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Effects of Interplanting Wheat and Clover on Growth and Productivity of Peach Trees

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GROWTH, flowering, productivity and leaf mineral contents of peach trees interplanting by clover and wheat were studied. Clover was sown within the trees during the last week of September and wheat was sown between the tree rows during the third week of December, 2003/2004 and 2004/ 2005seasons.

Results showed that, cultivation of wheat and clover under peach trees decreased significantly all growth parameters of peach trees comparing with sole trees. Moreover, growing of wheat under trees has less influence on growth, flowering and productivity of peach trees comparing with clover.

Sowing clover and wheat under trees decreased blooming density of peach trees by 31.65% and 7.55%, respectively, comparing with the blooming density of mono culture peach trees "average of the two studied seasons". As well as, fruit set was significantly decreased by sowing of wheat and clover under peach tress.

Interplanting decreased significantly the levels of macro and micro elements of leaves of peach trees, expect with that cultivation of clover under trees which led to increase of the level of nitrogen.

Yield of peach trees interplanted with wheat and clover was decreased by about 12.24% and 32.03%, respectively, comparing with mono culture peach trees (37.18 Kg/tree). Also, results cleared that cultivation of wheat under trees led to decreasing the income (L.E.) per unit area by about 1.43%, while clover decreases it by about 18.43% compared to mono culture peach trees (8695.8 L.E./feddan) "averages of the two studied seasons".

Consequently, it could be recommended that cultivation of winter agronomic crops under deciduous fruit trees should be avoided especially planting of clover under peach trees. However, if interplanting is a necessary, planting of wheat under trees at the third week of December can be recommended.

Keywords: Interplanting, Wheat, Clover, Peach trees, Growth, Flowering, Productivity , Income.

Intercropping is a complex system and comprises both negative and positive impacts (Hoyt *et al.*, 1994 and Noordwijk & Hairiah, 2000). Some benefits are addition of organic matter which improves soil physical properties and reduction of weeds by modifying light (Blevins *et al.*, 1977 and Nancy *et al.*, 1996).

However, the negative impacts on tree performance are reducing light intensity and competition for nutrients or water which can affect growth of both tree and crop, consequently reducing yield (Lehman *et al.*, 2000).

Deciduous fruit trees in cool-climate regions remain dormant for almost half of the year, and there is little uptake of essential nutrients from soil by dormant trees (Merwin, 2003). Intercropping of legumes that continue growing when fruit trees are dormant, can serve to fix or retain nitrogen and other essential nutrients (Marsh *et al.*, 1996). Legumes growing between or within the tree rows can also be managed to help control tree vigor, excess soil nitrogen and water availability during autumn which can prolonged shoot and canopy growth, increase the potential for winter cold injury when woody tissues fail to harden-off sufficiently and make dormant season pruning more difficult and costly (Elmore *et al.*, 1997).

Legumes have often proved to be competitive with the main crop for nutrients or water and have allelopathic effect (Putman, 1986). Allelopathy, a direct or indirect harmful effect produced in one plant through toxic chemicals released into the environment by anther (Nancy *et al.*, 1996). Release a toxic chemical compounds from different plant parts may escape to the environment by leaching, root exudation, volatilization, decomposition and other processes (Skroch & Shribbs, 1986; Nancy *et al.*, 1996 and Volence & Johanson, 2004).

Alfalfa has shown suppressive effects on both own species "autotoxicity" and different species "heterotoxicity" (Volence and Johanson, 2004). Intercropping of alfalfa with fruit trees have shown greater reduction in the values of growth parameters and yield (Salah, 1994) on banana ; (Dupraz *et al.*, 1999) on young walnuts and (Al-Qurashi, 2005) on young guava.

Legumes may improve the N nutrition of an associated fruit trees; however, results can be completely different for P, K, Ca and Mg and due to the fact that cover crop has a very high nutrient uptake (Lehman *et al.*, 2000)

An intercropping experiment was carried out by planting of wheat and soybeans in 60-feet alleys between pecan trees which planted at 35 feet apart with 60 feet alleyways, intercropping resulted in 17% reduction in yield of pecan trees compared to mono-cropped pecan trees (Alice, 2002).

There are meagre informations about the Interplanting under fruit trees and how the cultivation of wheat or clover under them can affect growth and productivity. Therefore, the following experiment was designed to determine the physiological response of peach trees to Interplanting of wheat or clover.

Material and Methods

The present study was conducted in two successive seasons of 2004 and 2005 on two peach cultivars namely "Floridaprince and Earligrande" (Ammon, 2000) budded on peach rootstock and planted at 4× 4 m apart and irrigated by flood

irrigation to determine the effect of sowing of wheat and clover under trees on tree performance, productivity and nutrients status. The trees were about 6 years old, and grown on a loamy soil at a private farm that belongs to Abo Akl, El Fashn, Beni Suef Governorate, Egypt. The physical and chemical characteristics of the soil are shown in Tables 1 and 2.

TABLE 1. Physical characteristics of the soil.

Depth	Particle size distribution				Bulk density	Soil moisture constant %		
	Total sand%	Silt %	Clay %	Texture		F. C.	W.P.	A.W.
0-30	48.11	42.7	9.19	Loamy	1.42	34.21	15.28	18.93
30-60	49.50	40.81	9.69	Loamy	1.48	29.25	12.17	17.08

TABLE 2. Chemical characteristics of the soil.

Depth	pH	ECe dS/m	Soluble cations (meq/L)				Soluble anions (meq/l)		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	Cl^{-}	HCO_3^{-}	So_4^{--}
0-30	7.60	2.11	6.94	1.91	10.30	1.95	7.11	2.01	11.98
30-60	7.65	2.76	7.91	2.57	9.11	2.73	3.48	1.69	13.15

Clover was sown within the trees during the last week of September of each season and was irrigated every 21 days equal 11 times from planting date till the end of May. Wheat was sown between the tree rows during the third week of December of each season and irrigated every month equal 6 times till harvesting.

Fertilization system

Peach trees were fertilized by nitrogen fertilizer in form of ammonium nitrate (33.5% N) at rate of 1750 g/tree/year. Phosphorus and potassium fertilizers were applied in the form of calcium superphosphate (37.5% P_2O_5) and potassium sulphate(48% $K_2 So_4$) at a rates of 210 and 1000 g/tree /year, respectively.

Wheat plants were fertilized by nitrogen fertilizer in form of ammonium nitrate at rate of 224 kg/feddan and phosphorus fertilizers were applied in the form of calcium super phosphate at rate of 40 kg/fed according to the recommendation of National Project of Wheat Research (2004). While, clover plants were fertilized by phosphorus fertilizers in form of calcium superphosphate at rate of 65 kg/ fed.

The experiment was designed as a factorial experiment in randomized complete blocks design; each plot consisted of 4 rows with 5 trees/row/ cultivar. Each treatment was replicated three times on 20 trees/ replicate.

Shoot length (cm) was measured in September of each season on 10 randomly, horizontal, secondary shoots in the top of each tree. The average shoot length of each tree was calculated and leaf area (cm^2) was estimated using digital planimeter (planix 7). Tree height and width were measured in September of each season to calculate the canopy volume according to Turrell (1946) using the following formula:

Canopy volume = $0.5236 \times HD^2$ where H = tree height and D= tree width.

Bloom density was determined at full bloom in both seasons by counting flowers on nine 30-50 cm long, randomly tagged, horizontal fruiting shoots in the top of each tree. The average bloom density per meter of fruiting shoot length for each tree was calculated.

Fruits were harvested based on maturity (ground colour) in May for both 'Floridaprince' and 'Earligrande' cultivars in both seasons. Total yield (kg of fruits/tree) was weighed for each tree. A sample of 20 mature fruits /tree was randomly taken to determine average fruit weight, fruit quality (TSS and acidity).

Fifty mature leaves were sampled from each tree in September and washed immediately and then dried at 70° C for 24 hr to determine nitrogen (A.O.A.C., 1975). Total phosphorus (P) was determined calorimetrically using the method described by Jackson (1973). Potassium (K) was determined by flame photometer according to the method of Wilde *et al.* (1985). Manganese (Mn), Zinc (Zn) and Iron (Fe) were determined by Atomic Absorption Spectrophotometer (Perkin-Elmer 2380).

Income of unit area (per feddan)

Income of each mono-culture peach trees as well as those intercropped by wheat and clover were estimated by Egyptian pound (L.E.) / feddan as follows:

1-Income of mono-culture peach trees =

Yield (kg fruit/tree) × number of trees/feddan ×farm price).

2- Income of peach trees intercropped by wheat =

Income of intercropped trees (L. E.) + (yield of wheat" ardap /feddan" × price of one ardap).

3- Income of peach trees intercropped by clover =

Income of intercropped trees (L.E.) + (yield of clover "ton /feddan" × price of one ton).

To determine the yield of wheat, samples of 9 units area (1×1m) were randomly taken to determine average grains weight for each replicate, then yield of grains (ardap/feddan). "one ardap = 150kg of wheat grains" was calculated. As well as, samples of 9 units area (1×1m) were randomly taken to determine the average fresh weight of clover per each mowing/replicate (three mowings/season), then fresh weight of clover (ton/feddan) was calculated.

Data were statistically analyzed according to Snedecor and Cochran (1980) and differences between means were tested using L.S.D at 5% level.

Results and Discussion

Data presented in Table 3 revealed that in general, trees of "Floridaprince" were vigorous and had the highest significant values of shoot length, leaf area and canopy volume compared with those of "Earligrande" trees. The differences among peach varieties were reported by Mansour and Stino (1986a), Mohmed (1995) and Seif & Abd El-Samad (2001).

TABLE 3. Effect of interplanting of wheat and clover on growth parameters of peach trees during 2004 and 2005 seasons.

Cultivars / Intercropping	* F.P	** E.G	mean	F.P	E.G	mean
	2004			2005		
	Shoot length (cm)					
Peach	67.73	63.00	65.36	71.85	67.33	69.59
Peach+ wheat	52.70	55.67	54.18	53.08	56.33	54.71
Peach+ clover	42.80	38.88	40.83	39.50	39.30	39.50
mean	54.41	52.51		54.88	54.32	
LSD at 5%	Cvs.= n.s Int.=8.41 Cvs.× Int.= n.s			Cvs.=n.s Int.=4.76 Cvs.× Int.= 5.32		
	Leaf area (cm^2)					
Peach	33.93	38.31	36.12	37.73	35.68	36.76
Peach+ wheat	31.92	36.74	34.19	36.07	34.83	35.45
Peach+ clover	30.33	32.55	31.44	32.00	31.73	31.87
mean	32.66	31.44		35.30	34.08	
LSD at 5%	Cvs.= 1.12 Int.=1.37 Cvs.× Int.= 1.94			Cvs.= n.s Int.= 1.91 Cvs.× Int.= 2.71		
	Canopy volume (m^3)					
Peach	14.32	12.41	13.37	15.38	13.39	14.39
Peach+ wheat	11.96	10.40	11.56	12.64	11.09	11.87
Peach+ clover	9.38	8.80	9.38	8.60	8.40	8.50
mean	12.08	10.54		12.21	10.96	
LSD at 5%	Cvs.= 0.56 Int.= 0.69 Cvs.× Int.=0.47			Cvs.= 0.84 Int.= 1.03 Cvs.× Int.=1.46		

* F. P = Floridaprince **E.G = Earligrande

However, it is clear from the pertaining results (Table 3) that cultivation of field crops (wheat and clover) under peach trees decreased significantly all growth parameters of peach trees comparing with solid trees. Growing of clover under trees gave the lowest significant values of shoot length, leaf area and canopy volume, while the highest values of these parameters were obtained from sole peach trees. Moreover, growing of wheat under trees has less influence on growth of peach trees comparing with that of clover.

The reduction on growth parameters of intercropped peach trees may be due to the competition for nutrients or water which can affect growth of peach trees. The intercropping of alfalfa under fruit trees has shown a greater reduction. Similar results were reported by Salah (1994) on banana, Dupraz *et al.* (1999) on young walnuts and Al-Qurashi (2005) on young guava.

Blooming density of peach trees also decreased significantly by interplanting (Table 4). Blooming density of sole peach trees was 42.45 and 40.53 in the first and second seasons, respectively. While these values decreased by about 7.32 and 7.77 % for trees interplanted by wheat and by about 35.56 and 27.75 % by clover in the first and second seasons, respectively. As well as, fruit set was significantly affected by sowing of wheat or clover under peach tress. The data in Table 4 revealed that fruit set percentages were 84.52, 82.86 and 51.45 (average of the two seasons) for peach only, peach with wheat and peach with clover, respectively.

TABLE 4. Effect of interplanting of wheat and clover on flowering density and fruit set percentage of peach trees during 2004 and 2005 seasons.

Cultivars / Intercropping	F.P	E.G	mean	F.P	E.G	mean
	2004			2005		
	Flowering density (no. of flowers/100 cm of fruiting shoot)					
Peach	37.55	47.36	42.45	34.46	46.6	40.53
Peach+ wheat	34.96	43.73	39.34	31.83	42.93	37.38
Peach+ clover	24.30	30.5	27.39	24.50	34.06	29.28
mean	32.27	40.53		30.26	41.20	
LSD at 5%	Cvs.= 1.76 Int.=2.16 Cvs.× Int.=3.05			Cvs.= 2.3 Int.= 2.83 Cvs.× Int.= 3.99		
	Fruit set (%)					
Peach	87.05	82.76	84.91	87.67	80.60	84.13
Peach+ wheat	85.33	80.31	82.82	86.39	79.83	83.11
Peach+ clover	53.81	46.73	50.27	57.17	48.10	52.63
mean	75.40	69.94		77.07	69.51	
LSD at 5%	Cvs.= 1.28 Int.=1.58 Cvs.× Int.=2.24			Cvs.=3.86 Int.= 4.73 Cvs.× Int.=6.69		

In addition, trees of "Floridaprince" cv. gave the lowest values of blooming density with highest values of fruit set % compared to the trees of "Earligrande" under the three intercropping system.

The sharp reduction in blooming density and fruit set could be easily observed in trees interplanted by clover compared to the sole trees, or with that interplanted by wheat. This may be due to the fact that clover had more water requirement more than wheat and it requires three times irrigation during autumn which lead to continuation of vegetative growth of trees, which delayed them to enter the rest period with increasing the chilling requirement of peach trees and consequently delayed the blooming.

In this respect, Elmore *et al.* (1997) reported that excess soil nitrogen and water availability during autumn can prolong shoot and increase canopy growth. Seif *et al.* (2003) found that irrigation regimes affected the chilling requirement of almond trees, mild regime reduced chilling requirement by about 16 % compared to those

subjected to wet regime. Ndung *et al.* (1997) on grape reported that deficit irrigation enhanced early bud break. Amnon (2000) mentioned that if bud break occurred too late, the maximum development potential of the tree will be reduced and with that its ecological competition ability.

Data presented in Table 5 showed that the yield and fruit quality of peach trees were affected significantly by cultivation of wheat or clover under trees. Growing of wheat or clover under peach trees decreased the tree yield by about 12.24% and 32.03 % comparing with that of mono culture peach trees (37.18 kg/tree), respectively.(averages of the two studied seasons). In regard to the fruit weight (Table 5) results revealed that mono culture peach trees gave the biggest fruit weight while the smallest fruit weight was obtained from trees interplanted by clover. It is worthy to mention that "Floridaprince" was the most productive peach cultivar while "Earligrande" had the greatest fruit weight under the experimental condition.

TABLE 5. Effect of interplanting of wheat and clover on yield and fruit quality of peach trees during 2004 and 2005 seasons.

Cultivars / Intercropping	F.P	E.G	mean	F.P	E.G	mean
	2004			2005		
	Yield(kg/tree)					
Peach	39.64	35.20	37.42	38.49	35.39	36.94
Peach+ wheat	33.67	31.00	32.33	34.47	31.37	32.92
Peach+ clover	26.88	24.58	25.74	25.88	23.75	24.81
mean	33.40	30.26		32.95	30.17	
LSD at 5%	Cvs.= 1.8 Int.=2.21 Cvs.× Int.= 3.12			Cvs.= 1.74 Int.=2.12 Cvs.× Int.=3.01		
	Fruit weight (g)					
Peach	108.28	113.46	110.87	109.66	112.77	111.22
Peach+ wheat	93.72	102.94	98.33	93.40	105.12	99.26
Peach+ clover	81.78	91.20	86.49	82.36	95.22	88.79
mean	94.59	102.53		95.14	104.37	
LSD at 5%	Cvs.= 1.92 Int.= 2.48 Cvs.× Int.=3.52			Cvs.= 3.75 Int.= 4.59 Cvs.× Int.= 6.5		
	TSS %					
Peach	12.91	12.17	12.54	12.88	12.10	12.49
Peach+ wheat	12.08	11.86	11.97	11.95	11.75	11.85
Peach+ clover	11.21	10.43	10.82	10.57	10.00	10.85
mean	12.06	11.49		11.80	11.28	
LSD at 5%	Cvs.= n.s Int.= 0.47 Cvs.× Int.=n.s			Cvs.=n.s Int.= 0.53 Cvs.× Int.=n.s		
	Acidity %					
Peach	0.97	0.83	0.90	1.00	0.94	0.97
Peach+ wheat	1.06	0.95	1.00	1.12	0.98	1.05
Peach+ clover	1.15	1.02	1.09	1.19	1.12	1.16
mean	1.06	0.93		1.10	1.01	
LSD at 5%	Cvs.= n.s Int.= n.s Cvs.× Int.= n.s			Cvs.= n.s Int.= n.s Cvs.× Int.= n.s		

The reduction of yield and fruit weight for interplanted peach trees my be attributed to the decrease of shoot length and leaf area which led to a decreasing of photosynthesis process. Moreover, decrease of blooming density and fruit set % may be due as a result of excess soil water availability during autumn. In this respect, Alice (2002) found that intercropping of wheat and soybeans under pecan trees resulted in 17% reduction in yield of pecan trees compared to mono cropped pecan trees.

It is clear from data in Table 5 that the highest values of total soluble solids (TSS %) were obtained from fruits of sole peach trees followed in descending order by fruits of interplaned peach tress by wheat and clover, respectively. In addition, significant differences were only found between interplanted treatments. On the other hand, peach trees interplanted by clover gave the highest values in fruit acidity while, the lowest values in this respect were obtained by sole peach trees.

From the above mentioned results, it could be concluded that cultivation of wheat under peach trees has less influence on growth, flowering and yield of peach trees compared to cultivation of clover under trees. This may be due to the time of planting of wheat (the third week of December), in that time, peach trees almost received the great part of their chilling requirements necessary for bud break.. Meanwhile, clover cultivated during the last week of September was irrigated several times during autumn which led to continuation of vegetative growth of trees, delayed them to enter the rest period. In this respect, Shaltout (1987) found that chilling hours required to bud break of "Floridaprince" peach were 100-150 hr at or below 7.2°C; Mansour and Stino (1986b) reported that chilling units of 74 U (according to Cairo model) were required to bud break of "Earligrande".

Results in Table 6 indicated that leaf N, P and K percentages of peach trees were significantly affected by interplanting. Cultivation of clover under peach trees gave the highest significant value of leaf nitrogen content with the lowest significant values of phosphorus and potassium contents. However, the highest significant values of phosphorus and potassium were obtained by mono-culture peach trees and peach trees intercropped by wheat gave the lowest significant values of leaf nitrogen content and intermediate values of phosphorus and potassium. In addition, no significant differences were found between the two studied peach cvs. in leaf nitrogen, phosphorus and potassium contents. In this respect, Lehman *et al.* (2000) reported that legumes may improve the N nutrition of an associated fruit trees; however, results can be completely different for P and K. This might be due to the fact that cover crop has a very high nutrient uptake.

TABLE 6. Effect of interplanting of wheat and clover on leaf mineral contents (N, Pand K) of peach trees during 2004 and 2005 seasons.

Cultivars / Intercropping	F.P	E.G	mean	F.P	E.G	mean
	2004			2005		
	N%					
Peach	1.83	1.87	1.85	1.70	1.73	1.72
Peach+ wheat	1.43	1.50	1.46	1.47	1.43	1.44
Peach+ clover	2.10	1.97	2.03	1.93	1.97	1.95
mean	1.78	1.78		1.70	1.71	
LSD at 5%	Cvs.= n.s Int.=0.26 Cvs.× Int.= n.s			Cvs.= n.s Int.=0.26 Cvs.× Int.= n.s		
	P%					
Peach	0.27	0.30	0.28	0.28	0.29	0.29
Peach+ wheat	0.25	0.26	0.25	0.26	0.25	0.26
Peach+ clover	0.21	0.19	0.20	0.19	0.18	0.19
mean	0.24	0.25		0.24	0.24	
LSD at 5%	Cvs.= n.s Int.=0.026 Cvs.× Int.= n.s			Cvs.= n.s Int.= 0.025 Cvs.× Int.= n.s		
	K %					
Peach	1.76	1.65	1.71	1.67	1.50	1.59
Peach+ wheat	1.50	1.48	1.49	1.48	1.45	1.46
Peach+ clover	1.27	1.20	1.24	1.23	1.19	1.21
mean	1.51	1.44		1.46	1.38	
LSD at 5%	Cvs.= n.s Int.= 0.14 Cvs.× Int.= n.s			Cvs.= n.s Int.= 0.12 Cvs.× Int.= 0.22		

It is clear from data in Table 7 that the leaf Fe, Zn and Mn (ppm) of intercropped peach trees decreased significantly by interplanting comparing with mono-culture peach trees. Therefore, the highest values of Fe, Zn and Mn were achieved in leaves of mono-culture peach trees. While, leaves of peach trees interplanted by clover contained the lowest values of Fe and Mn contents. Meanwhile, leaves of peach trees interplanted by wheat contained the lowest significant value of Zn with the intermediate values of Fe and Mn. This decreasing of leaf minerals content of intercropped peach trees may be due to the competition between clover and wheat with the peach trees for nutrients. These results are supported by Putman (1986) and Lehman *et al.* (2000).

Regarding the income (L.E.) of unit area (feddan) of mono-culture and interplanted peach trees (Table 8), data revealed that the income of mono-culture peach trees were 8672.6 L.E. in the first season and 8466.3 L.E. in the second season. These values decreased by about 0.82% in the first season and 2.04 % in the second season for peach trees interplanted by wheat; however, this reduction did not reach the level of significances. Meanwhile, income of peach trees interplanted by clover decreased significantly by about 18.4 and 18.1 % in the first and second seasons, respectively. In addition, "Floridaprince" peach cv. was more profitable than "Earligrande" cv.

TABLE 7. Effect of interplanting of wheat and clover leaf mineral contents (Fe, Zn and Mn) of peach trees during 2004 and 2005 seasons.

Cultivars / Intercropping	F.P	E.G	mean	F.P	E.G	mean
	2004			2005		
	Fe(PPm)					
Peach	993.5	926.8	960.15	925.5	931.03	928.27
Peach+ wheat	692.5	716.8	704.45	702.43	699.17	700.80
Peach+ clover	567.5	538.1	552.8	571.97	532.43	552.2
mean	751.17	727.10		733.3	720.88	
LSD at 5%	Cvs.= 21.10 Int.= 25.85 Cvs.× Int.= 36.55			Cvs.= n.s Int.= 26.19 Cvs.× Int.= n.s		
	Zn (ppm)					
Peach	181.5	183.29	182.54	176.40	184.36	180.38
Peach+ wheat	96.5	94.59	95.54	98.08	93.11	95.59
Peach+ clover	99.5	96.62	98.06	102.84	102.00	102.42
mean	125.83	124.83		125.77	126.49	
LSD at 5%	Cvs.= n.s Int.= 20.99 Cvs.× Int.= n.s			Cvs.= n.s Int.= 20.61 Cvs.× Int.= n.s		
	Mn(ppm)					
Peach	121.11	118.01	119.56	122.60	113.74	118.17
Peach+ wheat	73.11	69.67	71.39	70.17	65.88	68.03
Peach+ clover	53.73	56.69	55.21	53.84	50.17	52.01
mean	82.65	81.46		82.20	76.60	
LSD at 5%	Cvs.= n.s Int.= 4.66 Cvs.× Int.= n.s			Cvs.= 3.05 Int.= 3.73 Cvs.× Int.= n.s		

TABLE 8. Effect of interplanting of wheat and clover on income of units area for mono-culture and interplanted peach trees (L.E.) during 2004 and 2005 seasons.

Cultivars / Intercropping	F.P	E.G	mean	F.P	E.G	mean
	2004			2005		
	income of unit area (feddan) L.E.					
Peach	9257.8	8236.8	8747.3	9008.0	8281.7	8644.3
Peach+ wheat	8957.0	8245.7	8601.3	8914.6	8025.0	8469.8
Peach+ clover	7213.8	7002.4	7108.1	7236.8	6799.8	7018.3
mean	8476.2	7828.3		8386.5	7702.16	
LSD at 5%	Cvs.=399.88 Int.= 489.01 Cvs.× Int.=n.s			Cvs.=414.83 Int.= 508.06 Cvs.× Int.= n.s		

From the above mentioned results, it could be easily concluded that clean cultivation management (sole) was the best for deciduous fruit trees. As well as, planting of winter field crops under fruit trees should be avoided, in particular

planting of clover under peach trees. However, if intercropping is necessary, planting wheat under trees can be done at the third week of December.

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تأثير الزراعة البينية لكل من القمح والبرسيم على النمو الخضرى وانتاجية أشجار الخوخ

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تم دراسة تأثير الزراعة البينية لكل من البرسيم والقمح على النمو الخضرى والثمرى والحالة الغذائية والأنتاجية لصنفين من أصناف الخوخ هما الفلوريدا برنس والأيرلى جراند، حيث تم زراعة البرسيم بين الأشجار خلال الأسبوع الأخير من سبتمبر فى حين تم زراعة القمح بين صفوف الأشجار وذلك فى الأسبوع الثالث من ديسمبر(كموعد متأخر) لزراعة القمح خلال موسمى٢٠٠٣/٢٠٠٤ ، ٢٠٠٤/٢٠٠٥.

أظهرت النتائج أن:-

١- زراعة كل من البرسيم والقمح تحت اشجار الخوخ أدت الى نقص معنوى فى مكونات النمو الخضرى مقارنة بأشجار الخوخ غير المحملة، وكانت زراعة القمح تحت أشجار الخوخ أقل تأثيرا على الأشجارمن زراعة البرسيم.

٢- أدت الزراعة البينية لكل من البرسيم والقمح تحت أشجار الخوخ إلى نقص كثافة تزهير الأشجار بحوالى ٣١,٦٥٪ و ٧,٥٥٪ على التوالى مقارنة بكثافة تزهير الأشجار غير المحملة، كما أدت الزراعة البينية إلى نقص معنوى فى نسبة عقد الثمار مقارنة بالأشجار غير المحملة.

٣- تناقص محصول أشجار الخوخ المحملة بالقمح بنسبة ١٢,٢٤٪ فى حين تناقص محصول الأشجار المحملة بالبرسيم بنسبة ٣٢,٠٣٪ مقارنة بمحصول اشجار الخوخ البالغ ٣٧,١٨كجم / شجرة .

٤- أدى نظام الزراعة البينية الذى تم دراسته فى هذه التجربة إلى نقص محتوى أوراق الخوخ من العناصر الكبرى والصغرى باستثناء عنصر النيتروجين الذى ازداد معنويا فى حالة زراعة البرسيم تحت أشجار الخوخ.

٥- أظهرت النتائج أن متوسط الدخل من فدان الخوخ كان ٨٦٩٥,٨ جنيها وأن زراعة القمح تحت الأشجار أدت إلى نقص الدخل من الفدان شاملة ثمن كل من القمح والخوخ بمقدار ١,٤٣٪ فى حين ازداد مقدار نقص الدخل بالنسبة لوحدة المساحة إلى ١٨,٤٣٪ عند زراعة البرسيم تحت الأشجاربعد أخذ ثمن البرسيم فى الأعتبار.

وبناء عليه يمكن التوصية بعدم زراعة المحاصيل الحقلية الشتوية تحت أشجار الفاكهة متساقطة الأوراق خصوصاً البرسيم تحت الخوخ ، ويمكن زراعة القمح بشرط تأخر زراعته خلال الثلث الأخير من شهر ديسمبرحيث تكون اشجار الخوخ قد استوفت معظم احتياجاتها من البرودة مع عدم وجود فروق ذات جدوى فى انتاجية فدان الخوخ غير المحمل وانتاجية الفدان من الأشجار المحملة بالقمح مما يساهم فى زيادة الناتج المحلى من القمح.