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Effect of intercropping on fruiting and growth of flame seedless grapevines.

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ABSTRACT

This investigation was carried out at Samannud District Gharbia Governorate during seasons of 2009 and 2010 on Flame Seedless grapevines growing in clay soil. This objective amied to study the effect of intercropping Flame Seedless grapevines by: Clover, Peas, Onion and Japanese Turnip.

Clover was sown under and between vines during the second week of September, Peas was cultivated in rows during the first week of October, Onion Transplanting in rows during the first week of December and Japanese Turnip sown under and within vines during the second week of September, 2009 and 2010 seasons.

The results revealed that cultivation of Onion, Japanese Turnip, Peas and vines sole advanced budburst date and budburst % than other treatments. On the other hand Clover treatment delayed budburst in this respect. As for fertility indicators intercropping vines by Onion, Japanese Turnip, Peas thin vines sole occupied the highest values respectively in these parameters and the minimum values achieved from the vines were intercropped with Clover. The data also showed that the fruitful shoots which have more clusters presented from the vines which intercropped by Onion and Japanese Turnip. Concerning vegetative growth data revealed that Peas, Onion and Clover treatments increased leaf area, shoot length, pruning weight/vine (kg) and enhanced wood ripening % than other treatments.

As date of leaves fails, intercropping vines with Clover delayed leaves fails to November but other treatment occurred in October. Also intercropped vines with Peas, Clover and Onion have maximum values in N,P and K leaf petiole%.

Average yield (Ton)/Fe. of vines, intercropping with Clover decreased the yield by about 7.4 %. On the other hand yield of vines intercropping with Peas, Onion and Japanese Turnip increased the yield by about 17.3, 49.4 and 19.8%, respectively comparing with vine sole. Also results cleared that intercropping of Clover, Peas, Onion and Japanese Turnip increased the income (L.E) / Fe. by about 8.5, 51.2, 61.4 and 47.1 % compared to sole vines (averages of two seasons under the study).

From this results, it could be recommended that cultivation of Autumn and Winter agronomic crops under and between Flame Seedless grapevines, and harvested its before the main crop (grapes) led to increasing the income from farm (L. E.) .

INTRODUCTION

Intercropping is a difficult system and comprizes both negative, positive impacts and prepossess study (Noord wijk and Hairiah 2000).

When two or more crops are grown in the same field this is called intercropping and the intercrop grow under or between the vine rows and will mature more rapidly than the main crop. Crops sown or transplanting in Autumn or Winter to be harvested before harvesting grape. Intercropping has traditionally been neglected in research on plant production systems in temperate agricultural ecosystems, due to its complexity and because of the difficulties for its management and lesser relevance in cropping systems, based on agrochemicals. Intercropping can provide several benefits for vineyards management (Miller et al 1989). Some benefits of intercropping include: Maintain soil fertility as the nutrient uptake is made from both layer.

Some plants release certain elements into the soil that prevent other plants from grown, so this is also minimized. (Miller et al. 1989). More number and different variety of crops can be grown in a year without degrading the soil.

In an intercropping system weeds are often more easily controlled. For example in Clover, Peas and Japanese Turnip intercrop the crop covers the soil, preventing weeds to grow on the other hand weeding can also be more complicated in an intercrop.

Intercropping gives higher income per unit area than sole cropping. One of the benefits intercropping grapes with other plants is it can control or remove pests in a natural way (Ahmed and Mahdy 1993). When the prices of the grapes are down in the out break of a disease or when the vines are still not producing a companion crop can provide another source of income (Abd El-Samad 2006 and Rizk 2006).

The negative effects of intercropping competition for water and nutrient between crops and vines can be reduced the yield.

Under Gharbia Governorate today intercropping is a common practice that is being used in vineyards and most cultivation: legume crops, Clover, Peas and Japanese Turnip for N fixation by the legume is not enough to maintain soil fertility, fertilizers are more efficiently used in an intercropping system due to the increased amount of humus and different rooting systems of the crops as well as differences in the amount of nutrients taken up (Striegler et al 1997). Also the yield of two crops grown as intercrops can be higher than the yield of the some crops grown as a pure stand. Therefore the objectives of this study were to examine of intercropping on fruiting and growth of Flame Seedless grapevines.

MATERIALS AND METHODS

This investigation was carried out during 2009 and 2010 seasons on 7 – year old Flame Seedless grapevines grown in a clay soil (Table 1), under flood irrigation surface was follow in a private orchard located at Samannud Gharbia Governorate Egypt, water table not less than two meters deep. This study investigate the effect of intercropping on growth and fruiting of Flame Seedless grapevines.

For this investigation 540 vines of nearly similar uniform according to vine vigor and preceding weight of pruning wood (Kg)/ vine. The vines were trained according to quadrilateral cordon using Telephone supporting system; the planting distance was 3.0 X 2.0 m between the rows and the vines (700.0 vine/feddan). Winter pruning had done on the fourth week of January during two seasons of study, leaving 56 bud / vine were leaved (4 cordon X 7 fruiting spurs, two buds were remained / each spur).

The experiment contained five treatments:

1- Flame Seedless vines (sole)
2- Flame Seedless vines + Clover (Trifolium Alexandrinum)
3- Flame Seedless vines + Peas (Master B)
4- Flame Seedless vines + Onion
5- Flame Seedless vines + Japanese Turnip)

The design of the experiment was randomized complete block with three replicates consists of 36 vines per each.

The vines of each treatment divided into two equal group according to Omar (2004). The first group was used to study: budburst date and percentage , fruitful shoots % absolute fertility coefficient, berry set %, leaf area (cm^2) and vine area (m^2), shoot length cm, leaf N, P, K content, leaf fails date and wood ripening %.

But the second group was kept to study: Number and Weight of clusters, yield (kg) / vine, yield (Ton)/ Fe. T.S.S % and Total acidity of berries juice %.

At primary of the experiment physical properties of the soil at 0.0 – 90.0 cm soil depth were determined, (Table 1) also chemical properties of the soil at 0.0 – 90.0 cm soil depth at the end of experiment were determined according to Wiled et al (1985) to give information's about the effect of intercropping different crops on soil nutritional element status after harvesting crop, and the obtained data in table (2).

Table (1): physical properties of the soil at 0.0 – 90.0 cm depth.

Sand %	8.10
Silt %	22.40
Clay %	69.50
Texture	clay

Table (2): Chemical characteristics of the soil at 0.0 – 90.0 depth.

	Before experiment	After experiment				
		Intercropping				
		1	2	3	4	5
pH	7.8	7.8	7.6	7.6	7.5	7.1
E.C	0.21	0.21	0.22	0.25	0.27	0.21
O.M %	2.6	2.6	3.1	2.8	2.6	2.7
Total N %	2.2	2.2	2.8	2.9	2.1	1.8
Available P (ppm)	5.1	5.1	5.2	5.6	4.4	4.2
Available K (ppm)	180.0	180.0	184.0	189.0	148.0	141.0

1 = vines sole
2 = vines + Clover
3 = vines + Peas
4 = vines + Onion
5 = vines + Japanese Turnip

All the tested vines received the same horticultural practices including 400.0 kg ammonium sulphate (20.6 N), 150 kg potassium sulphate (48.0 % k_2o), 200.0 kg mono calcium super phosphate (15.5 % P_2O_5)and 20.0 m^3 organic manure / feddan, hoeing, irrigation as well pests and fungi control were carried out as usual. (These amounts of fertilizers did not excessive because the farm used flood surface irrigation system which leach some fertilizers). Super phosphate and organic manure were applied during winter service, which N fertilizer added as follow:

- 100 Kg ammonium sulphate plus 50 Kg potassium sulphate added after budburst to primary of flowering
- 200 Kg ammonium sulphate plus 100 Kg potassium sulphate added after berry set.
- 100 Kg ammonium sulphate added after harvesting.

Intercropping materials:

1- Clover (Trefoilium Alexandrinum) was sown within and under the vines rows (36 vines in length row and 4 vines row wide), during the second week of September in two seasons of study and was irrigated every 20 day equal 7 times from sowing date till the end of February (Taken 4th plowings then the orchard was prepared for the new season).

2- Peas (Master B) was cultivated in rows (one row / 70 cm) during the first week of October in seasons of study and was irrigated every 20 day equal 5th times from planting date till the end of January.

3- Onion transplanting in rows (one row / 70 cm) during the first week of December and was irrigated every 25 day equal 5th times from transplanting date till the end of April.

4- Japanese Turnip sown under and between vines during the second week of September for two studies seasons and was irrigated every 20 day equal 4th times from sowing date till the second week of January.

Intercropping fertilization system:

1- Clover (Trifolium Alexandrinum) were fertilized by 100 kg P (15.5% P_2O_5) / Fe , before sowing and 200 kg granular ammonium nitrate (33.5% N)/ Fe which divided into 50 kg / Fe with all one blowing.

2- Peas (Master B) were fertilized by 250.0 kg P (15.5% P_2O_5) / Fe during preparing the soil and 250.0 kg / Fe ammonium sulphate (20.6 % N) were added during growth season.

3- Onion were fertilized by 300.0 kg P (15.5% P_2O_5)/ Fe plus 100kg potassium sulphate (48.0% K_2O) during preparing the soil. N were fertilized in form of ammonium nitrate (33.5% N) at rate of 60.0 unite after month from transplanting and 60.0 unite after one month from the first dose.

4- Japanise Turnip were fertilized with 200.0 kg P (15.5 % P_2O_5) and 50 kg potassium sulphate (48.0% K_2O) applied during the soil preparing. N fertilizer in form of ammonium nitrate (33.5% N) were applied at rate of 100 kg + 25.0 kg K (48.0% K_2O) as the first dose and the second dose at the same rate after one month.

All intercropping crops in this experiment received other agricultural practices such as hoeing (without clover) bests mites and fungicides control.

The study involved the following determination:

Bud behaviour: Budburst date, Number and percentage, fruitful shoots %, No of flower cluster / vine, fertility coefficient and absolute fertility coefficient were recorded:

- Beginning of budburst date: Was recorded when 5 buds / vine were opened. I.e. when the red leaves it's emerged from the buds of each vines. (El-Ashrm 1993)

$$\text{Budburst \%} = \frac{\text{No. of opened buds / vine}}{\text{Bud load / vine}} \times 100$$

$$\text{Fruitful shoots \%} = \frac{\text{No. of fruitful shoots / vine}}{\text{Total No. of shoots / vine}} \times 100$$

$$\text{Absolute fertility coefficient} = \frac{\text{No. of clusters / vine}}{\text{Total No. of fruitful shoots / vine}}$$

according to (Lazarevskii 1963).

Vegetative growth:

- Leaf area (cm^2) and vine area (m^2) / vine. Twenty leaves / vine were picked at Veraison of 5^{th} position from shoot top(vegetative shoot at the same length) for measuring leave area (cm^2) and vine area (m^2) by using CI – 203 area meter made by CID, Inc, Vancouver, U.S.A.
- Shoot length (cm) : Twenty vegetative shoot at the same length / vine were used in November were. measured as average by (cm), also leaves fail date were calculated for each treatment when the leaves began take the red color and begins fail (El-Ashram 1993).
- Pruning wood weight kg: were recorded / vine by using all shoots age 1- year / vine (at winter pruning) as a parameter of vegetative growth vigor. Also wood ripening % were determined at the end of growth season as a parameter of canes ripening . Smith et al (1956) by dividing the brownish cane length by the total shoot length X 100.

Leaf petiole N.P.K %: leaves samples opposite to the basal cluster were taken at full bloom to determine leaf petiole N.P.K % Content.

Berry set%: Berries set % were estimated by caging five flower clusters on 30 vines / each treatment in perforated paper before bloom and after berries set was calculated by dividing the number of berries set / cluster by the total number of flowers per cluster and multiplied by 100 according to Ahmed *et al* (2003).

No. of cluster / vine, cluster weight (g), yield / vine (kg) and yield / Fe. (Ton):

Number of cluster / vine, average yield / vine (kg) and average yield / Fe (Ton) were calculated at harvest date during the two seasons of study. Yield was harvested, when T.S.S % in berries juice reached (17 – 18) for all treatments. Random samples of 30 clusters /treatment (10 cluster / each replicate were collected at the harvest time to determined average cluster length (cm) and weight (gm), Number of berries / cluster and cluster compactness coefficient was calculated from this formula.

$$\text{Coefficient of cluster compactness:} \frac{\text{No of berries / cluster}}{\text{Cluster length (cm)}}$$

Chemical characteristics of berries: Total soluble solids (T.S.S %) in berries juice % were calculated by using a hand refractometer and total tetra table acidity % in berries juice (as tartaric acid %) according to A.O.A.C (1985).

Income of unite area (per feddan) were calculated for each treatment:

Income of each mono – culture Flame Seedless grapevines as well as those intercropped by Clover (Trifolium Alexandrinum), Peas (Master B), Onion and Japanise Turnip were estimated by Egyptian pound (L.E.) / feddan as follows :

Income of mono-culture Flame Seedless grapevines= Yield (kg fruit/vine) number of vines / feddan X farm price.

Income of vines intercropped by Clover = Income of intercropped/ vines from fruits (L.E.) + price of one plowing (L. E.) x 4 (No. of plowing / Fe.).

Income of vines intercropped by Peas = Income of intercropped/ vines from fruits (L.E.) + yield of peas ton / Fe. X price of one ton.

Income of vines intercropped by Onion = Income of intercropped /vines from fruits (L.E.) + (yield of onion ton / Fe.X price of one ton).

Income of vine intercropped by Japanise Turnip = Income of intercropped /vines from fruits (L.E.) + (yield of Japanise Turnip ton / Fe.X price of one ton).

All the obtained data were tabulated and statically analyzed according to Snedecore and Cochran (1973) using new L.S.D. test for examining the significant differences between the studied treatments.

RESULTS AND DISCUSSION

As for soil elements status after finish of the experiment data from table (2) revealed that intercropping vines with legume crops, Clover and Peas resulted in increasing O.M and nutrient elements and improving soil physical and chemical properties than other treatments during study. This is not astonishing since, intercropping crops help bring other nutrients back into the upper soil profile from deeper soil layers by Cover crop roots. When the intercropping crop dies and decomposes the nutrients released back into the soil. Also some crops are through to secrete acids into the soil and put P into a more soluble form. (Rizk 2006) on Thompson Seedless grapevines.

Bud behaviour

Budburst: Date, No. and percentage of buds / vine and fruitful shoots No. / vine.

Data presented in table (3) showed that budburst date occurred in Mars between 2 -16 and 4 – 13 day and the vines sole advanced the beginning of budburst date comparison with other treatments followed by the vines were intercropped with onion, Japanese Turnip and the vines intercropped with clover have a latest date (delayed budburst date by about 14 – 9 days than the vines sole) during two seasons of study because excess soil water availability during Autumn prolonged shoots and canopy growth (Elmore et al., 1997) and the budburst date relapsed to number five between the budburst dates. These findings agreement with Ndung et al (1997) on grape who reported that deficit irrigation enhanced bud break.

Concerning the effect of intercropping on budburst , data cleared that this parameter was affected according to the treatment sinces vines cropped with onion enhanced budburst and have highest significant values in this respect follow by intercropped vines with Japanese Turnip, Peas and vines sole take nearly the same values. Yet, the lowest values came from vines were intercropped with clover. These differences perchance due to different treatments for disease control during dormancy period like as sulphur fungicides, copper fungicides, systemic fungicides which effect on buds endoparasites for intercropped vines with Onion, Japanese Turnip and Peas. Ahmedand Mahdy (1993). Budburst % take similar trend during seasons of study. Furthermore data in table (3) indicated that fruitful shoots No. / vine also was affected by intercropping and the vines were intercropped with Onion enhanced this parameter and have high significant values (27.0 and 28.0) fruitful shoot / vine follow by the vines intercropping with Japanese Turnip, vines sole, Peas and finally the minimum values (20.0 and 21.0) fruitful shoot / vine come from intercropping vines with Clover. These differences due to all the treatments increased budburst %, take little irrigated number during dormancy material and methods and treated for disease control enhanced fruitful shoots No. / vine. Also increasing budburst No / vine caused an increasing in fruitful shoots No / vine like as using dormancy breaking agents which increase bud burst No. / vine caused increasing in fruitful cluster / vine.

Table (3): Effect of intercropping on budburst: Date, budburst No. , % and fruitful shoots No. of Flame Seedless grapevines.

Treatments	Budburst date		Budburst No / vine		Budburst %		Fruitful shoots No. / vine	
	2009	2010	2009	2010	2009	2010	2009	2010
Grapevines sole	Mars 2	Mars 4	48.0	47.0	85.7	83.9	23.0	25.0
Grapevines + Clover	Mars16	Mars13	40.0	38.0	71.4	67.9	20.0	21.0
Grapevines + Peas	Mars10	Mars 8	47.0	45.0	83.9	80.4	23.0	24.0
Grapevines + Onion	Mars 4	Mars 5	51.0	50.0	91.1	89.3	27.0	28.0
Grapevines + Japanese Turnip	Mars 4	Mars 6	49.0	48.0	87.5	85.7	24.0	25.0
New L.S.D at 5 %			5.2	4.9	8.4	9.6	2.6	3.2

Fruitful shoots %, No of flower cluster / shoot, fertility coefficient and absolute fertility coefficient.

Concerning fertility indicators of Flame Seedless grapevines which intercropped with different crops data from table (4) showed that above indicators were higher for the vines intercropped with Onion and have significant values in this respect. Also intercropping with Onion and Japanese Turnip gave a higher significant values in the shoots carriers for more than one cluster specially in the second season because the clusters have already been formed in the preceding season. (Rizk 2006) comparison with other treatments in the seasons of study.

On the other hand the vines were intercropped with Clover have a second value as for fruitful shoots % only. Data in table (4) revealed that highest significant values of No. of flower cluster / vine, fertility coefficient and absolute fertility coefficient came from the vines were intercropped with Onion, Japanese Turnip and grapevines sole. Peas and Clover intercropping take nearly similar values. These values consider lowest values comparison with (Onion, Japanese Turnip and sole vines). This may be due to that Clover and Peas had more water requirement more than (Onion, Japanese Turnip and sole vines) and its requires seven and fifth time irrigation during dormancy which lead to continuity of vegetative growth of vines, which delayed and reduction of above indicators comparing with other intercropping crops. These findings agreement with Amnon (2000) who mentioned that if bud break occurred too late, the maximum development potential of the vines will be reduced and with that it ecological competition ability. Also , Abd-Samad (2006) found that sharp reduction in blooming density could be easily observed in Peach trees interplanted by clover compared to the sole trees. Also these results agreement with Rizk (2006) who mentioned that the Clover and Peas cover crop + compost treatments had the least effect on increasing bud fertility coefficient or number of cluster / vine.

Table (4): Effect of intercropping on fruitful shoots %, No. of flower clusters/ vine, fertility coefficient and absolute fertility coefficient.

Treatments	Fruitful shoots%		No. of flower clusters / vine		Fertility coefficient		Absolute fertility coefficient	
	2009	2010	2009	2010	2009	2010	2009	2010
Grapevines sole	47.9	53.2	25.0	27.0	0.50	0.53	1.1	1.1
Grapevines + Clover	50.0	55.3	22.0	23.0	0.55	0.61	1.1	1.1
Grapevines + Peas	48.9	53.3	25.0	27.0	0.53	0.60	1.1	1.1
Grapevines + Onion	52.9	56.0	38.0	39.0	0.75	0.78	1.4	1.4
Grapevines + Japanese Turnip	49.0	52.1	32.0	34.0	0.65	0.71	1.3	1.4
New L.S.D at 5 %	2.4	2.6	2.8	3.2	0.04	0.06	0.2	0.2

Vegetative growth:

Leaf area (cm^2), vine area (m^2), shoot length (cm) and pruning weight (kg)/vine

As shown in table (5) leaf area and vine area was positively affected by the kind of intercropping crop namely Peas, Clover , Onion, Japanese Turnip and finely vines free (sole). Intercropped vines with Peas, Clover and Onion were preferable in improving the leaf area / vine and shoot length compared to the vines free (sole) or intercropped with Japanese Turnip. The maximum leaf area/ vine and shoot length were recorded on the vines were intercropped with Peas, Onion and Clover. Its due to the residual roots of its supplying the vines with their requirements from various nutrients and improving physical and chemical properties of the soil, the rely enquiry good roots growth and as a result the growth of leaf area, vine area and shoot length were raised (Nijjar, 1985) especially in the second season because its need more time to get its effect. These results are in agreement with those obtained by Rizk (2006) who worked on Thompson seedless grapevines which intercropped with Clover and Peas as a cover crop and Abd El - Samad on two Peach cultivars namely "Floridaprince and Earlygrand".

Table (5): Effect of intercropping on leaf area (cm^2), vine area (m^2), shoot length (cm) and pruning weight (kg)/vine.

Treatments	leaf area (cm^2)		vine area (m^2)		shoot length (cm)		pruning weight (kg)/vine	
	2009	2010	2009	2010	2009	2010	2009	2010
Grapevines sole	145.8	144.1	16.0	15.8	215.5	218.8	2.80	3.10
Grapevines + Clover	151.4	152.6	16.8	17.6	226.4	234.0	3.40	3.70
Grapevines + Peas	162.9	164.5	19.5	19.0	231.5	238.8	3.80	4.10
Grapevines + Onion	151.6	153.1	16.9	17.8	227.3	235.1	2.70	2.80
Grapevines + Japanese Turnip	130.5	134.6	13.4	13.7	190.8	198.6	2.40	2.60
New L.S.D at 5 %	5.4	6.4	1.3	1.6	5.8	6.8	0.60	0.80

On other hand the minimum values in leaf area, vine area and shoot length resulted from the vines were intercropped with Japanese Turnip might be attributed to its have large voliage which consumption nutrients from the soil. Its was true during seasons of study.

As for intercropping vines with Onion data from table (5) showed that this treatment have a second values in this respect during seasons of study sinces it might be attributed to the large amount of N fertilizers which added during growth seasons of Onion which leaved a greet residual from N in the soil after the end of study seasons.

Concerning pruning weight (kg) / vine table (5) showed that pruning weight (kg) / vine was positively affected in the vines were intercropped with Peas and Clover than those intercropped with Onion, Japanese Turnip. Also vine sole take insignificant values in this respect. Further more, all treatments increased shoot length, vine area (Peas and Clover) and have significant values in this respect. The beneficial effect of the vines were intercropped with Peas and Clover on pruning weight (kg) / vine might be attributed to their effect on supplying the vines with their requirements from various nutrients from the organic parts which leave in soil and improving physical and chemical properties of the soil, the rely enquiry good roots growth and as a result the growth of vines was raised (Nijjar, 1985).

The present results are in agreement with those obtained by Ahmed et al (1996 a) and Darwish et al (1996) they worked on organic N fertilizers.

Also data from table (5) showed that reduction in pruning weight (kg/vine) of vines were intercropped by Onion and Japanese Turnip may be due to these two crops especially Onion take more time in the soil for its maturation completion its consumption nutrients and excess soil N and water availability during autumn can prolong shoot and increase canopy growth.

This result agreement with Abd El-Samad (2006) on Peach trees. This was true during seasons of study.

Leaf petiole N, P and K % content, wood ripening % and leaves fails date.

Data in table (6) showed that leaf petiole N % of Flame Seedless grapevines was effected by different treatments significantly since, vines were intercropped with Clover and Peas have highest significant values in two seasons of study. Also we observed that intercropping Clover increased N petioles % in the second seasons than the first one. This may be due to residual organic matter need more time to get its effect. Also the above data revealed that higher significant values came from intercropped vines with Peas. These findings agreement with Chambliss et al (2003) who found that legumes and Clover roots have the ability to symbiotically associate with certain soil bacteria, rhizobia, that fix atmospheric N. also who added that legumes normally produce organic matter in the soil with higher N content. These findings go in line with Rizk (2006) who found that Clover and Peas cover crops increased leaf petiole N % of Thompson Seedless grapevines.

Results from table (6) indicated that leaf petiole N % of vines were intercropped with Onion have a third value comparison with other treatments its due to highest fertilizers of Onion during growth seasons which leave high residual from N in the soil. Vines free (sole) have a moderate values in this respect. On the other hand, minimum leaf petiole N % came from the vines which intercropped with Japanese Turnip its true during seasons of study because its have large voliage which consume a great amount of N from the soil table (2).

Table (6): Effect of intercropping on leaf petiole N, P, K %, wood ripening and leaves fail date of Flame Seedless Grapevines.

Treatments	N %		P %		K %		Leaves fail date		Wood ripening %	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Grapevines sole	2.36	2.48	0.23	0.21	1.52	1.50	Oct. 18	Oct. 20	77.1	76.2
Grapevines + Clover	2.65	2.76	0.28	0.31	1.66	1.67	Nov. 10	Nov. 13	86.4	87.1
Grapevines + Peas	2.78	2.84	0.29	0.30	1.68	1.69	Oct. 22	Oct. 24	87.9	88.9
Grapevines + Onion	2.45	2.54	0.29	0.30	1.62	1.64	Oct. 10	Oct. 14	80.6	81.2
Grapevines + Japanese Turnip	2.10	2.18	0.15	0.18	1.36	1.28	Oct. 8	Oct. 12	78.2	77.1
New L.S.D at 5 %	0.25	0.32	0.05	0.08	0.12	0.18			1.8	1.4

Oct = October Nov=November

As for P and K % in leaf petiole, data show an increase by intercropping vines with Clover and Peas as compared with the vines which intercropped with Onion or Japanese Turnip and free vines (sole). It is due to some intercropping crops like as Clover and legumes crops help bring other nutrients back into the upper soil profile from deep soil layers Miller et al (1989). Potassium is a macronutrient which cane be brought up from deeper soil layers by intercropping crop roots, then the nutrients are released back into the active organic matter when the intercropping crop dies and decomposes. Also some crops are through to some acids like as Onion (Sulphoric acid) into the soil that put phosphorus into a more soluble plant usable form. The roots of legumes crops house beneficial fungi known as mycorhizae. The mycorhizae fungi have evolved efficient means of absorbing P from the soil, which they pass into their plant most keeping phosphorus in an organic form. This is the efficient way to keep its cycling in the soil. Rizk (2006). Also intercropping crops help retain P in the fields by reducing erosion(Sarrantonio, 1989). Data also revealed that lowest leaf petiole K % value came from intercropping vines with Japanese Turnip this may be due to consumption of K in growth of its tupper roots.

Data are presented in table (6), presented that wood ripening % was positively affected by the kind of intercropping crop and the maximum wood ripening % resulted from the vines were interloped with Peas ,Clover and Onion this might be attributed to these treatments have a maximum vine area table (5) which enhancement in chlorophly and increased carbohydrate synthesis. Ghobrial (2006) on Flame Seedless grapevines. Also Clover treatment reduce yield/vine table (8) and therefore wood ripening enhancement. As for the vines free (sole) data revealed that this treatment have a moderate values in this respect, its due to reduction in vine area table (5) which resulted from leaching of some nutrient elements by flood irrigation. Also the vines were intercropped with Japanese Turnip take lower values because its consumption the nutrient elements from the soil during growth season table (2).

As for leaves fails date data from table (6) indicated that intercropping vines with different crops affected on leaves fail date and the vines were intercropped with Japanese Turnip advanced the leaf fail date follow by Onion , grapevines sole, Peas and finally the vines were intercropped by Clover which delayed leaves fail date compared to other treatments. This may be due to the fact that Clover had more water requirement more than other intercropping crops and it requires 7 times irrigation during autumn which lead to continuation of vegetative growth of vines. In this respect, Elmore et al (1997) reported that excess soil N and water availability during autumn can prolong shoot and increase canopy growth.

Berry set%, No. of berries / cluster, cluster length (cm) and cluster compactness.

It can be seen from data which presented in table (7) that intercropping vines with Onion and Peas resulted in a positive effect on berry set % and No. of berries / cluster compared to other treatments perhaps attribute to using fungicides like as sulphur, Copper and systemic fungicides during growth season of these two crops against downy mildew of Onion and Peas, powdery mildew and tetranychus telarius which increased the chemical plant protection. Also these fungicides used for Disinfection, protectants, Eradicates or suppressors (Ahmed and Mahdy 1993). Therefore the vines were intercropped with Onion and Peas effect positively on increasing berry set % and No. of berries / cluster during seasons of study. As for other treatments data revealed that grapevines free (sole) take the second values. Yet, the smallest values resulted from the vines were intercropped with Clover and Japanese Turnip. Its due to these two crops considered as host of fungi and grape leaf hopper.

As for cluster length the maximum values resulted from the vines were intercropped with Peas, Clover and Onion in seasons of study compared to other treatments. This attributed to the roots of (Clover and Peas) have the ability to symbiotically associate with certain soil bacteria, rhizobia, that fix atmospheric N. and normally leave organic matter in the soil which supply the vines with their requirements from various nutrients, improving physical and chemical properties of the soil which increase leaf area, vine area and shoot length table (5). Sinces the biosynthesis of plant growth promoters which increase the length of the cluster. Also high Onion nutrient during the growth leave N residual in the soil after harvesting Onion which improved soil N status table (2). Vines free (sole) have a moderate values between the treatments, flow by the vines were intercropped with Japanese Turnip which have a lowest values in this respect table (2) showed that this treatment effect on soil nutrient status at the end of study because Japanese turnip stems and leaves consumed a highest percentage of nutrient during growth seasons. These findings agreement with Kassem and Marzouk (2002) on Flame Seedless grapevines, El-Shenawy and Fayed (2005 b) on Crimson Seedless grapevines, Rizk (2006) on Thompson Seedless grapevines and Ghobrial (2006) on Flame Seedless grapevines.

As for cluster compactness data from table (7) reveled that the vines were intercropped with Clover, Onion and Peas enhanced cluster compactness than other treatments it might be attributed to these treatments increased cluster length table (7) follow by the vines free (sole) and finally the vines were intercropped with Japanese Turnip because its have a short cluster length table (7) .

Table (7): Effect of intercropping on berry set %, No. of berries/cluster, cluster length (cm) and cluster compactness.

Treatments	berry set %		No. of berries/cluster		cluster length (cm)		cluster compactness	
	2009	**2010**	**2009**	**2010**	**2009**	**2010**	**2009**	**2010**
Grapevines sole	8.4	8.1	208.0	202.0	25.0	27.0	8.3	7.5
Grapevines + Clover	8.1	8.0	210.0	207.0	32.0	33.0	6.6	6.3
Grapevines + Peas	8.8	8.6	220.0	212.0	33.0	32.0	6.7	6.4
Grapevines + Onion	9.6	9.4	230.0	221.0	32.0	30.0	7.2	7.4
Grapevines + Japanese Turnip	7.6	7.2	198.0	192.0	24.0	25.0	8.3	7.7
New L.S.D at 5 %	0.5	0.4	18.1	17.2	4.8	5.2	0.6	0.8

No. of cluster / vine, cluster weight (g), yield / vine (kg) and yield / Fe. (Ton):

It can be seen from table (8) that above parameters were affected significantly by cultivation of Clover, Peas, Onion and Japanese Turnip and vines free (sole) under grapevines. The highest number of clusters / vine were recorded on vines were intercropped with Onion, Japanese Turnip then Peas and vines free (sole) give the same values. This improvement in No. of clusters / vine due to these crops positively affected on bud behaviour tables (3 and 4) and treatments for diseases control during dormancy period by sulphur fungicides, copper fungicides, systemic fungicides which effect on bud endo- parasites for intercropped vines with Onion, Japanese Turnip and Peas. Although the cluster have been already formed in the preceding season. The increment in No. of clusters / vine did not due to transformation of vegetative buds to fruitful buds (clusters have been already formed in the preceding season) but attributed to increasing in budburst % like as which happened in treatments of dormex which increase budburst % and therefore fruitful shoots % increase. This findings agreement with Marwad et al (1988) on persimmon trees and dormex and El-Sayed et al (2002) on Roomy Ahmer. This was true during seasons of study.

Table (8): On No. of clusters/vine, cluster weight (gm), yield/vine (kg) and yield/Fe. (Ton)

Treatments	No. of clusters/vine		Cluster weight (gm)		Yield/vine (kg)		Yield/Fe. (Ton)	
	2009	2010	2009	2010	2009	2010	2009	2010
Grapevines sole	25.0	27.0	440.0	445.0	11.0	12.0	7.7	8.4
Grapevines + Clover	22.0	23.0	470.0	480.0	10.3	11.0	7.2	7.7
Grapevines + Peas	25.0	27.0	515.0	530.0	12.9	14.3	9.0	10.0
Grapevines + Onion	38.0	39.0	445.0	450.0	16.9	17.6	11.8	12.3
Grapevines + Japanese Turnip	32.0	34.0	410.0	430.0	13.1	14.6	9.2	10.2
New L.S.D at 5 %	3.8	4.2	14.6	16.4	1.6	1.4	1.3	1.6

As for cluster weight the best results were obtained from the vines were intercropped with Peas Clover than vines free (sole) and Onion, finally vines were intercropped with Japanese Turnip respectively in both seasons. This may be due to Peas and Clover have a little No. of cluster table (8) and legume crops fix atmospheric nitrogen (Chambliss et al 2003) in the soil. Also residual organic parts improving physical and chemical properties of the soil. On other hand lowest cluster weight resulted from the vines were intercropped with Japanese Turnip. So, a great growth of Japanese Turnip roots consumption many fertilizer elements and its competitive with vines growth table (2). This results agreement with Rizk (2006) on Thompson Seedless grapevines. Data in table (8) reveal that the vines were intercropped with Onion, Peas and Japanese Turnip resulted in a positive effect on yield / vine compared to vines free or intercropping vines with Clover and the best results were obtained in vines were intercropped with Onion. This results due to No. of cluster / vine and cluster weight table (8). The improving effect of intercropping vines on yield / vine is supported by Ragab and Mohamed (1999) on Flame Seedless, Rizk (2006) on Thompson Seedless and disagreement with Abd El-Samad (2006) on peach trees because he leaved Clover which cultivation under trees for more period (end of growth tree seasons) which increased the competition of water and fertilizer elements.

As for yield / Fe. (Ton) data from table (8) revealed that a great variation in this parameter and the vines were intercropped with Onion have highest significant value in this respect during studied seasons, and the differences attributed to bud behaviour table (3), berry set table (7), kind of intercropping crop, No. of cluster / vine, cluster weight and yield / vine, table (8). This was substantial in both seasons, and agreement with Ragab and Mohamed (1999), Rizk (2006).

Effect on T.S.S % and acidity:

It can be seen from the data in table (9) that the highest values of T.S.S % were resulted from the berries of vines were intercropped with Peas and Clover, this might be attributed to there effect on leaf and vine area table (5) which increased photosynthesis activity and hence increased T.S.S % in berries juice. This resulted agreement with Killer et al (1998). They found that photosynthesis is the process for producing sugar (glucose), which means that more sugars are available for growth and fruit ripening. On the other hand vines free (sole) have a moderate values between treatments and the minimum values resulted from vines intercropped by Onion and Japanese Turnip in this respect because its have a long growth period in the soil specially (Onion crop) during vines growth season which increase the competition for nutrients or water which can effect on leaf area and area / vine table (5). These findings agreement with Abd El-Samad (2006) on Peach trees.

As for total acidity % it's clear from data in table (9) that the lowest values in total acidity were obtained by the vines which were intercropped with Peas and Clover and they have significant differences comparison with other intercropping crops. This may be due to leaf area and area / vine table (5) which effect with positively and negatively on photosynthesis.

These results was true during two studies seasons and agreement with Abd El-Samad (2006) on Peach trees, Killer et al (1998) and Rizk (2006) on Thompson Seedless grapevines.

Table (9):Effect on intercropping on T.S.S % and Acidity % .

Treatments	**T.S.S %**		**Acidity %**	
	2009	**2010**	**2009**	**2010**
Grapevines sole	18.1	18.2	0.72	0.71
Grapevines + Clover	18.6	19.4	0.56	0.47
Grapevines + Peas	18.4	19.2	0.51	0.44
Grapevines + Onion	17.9	17.8	0.55	0.56
Grapevines + Japanese Turnip	17.2	17.5	0.57	0.55
New L.S.D at 5 %	0.40	0.60	0.02	0.01

Economical study on costs and average net profit / Fed. (L.E) of Flame Seedless grapevines intercropping compared to vines sole.

Data from table (10) revealed that the vines were intercropped with other crops increased the average yield / Fed. Without intercropping vines with Clover which decreased average total yield by about 7.4%. These differences attributed to the effect on budburst %, fruitful shoots %, number of flower clusters /vine and fertility coefficient tables (3 and 4). Also we noticed that the increment in yield / Fe. (Ton) and net profit due to effect of the crop which intercropped on vines fertility indicators tables (4 and 8).

As a conclusion if intercropping is necessary in vineyards (Flame Seedless grapevines) planting Onion, Peas and Japanese Turnip under grape vine for increasing farmer income

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REFERENCES

Abd El-Samad, G.A. (2006) Effects of interplanting Wheat and Clover on growth and productivity of peach trees. Egypt J. Hort., 33, PP: 59 – 71 (2006).

Ahmed, A. M; H. A. El- Sayed and M. M. shoieb (2003). Effect of bio and organic source of N as a partial substitute for chemical fertilizer and bud behaviour, growth and fruiting of Flame Seedless grapevines. Minia J. of Agric. Res and develop., (23) No. 3pp: 529 – 546, 2003.

Ahmed, C. M. and Mahdy, A. M. (1993). Lectures in the basics of Plant Pathology Zagazig Univ., Banha Branch Facul. of Agric. Department of Botany, Moshthor Agric. branch of Fungi, plant Pathology..

A. O. A. C. (1985). Association of Official Agricultural Chemists, Benjumin Franklin Station, Washington, D.C.N. S.A. PP 440 – 510.

Chambliss, C. G., R. M. Muchovej, and J.J. Mullahey (2003). Cover crops. Extension service, Instit. Of food and Agricultural Sci. Univ. of florida, SS – AGR – 66.

Elshenawy, F.E. and T.A. Fayed (2005b). Evaluation of the conventional to organic and bio-fertilizers on Crimson Seedless grapevines in comparison with chemical fertilization. 2-Yield and fruit quality. Egypt. J. Appl. Sci. 20(1): 212 – 225.

El-Sayed, H. A., M. M. shoaieb and M. M. Mogy(2002). A comparative study on some substances used in breaking dormancy in Roomy Ahmer vines. Minia J. of Agric. Res. Develop., (22) No. 1 pp: 115 – 127, 2002.

Elmore , C. I., Merwin, I. and Cudney, D. (1997). Weed management in fruit trees, nuts, citrus and vine grapes. In: " Weed Management in Hort. Crops" Me Giffen M. N. (Ed.) pp. 17 – 29. Alexandria. VA AHHS Press.

El – Ashram, M. A. (1993). The modern methods in production and cultivation of grape. Cairo. Dar El Fekr El Araby (1993).

Ghobrial, S.F. (2006). Minimizing mineral fertilizers in grapevines forms to reduce the chemical residual in grapes. M. Se. Thesis, Inst. of Environmental studies and Research, Ain Shams., Egypt, pp : 67.

Killer, M.; Arnink, K. J. and G. Harzdina (1998). Interaction of N availability during bloom and light intensity during veraison. I Effect on grapevines growth fruit development, and ripening. Amer. J. of Enol. And vitic. 49(3): 333 – 340.

Lazarevskii, M. (1963). How to study grape sorts Ezotshene sartov vinograda in Rus. Ezdat. Rostorskova uneversteta.

Miller, P. R., W. L. Graves, and W. A. Williams. (1989). Cover crops for California agric. Univ. of Calif., Div. of Agric. And Nat. Resources Leaflet 21471.

Ndung, C. K. , Shimizu, M., Okamoto, G. and Hirano, K. (1997). Abscisic acid carbohydrates and nitrogen contents of "Kyoho" grapevines in relation to bud break induction by water stress. Amer. J. of Eno1. and vitic., 48, 115 (C. F. CAB Abst., 51-88).

Marwad, I. A, E. M. El – Fakharani and L. H. Osman (1988): Effect of some hydrogen cyanamide treatments on bud behaviour, yield, fruit quality and shoot growth of costata Persimon Trees. Egypt. J. Sci; 13 (8) 1988
Nijjar, G. S. (1985). Nutrition of fruit trees. Mrs. Msha Raj Kumar for Kalyani Publishers, New Delhi, PP. 10 – 52.
Noordwijk, M. and Hairiah, K. (2000). Tree – soil – crop interactions. International Center for Research in Agroforestry. South Asian Regional Research program , Porgor, Indonesia.
Omar, A. H. (2004). Summer pruning and foliar application with Fe, Zn and Mn for Thompson Seedless grapevines. J. Agric. Sci. Mansoura Unv., 29 (12): 7177 – 7189.
Rizk, M. M. (2006). Effect of some legume cover crops and organic fertilizer on petiole nutrient content, productivity and fruit composition of Thompson Seedless grapevines. J. Agric. Sci. Mansoura Univ., 31 (10): 6401 – 6412.
Ragab, M. A. and Mohamed, G. A. (1999). Effect of some organic and mineral N fertilization treatments on Flame Seedless grapevines, Minia. J. Agric. Res. Develop. , 19, PP: 27 – 43.
Striegler M. A., M. A. Mayse, W. O. Keefe, Winman, D. R. (1997). Response of Thompson Seedless grapevines to sustainable Vitic. Pra. Divi. Of Agric Scie., Unive. of California. Publication 970102.
Sarrantonio, M. (1989). Managing cover crop. Profitability A publication of the Sustainable Agriculture Network with funding by the Sustainable Agric. Rese. And Education program of the CEREES, U. S. Department of Agriculture.
Snedecore, G. W and Cochran, W. G. (1973). Statistical Methods. Iowa state Univ. press Ames Iowa, USA.
Wilde S. A.; R. B. Coary; J. G. Layer and G. K. Voigt (1985). Soils and plant analysis for tree culture Oxford, IBH New Delhi, India.

تأثير التحميل علي نمو و اثمار كرمات العنب الفليم سيدلس

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أجريت هذه الدراسه خلال عامين متتاليين ٢٠٠٩ ، ٢٠١٠ بمحافظه الغربيه لدراسه تأثير تحميل كرمات العنب الفليم سيدلس الناميه في الأرض الطينيه بمحاصيل البرسيم الاسكندراني – البسله – البصل و اللفت الياباني و أثر ذلك علي نمو و إثمار هذه الكرمات.

و قد أظهرت النتائج أن تفتح البراعم كان أكثر تبكيرا في الكرمات الغير محمله تلاها الكرمات المحمله بالبصل و اللفت الياباني و اخرها كانت المحمله بالبرسيم الاسكندراني. بالنسبه لعدد البراعم المتفتحه و النسبه المئويه لها و عدد الأفرخ الثمريه و معامل الخصوبه فأفضل النتائج حصل عليها من الكرمات المحمله بالبصل و اللفت الياباني تلاها الكرمات الغير محمله.الكرمات المحمله بالبسله و البرسيم حسنت من مساحه الورقه و طول الفرع النامي في نفس الموسم. تحميل الكرمات بالبرسيم الاسكندراني ، البسله و البصل أدي إلي زياده محتوي عنق الورقة من الأزوت و الفسفور و البوتاسيوم.

بالنسبه لتأثير التحميل علي نسبه العقد و طول العنقود و معدل التزاحم كانت أفضل النتائج المتحصل عليها من التحميل باللفت الياباني و البصل و الكرمات الغير محمله أيضا هذه المعاملات حسنت من عدد العناقيد علي الكرمه و التحميل بالبسله زاد من وزن العنقود و بالنسبه للمحصول كمتوسط عامين أفضل النتائج حصل عليها من تحميل الكرمات بالبصل (حيث زاد الإنتاج ٤٩.٤ %) يليها اللفت (+ ١٩.٨ %) و البسله (+ ١٧.٣ %) و أقلها التحميل بالبرسيم (خفض الإنتاج ٧.٤ %) مقارنه بالكرمات الغير محمله. تحميل الكرمات باللفت الياباني و البصل و الكرمات الغير محمله أسرعت من ميعاد تساقط الأوراق أما المعامله بالبرسيم الاسكندراني فقد أخر ميعاد تساقط الأوراق. بالنسبه لنضج الخشب و وزن الأفرع عمر سنه كناتج تقليم و كان أفضل النتائج تم الحصول عليها من التحميل بالبسله و البرسيم الاسكندرانيحيث أدي تحميل الكرمات بالبصل – البسله – اللفت الياباني – البرسيم إلي زياده دخل المزارع بنسبه ٦١.٤ % ، ٥١.٢ % ، ٤٧.١ % ، ٨.٥ % علي التوالي.

و مما سبق فإنه لزياده دخل المزارع نوصي بتحميل كرمات العنب الفليم سيدليس في الخريف بالبصل – البسله – اللفت الياباني و عدم زراعه برسيم.

قام بتحكيم البحث

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Table (10): Economical study on costs and average net profit / Fe(L.E) of Flame Seedless grapevines intercropping compared to vines sole.

Treatments	Fertilizers price/Fe (L.E)		Seeds price/ Fe (L.E)	Pestcides and fungcides control/ Fe (L.E)		Labour cost of harves-ting inter-cropp-ing crops/ Fe (L.E)	Total costs/Fe (L.E)		Average production Ton/Fe		Average total production/Fe (L.E)		Total producti on /Fe (L.E)	Profit net/Fe (L.E)	Profit net (L.E)/Fe % ± on vine sole.
	vines	Inter-cropp-ing crops		Vines/	Inter-cropp-ing crop		Vines/ sole	Intercro-pping Crops only	Grape-s only	Intercr-opping crop	Grapes fruit	%± on vine sole ton			
Grapevines sole	2130.0	-	-	1250.0	-	-	3380.0	-	8.1	-	20250	-	20250.0	16870.0	-
Grapevine+Clover	2130.0	980.0	90.0	1250.0	150.0	1200.0	3380.0	2420.0	7.5	1337.5	18750	- 7.4	24100.0	18300.0	8.5
Grapevine + Peas	2130.0	2490.0	1050.0	1250.0	1150.0	1500.0	3380.0	6645.0	9.5	3.8	23750	+ 17.3	35530.0	25505.0	51.2
Grapevine+ Onion	2130.0	3440.0	3600.0	1250.0	2650.0	1650.0	3380.0	11340.0	12.1	22.5	30250	+ 49.4	41950.0	27230.0	61.4
Grapevine + Japanese Turnip	2130.0	2590.0	200.0	1250.0	1100.0	1900.0	3380.0	5790.0	9.7	19.1	24250	+ 19.8	33991.0	24821.0	47.1

Average grape farm price of Ton (L.E) = 2500.0
Average price of one fresh mowing Clover (L.E) = 1337.5
Average price of one fresh Ton Peas (L.E) = 310.0
Average price of one Ton Onion (L.E) = 520.0
Average price of one Ton Japanese Turnip (L.E) = 510.0
± = Increasing and decreasing on vines free (sole).