0.90	1.02	2.79	2.80
Intercropping clover****	290.0	281.0	114.3	114.4	28.0	26.7	0.84	0.81	0.99	1.08	2.99	3.00
Mulching green sheets	271.0	260.0	115.8	116.0	29.9	29.0	0.88	0.84	1.10	1.13	3.14	3.15
Mulching blue sheets	86.0	80.0	117.3	117.6	31.9	31.0	0.90	0.87	1.20	1.20	3.30	3.31
Mulching black sheets	60.0	51.0	119.0	119.2	34.0	33.3	0.93	0.90	1.33	1.26	3.50	3.51
New L.S.D at 5%	20.0	21.0	1.4	1.6	1.9	2.0	0.03	0.02	0.04	0.05	0.11	0.13

Table (3) Effect of some weed control treatments on photosynthetic pigments and percentages of N, P, and K in the Leaves and percentage of berry setting % of Superior grapevines during 2016/2017 and 2017/2018 seasons.

Treatments	Chlorophyll a (mg/g fw)		Chlorophyll b (mg/g fw)		Total Chlorophyll (mg/g fw)		Leaf N%		Leaf P%		Leaf K%		Beery setting %	
	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018
Untreated control	4.11	3.97	1.15	1.11	5.26	5.08	1.50	1.45	0.121	0.119	1.14	1.11	10.1	9.9
Hand hoeing	4.85	4.82	1.50	1.50	6.35	6.32	1.60	1.59	0.131	0.132	1.20	1.19	11.4	11.0
Round up	5.61	5.61	1.80	1.80	7.41	7.41	1.67	1.70	0.150	0.149	1.27	1.30	13.0	12.2
Intercropping onion*	6.45	6.46	2.15	2.15	8.6	8.61	1.75	1.85	0.164	0.165	1.35	1.36	14.1	13.4
Intercropping garlic**	7.30	7.29	2.55	2.50	9.85	9.79	1.85	1.93	0.174	0.175	1.45	1.44	15.3	13.6
Intercropping bean***	8.05	8.06	3.00	2.81	11.5	10.87	1.90	1.89	0.185	0.189	1.51	1.49	16.3	16.7
Intercropping clover****	8.79	8.80	3.33	3.20	12.12	12.0	1.95	1.96	0.200	0.205	1.55	1.54	17.4	17.8
Mulching green sheets	9.5	9.51	3.64	3.51	13.14	13.02	2.09	2.10	0.214	0.215	1.60	1.59	18.5	18.9
Mulching blue sheets	10.25	10.27	3.96	3.81	14.21	14.08	2.16	2.20	0.230	0.229	1.66	1.64	19.6	20.0
Mulching black sheets	11.00	11.08	4.31	4.11	15.31	15.17	2.25	2.24	0.241	0.241	1.71	1.73	20.7	20.1
New L.S.D at 5%	0.71	0.69	0.31	0.29	1.02	1.25	0.05	0.04	0.009	0.011	0.04	0.04	1.0	1.1

2- Vegetative growth characteristics:-

It is obvious from the obtain data in Table (2) that controlling weeds in Superior vineyards by hand hoeing, chemically by Round up, soil mulching and intercropping significantly stimulated all growth aspects namely leaf area, number of leaves /shoot, wood ripening coefficient, cane thickness and pruning wood weight relative to the unweeded control. Chemical control of weeds by Round up significantly stimulated all growth aspects than hand hoeing. Soil mulching was significantly superior on enhancing the growth aspects than using intercropping. The highest values of these growth aspects were recorded on the treatment included the conducting of soil mulching with black sheets. The lowest values of these growth aspects were recorded on unweededcontrol.

These results were true during both seasons.

3- Leaf chemical composition:-

Data in table (3) revealed that controlling weeds chemically by Roundup, hand hoeing, intercropping or soil mulching had significant promotion on chlorophylls a & b, total chlorophylls, N, P and K in the leaves over the control. The promotion on these chemical constituents was significantly associated with soil mulching, intercropping, hand hoeing and Roundup, in descending order. Using Roundup was superior significantly to hand hoeing in enhancing leaf chemical composition. Intercropping onion, garlic, bean and clover, in ascending order was significantly very effective in enhancing these photosynthetic pigments and nutrients in the leaves. Soil mulching with the three colored sheets significantly was preferable than cases of intercropping with the three previous intercrops with Superior grapevines. The best colored sheets were black followed by blue and green sheets ranked the last position in this respect. The maximum values were recorded when the soil was mulched with black sheets. The lowest values were recorded on unweeded control. These results were true during both seasons.

Table (4) Effect of some weed control treatments on some chemical characteristics, yield/fed and net profit (L.E) of grapes and seed yield ardab/fed of bean in Superior grapevines during 2016/2017 and 2017/2018 seasons.

Treatments	Reducing sugars %		Total acidity %		T.S.S/acid		Yield/fed of grapes (tons)	
	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 2017	2017 /2018
Untreated control	15.1	14.9	0.879	0.880	19.3	19.2	8.3	7.9
Hand hoeing	15.6	15.5	0.869	0.860	20.3	20.4	8.5	8.8
Round up	16.2	16.3	0.839	0.830	21.4	21.8	9.1	9.8
Intercropping onion*	17.0	16.9	0.820	0.810	22.4	22.8	9.4	10.5
Intercropping garlic**	17.6	17.5	0.800	0.790	23.7	24.0	9.6	11.7
Intercropping bean***	18.2	18.3	0.780	0.770	25.0	25.3	9.9	12,4
Intercropping clover****	19.0	18.9	0.760	0.750	25.6	26.6	10.2	13.1
Mulching green sheets	19.4	19.5	0.730	0.730	36.5	28.2	10.4	14.0
Mulching blue sheets	19.9	20.0	0.700	0.710	30.0	29.9	10.7	14.7
Mulching black sheets	20.5	20.5	0.680	0.680	31.8	31.6	11.0	15.7
New L.S.D at 5%	0.4	0.3	0.014	0.016	28.5	25.0	0.2	0.4

4- Berry setting %, yield and cluster weight:-

Tables (4) clearly show that all weed control treatments significantly were necessary for promoting berry setting %, yield and cluster weight relative to the control. Chemical control of weeds using Roundup was significantly favorable than hand hoeing in promoting berry setting, yield and cluster weight. Mulching with the three colored sheets (green, blue and black) significantly improved berry setting %, yield and cluster weight compared with intercropping the four intercrops (onion, garlic, faba bean and clover) with Superior grapevines. The best intercropped crop and colored sheets were clover and black, respectively. The maximum values were recorded on soil mulching with black sheets and the unweeded control gave the lowest values. Yield vine reached 11. & 15.7ton in soil mulching with black sheets during both seasons, respectively. Mean while unweeded check control produced 8.3 and 7.9ton during 2016/2017 and 2017/2018 seasons, respectively. The percentage of increment on the yield of the best treatment (soil mulching with black sheets) over the unweeded control reached 32.53 and 98.73 % during the both seasons respectively. Number of cluster in the first season was significantly unaffected by the present weed control treatments. These results were true during both seasons.

5- **Physical and chemical characteristics of berries:-**

Data in Tables (4) clearly show that controlling weeds by hand hoeing, Roundup, intercropping and soil mulching was significantly very effective in improving quality of berries in terms of increasing berry weight, T.S.S %, reducing sugars and T.S.S/ acid and reducing total acidity relative to the control. The promotion was significantly associated with using soil mulching, intercropping, Roundup and hand hoeing, in descending order. Soil mulching was significantly favorable than intercropping in promoting quality of berries. The best intercropcrop was clover followed byfaba bean and garlic, onion intercrop ranked the last position in this respect. The best colored sheets in improving quality of berries were black, blue and green, in descending order. The best results with regards to berries quality were obtained in the mulched soil with black sheets. Unfavorable effects on berries quality were recorded on unweeded control. Similar results were announced during both seasons.

Table (5): Land Equivalent Ratio (LER), time Equivalent Ratio (ATER), Aggressivety (Agg) and competitive ratio (CR) as affected by the interactio between intercropping patterns of onion, garlic, faba bean and Egyptian clover of Grapes 2016/2017 and 2017/ 2018 seasons.

Cropping system	Yield of Main crop/fed		Yield of bey crop /fed		LER		Total LER	ATER	Agg Grapes (A)	Agg b	CR+ CR Grapes (A) b		CR
	Solid	Interco	Solid	Interco	Main	Bey crop							
Season 2016/2017													
Intercropping grapes onion	9	9.4	11.10	10.50	1.04	0.946	1.986	1.51	+8.37	-8.37	1.81	0.85	2.03
Intercropping grapes garlic	9	9.6	12.10	11.50	1.07	0.950	2.01	1.57	+ 9.30	-9.30	1.21	0.83	2.04
Intercropping grapes bean	9	9.9	9.92	9.50	1.10	0.958	2.06	1.55	+10.76	-10.76	1.23	0.81	2.04
Intercropping grapes clover	9	10.2	30.50	20.10	1.13	0.981	2.11	1.56	+26.82	-26.82	1.23	0.81	2.04
Season 2017/2018													
Intercropping grapes onion	10.20	10.50	11.31	10.15	1.03	0.898	1.928	1.473	+9.93	-9.93	1.23	0.81	2.04
Intercropping grapes garlic	10.20	11.70	11.49	10.77	1.15	0.937	2.087	1.651	+14.09	-14.09	1.31	0.76	2.07
Intercropping grapes bean	10.20	12.4	9.11	8.23	1.22	0.903	2.123	1.641	+19.28	-19.28	1.45	0.69	2.14
Intercropping grapes clover	10.20	13.7	31.23	19.9	1.34	0.937	2.227	1.751	+3 8.72	-38.72	1.53	0.65	2.18

Table (6): Economic analysis and Monetary advantage index (M A I) as affected by the intercropping patterns of onion, garlic, faba been and Egyptian clover of grapes 2016/2017 and 2017/2018 seasons.

Treatments	Yield/fed Of grapes (ton)	Yield/fed Of grapes (ton)	Intercrop Patterns	Intercrop patterns	Total income (LE/fed)	Total income (LE/fed)	Total expenditure (LE/fed)	Total expenditure (LE/fed)	Net profit Patterns (LE)	Net profit Patterns (LE)
	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018	2016 /2017	2017 /2018
Unweeded cont.	8.3	7.9	-	-	24900	23700	24893	23694	6.900	5.700
Hand hoeing	8.5	8.8	-	-	25500	26400	25493	26392	7.500	8.400
Round up	9.1	9.8	-	-	27300	29400	27291	29389	9.300	11.400
Inter.grapes + onion	9.4	10.50	10.5	10.15	51150	49075	51117	49041	33.450	33.875
Inter.grape	9.6	11.7	10.77	11.50	54579	57450	54550	57413	29.390	37.100

s + garlic										
Inter.grapes + bean	**9.9**	**12.4**	**9.50 2.11**	**8.23 2.15**	**58515**	**62646**	**58477**	**62604**	**37.515**	**41.706**
Inter.grapes + clover	**10.2**	**13.7**	**20.10**	**19.90**	**7200**	**7200**	**6000**	**6000**	**1.200**	**1.200**
Mul. Green	**10.4**	**14.0**	**-**	**-**	**31200**	**42000**	**31187**	**41976**	**13.200**	**24.000**
Mul. Blue	**10.7**	**14.7**	**-**	**-**	**32100**	**44100**	**32086**	**44074**	**14.100**	**26.100**
Mul. Black	**11.0**	**15.7**	**-**	**-**	**33000**	**47100**	**32985**	**47071**	**15.000**	**29.100**
Pure grapes	**9.0**	**10.20**	**-**	**-**	**27000**	**30600**	**26991**	**30587**	**9.000**	**12.600**
Pure onion	**-**	**-**	**11.1**	**11.31**	**27750**	**28275**	**27731**	**28256**	**18.750**	**19.27**
Pure garlic	**-**	**-**	**12.11**	**11.49**	**24220**	**22980**	**24205**	**22966**	**15.220**	**13.980**
Pure bean	**-**	**-**	**9.92 2.31**	**9.11 2.90**	**30249**	**28947**	**30227**	**28927**	**22.292**	**20.197**
Pure clover	**-**	**-**	**30.50**	**31.23**	**12000**	**12000**	**6100**	**6100**	**4900**	**4900**

3000 for ton of grapes; LE 2500 for ton of onion; LE 2000 for ton of garlic; LE 2700 ardab of faba bean + LE 1500 ton starw of faba bean LE and LE 7200 for 3 cutting of Egyptian clover.

6- Competitive relationships:-

-Effect of various cropping systems on the land equivalent ratio (LER)

It is clear from the data in Tables (5) that LER was significantly affected with varying Intercropping systems. The values of land equivalent ratio for intercropping treatments were significantly greater than mono culture. It was the same (1.0) for all pure stands of main crop and intercrops, while it was ranged from 1.986 to 2.277 in the four intercropped systems. It was significantly highest on the main crop than on the four intercrops. The maximum values (2.11 & 2.277) were recorded on Egyptian clover intercropped with grapes.

- Effect of various cropping systems on the area time equivalent ratio (ATER).

Data in Tables (5) clearly show that values area time equivalent ratio was slightly varied among the two intercrops namely garlic and Egyptian clover when anyone was intercropped with grapes. Values of area time equivalent ratio were 1.57 & 1.75 during both seasons, respectively for either garlic or garlic and Egyptian clover intercropped with grapes.

Effect of various cropping systems on Aggressivity (Agg)

Data in Tables (5) show that aggressivity values of grapes were positive, whereas values of all intercrops were negative, meaning that grapes was dominant and the four intercrops were dominated.

Effect of various cropping systems on competitive ratio (CR)

Data presented in Tables (5) revealed that grapes had competitive ratio higher than that in the four intercrops namely onion, garlic, fababean and Egyptian clover when they were intercropped together. Values of competitive ratio for grapes intercropped with were onion, garlic, bean and Egyptian clover onion, garlic, bean and Egyptian clover 2.03,2.04,2.04 & 2.04 during the first season and were2.04,2.07,2.14 & 2.18 during both seasons, respectively. From these result it can be noticed that grapes was dominated crop when it was intercropped with onion, garlic, bean and Egyptian clover. These results were true during both seasons.

Effect of various cropping systems on total profit (LE/ fed.).

It is evident from the obtained data in Tables (6) that all intercropping systems significantly improved total net profit (LE/ fed) over pure stand of over and under story crops. Pure stand of the main crop namely grapes produced 9.000 and 12.600 LE/ fed during both seasons, respectively. Total net profit produced from sole planting of faba bean reached 22.242 & 20.197 L.E.fed^{-1}. Intercropping faba bean with grapes produced 37.515 & 41.706 L.E.fed^{-1} in during both seasons, respectively. Values produced by onion, garlic and clover when intercropped with grapes reached 33.45, 29.39, 17.80 and 33.875, 37.100, 23.10 LE during both seasons, respectively rather than pure stand of grapes. The percentage of increase on total profit due to intercropping faba bean with grapes reached 75.68 and 68.09% over pure stand of grapes. Using onion, garlic and clover as intercrops increased net profit by 73.09, 69.38 & 49.44% as well as by 62.81, 66.04 & 45.46 % during both seasons, respectively rather than pure stand of grapes. Therefore, from economical point of view, the best intercrop used with grapes was faba bean 37.52 & 41.71(L.E) followed by onion 33.45 & 33.88(L.E), garlic 29.39 & 37.10(L.E) and clover 17.80 & 23.10(L.E). These results were true during both seasons.

4. Discussion

Weed completion in fruit crops is a chronic problem faces extensions and improvement of the Egyptian grape industry. Leaving weeds without control restricts growth directly and severely limits the ability of grapevines to respond to favorable nutritional and soil moisture conditions, resulting in

poor reduce yield **(Oren, 1976)**. In addition**,** weeds harbor insects and diseases and reduce the efficiency of cluster practices and impede harvesting operations. Therefore, it is necessary to control weeds in vineyards. There are many methods of weed control adopted specific weeds situation. These include mulching, hand hoeing and using chemical agents. The previous positive action of mulching the soil with plastic mulches on fruiting of grapevines might be attributed to their effects on increasing the efficiency of water consumption, controlling weeds, warming the soil moisture content making the soil warmer earlier in the season, thus causes fruit crops to mature earlier and results in better fruit quality (further benefits of organic mulches are reducing soil erosion and increasing soil organic mulches are the activity of micro flora. Colored foil induces changes in the field microclimate primarily affecting the light, temperature and air humidity conditions **(Tomasi et al, 2001 and Bunty and Rana,2005).** The beneficial effects of weed control methods on controlling weeds were supported by the results of El-**Shamma and Hassan (2001); Yao *et al* (2005), Yamdagni *et al* (2007); Dilley (2007) and Sandler *et al* (2009)** on Thompson seedless vineyards. Controlling weeds was found by many author to enhance growth **(Hostetler *et al,*2007 a and Derr 2008)**; Vine nutritional status **(El- Shamma and Hassan,2018 and Hansen, 2005);** cluster weight **(Hostler *et al*, 2007 a; Sandler *et al*,2009 and Linjian – Jiang, 2010)** and quality of the berries **(Leal, 2007).**

Conclusion

To control weeds in Superior vineyards and at the same times promote both yield and berries quality; it is advised to soil mulching with black sheets. On the economic side and the material return of the farmer prefer to intercrop of faba bean or garlic under the grapevines.

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