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PRODUCTION OF COMPOST FOR AGRICULTURAL FROM OLIVE-MILL WASTE

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ABSTRACT

A pollutant solid material called "olive cake", which is the main by-product from the olive oil industry, generated by the olive oil extraction industry is a great pollutant because of its high organic load and also because of its high content of phytotoxic and antibacterial phenolic substances, which resist biological degradation. The present work was conducted during season 2007 at the SEKEM company farms, at Bilbies, Sharkia governorate,.to study the effect of using four compost varieties (C1: 20% olive cake + 20% organic manure + 50% plant residues + 10% soil), (C2: 30% olive cake + 15% organic manure + 45% plant residues + 10% soil), and (C3: 40% olive cake + 10% organic manure + 40% plant residues + 10% soil) and (C4: 50% olive cake + 5% organic manure + 35% plant residues + 10% soil) and/or four periods (30, 40, 50 and 60 days) and their interaction on EC, pH, Total organic carbon %, Total nitrogen %, C / N ratio, Organic matter %, Total phosphorus %, Total potassium %, Compost temperature, Compost carbon dioxide (CO_2), Moisture content % , phenol, cadmium, copper, zinc and lead. The results can be summarized as follows:

1- Increasing olive cake percentage in compost varieties caused a significant reduction in pH, total organic carbon %, total nitrogen %, organic matter %, total phosphorus %, total potassium % and moisture content. On the other hand, EC, temperature, carbon dioxide, total phenol, cadmium, copper, zinc and lead increased with increasing olive cake percentage in compost varieties.
2- Increasing compost production periods from 30 to 60 days resulted in a significant increase in EC, pH, Total nitrogen %, Total phosphorus %, Total potassium % and carbon dioxide, while increasing periods up to 60 days caused a reduction effect on total organic carbon, C/N ratio, organic matter %, temperature, moisture content, total phenol, lead, Cd and Zn.
3- Interaction between compost varieties and periods exerted a significant on pH, total organic carbon, C/N ratio, organic matter, temperature and carbon dioxide.

Keywords: olive cake, organic manure, plant residues, microbial inocula, compost periods, physical analysis, chemical analysis, SEKEM company, Northwestern Coast of Egypt.

INTRODUCTION

In Egypt, olive tree planting is 116824 feddan and the total amount of olive production is 315193 ton per year. Every ton of olive produce 50% moisture, 15% oil and 35% solid waste during the extraction process.

The traditional methods of extraction, based on press, and the continuous three phase decanting processes generate one stream of olive oil and two streams of wastes, an aqueous waste and a wet solid waste .Large quantities of olive mill by-products are obtained when oils are extracted after mechanical and chemical treatments of olive yields. The production of olives varies from one year to other because several factors mainly related to weather and plagues that can affect the trees and olives. By this reason, the data shown in Table (1) are only rough mean data only shown to remark the importance of the olive oil sector and the magnitude of the problems related with the wastes and by-products generated in the olive oil extraction.

Table (1) Mean data of production of olive yield (ton/year), olive oil (ton/year) and waste generated from extraction process (ton/year) in Egypt and world .

World / Olive varieties	Spain	EU	Egypt	World
Olive yield	3 450 000	7 700 000	315 580.14	9 700 000
Olive oil	650 000	1 450 000	47 337.021	1 825 000
Waste generated	2 600 000	5 800 000	110 317.55	7 300 000

As will, olive milling by-products are expected to be increased accordingly. The amount of solid waste produced from olive oil mills is estimated to be over 110,000 ton per year in Egypt. The gradual accumulation or incorrect disposal of these wastes may cause environmental problems. These materials must be treated or re-used if their environmental impact is to be reduced, enabling at the same time some of their primary components to be recovered (organic matter, nutrients, etc.). Olive cake is a major environmental problem in the Mediterranean area. The problems created in managing olive cake have been extensively investigated during the last 50 years without finding a solution, which is technically feasible, economically viable, and socially acceptable. Up-to-date the emphasis has been on detoxifying olive cake.

However, one of the viable solutions to benefit from these organic materials is to be used as soil amendment. Recently, extensive application of chemical fertilizers is becoming of increasing concern to the environment and human health. Therefore, using organic wastes like olive oil mill waste olive cake as organic fertilizers may reduce the amount of chemical that applied to the soil. Despite of the fact that olive cake is a nutrient rich organic waste, high levels of phytotoxic compounds present in fresh olive cake, which may inhibit seed germination or reduce plant growth. However, it was found that. Composting olive cake may reduce its phytotoxicity compared to fresh one. Composting as a method for preparing organic fertilizers and amendments is economically and ecologically sound and may well represent an acceptable solution for disposing of olive cake, at the same time increasing its value. Olive cake is a solid waste highly contaminating and phytotoxic, due to the presence of polyphenols, salts and fats (Saviozzi *et al.*, 1993 and Paredes *et al.*, 2002). Different methods have been used for its elimination or transformation. Composting olive cake, prior to its application in the field, should improve the soil's agronomic quality and reduce or avoid some of the adverse effects that have been recorded when olive-mill residues are directly supplied to the soil. Some of these effects have been related to its phytotoxic and antimicrobial properties due to their phenolic and lipidic constituents (Paredes *et al.*, 1987; Pe´rez *et al.*, 1992 and Linares *et al.*, 2003), while damage to the soil's structural stability has also been described (Tejada *et al.*, 1997). Composting has been shown to be a suitable method for recycling olive mill wastes (OMW), mainly olive cake, which needs to be mixed with lignocellulosic materials to obtain adequate physical conditions for composting, due to their sticky texture (Madejo´n *et al.*, 1998; Rosa *et al.*, 2001 and Filippi *et al.*, 2002). The pH values of the composting mixture were reduced by one unit after 2 weeks following the addition of elemental S causing no negative effects on the final compost quality (Roig *et al.*, 2004). Composting of solid olive-mill involved a relatively low level of organic matter biodegradution, an increase in pH and clear decreases in the C/N ratio and fat, water soluble organic carbon and phenol content but was low in phosphorus and micronutrients (Alpurquerque *et al.*, 2005)

MATERIALS AND METHODS

The experiment was carried out on compost varieties during season 2007 at the SEKEM company farms, at Bilbies, Sharkia governorate. The aim of experiment to study the effect of four compost varieties, four period and their interaction on EC, pH, total organic carbon %, total nitrogen %, C / N ratio, organic matter %, total phosphorus %, total potassium %, compost temperature, compost carbon dioxide (CO_2), moisture content % , phenol, cadmium, copper, zinc and lead.:

A- Compost varieties:

1- C1: 20% olive cake + 20% organic manure + 50% plant residues + 10% soil
2- C2: 30% olive cake + 15% organic manure + 45% plant residues + 10% soil
3- C3: 40% olive cake + 10% organic manure + 40% plant residues + 10% soil
4- C4: 50% olive cake + 5% organic manure + 35% plant residues + 10% soil

Organic manure, olive cake, plant residues (rice straw and bean straw) were used in compost preparation. These wastes were organically produced (instead of olive cake) and obtained from organic SEKEM company farms, but olive cake was obtained from the Northwestern Coast of Egypt. Some natural inorganic additives and two microbial inocula were used. The inorganic additives were: soil, collected from Sekem farm, rock phosphate powder that contains 13% total phosphate, feldspar ore powder, contains 10.1% total potassium and natural powder of iron, zinc and manganese salts, natural additives. The plant residues were air dried, and chopped into about 5-10 Cm segments. The soil nitrogen, phosphorus and potassium were determined according to the method described by (Page *et al.*, 1982). The chemical and physical analyses of the organic materials used in the compost are presented in Table (2).

Concerning the two microbial inocula (compost starter), the first Sekemix 1 (thermophilic microorganisms) was used directly after building piles suspend 300 g in 20 L of water and spray them on the surface of 10 m3 .While the second inocula Sekemix 2 (mesophilic microorganisms). It was prepared and used after 40th days from building piles (when the temperature was decreased less than 45° C), according to method described by (El-Gizawy, 2005).

Table (2): Chemical and physical characteristics of organic materials used in compost

Organic materials / Characters	Organic manure	Bean straw	Olive cake	Rice straw
Total nitrogen %	1.38	1.97	0.84	0.67
Total organic carbon %	44.30	42.40	32.6	50.10
C/N Ratio	24.00	21.50	39.1	71.10
Total phosphorus %	0.17	0.10	1.01	0.07
Total potassium %	0.75	0.54	1.82	0.39
Bulk density Kg/m^3	450	250	320	235
Moisture content %	46.00	31.00	24.2	10.90

B- Periods:

1- 30 days 2- 40 days 3- 50 days 4- 60 days

The design of experiment was split plot with three replication, every replicate included 16 treatments which were the combination of four compost varieties and four periods. The mian plots were devoted to compost varieties, while the sub-plots were occupied by the periods. Th differences between means were tested according to L.S.D. at 5% method (Steel, 1960).

Three randomized compost samples from each pile of the 16 compost piles were collected from the top, middle and bottom of the compost heap at different intervals. Samples were collected, air-dried for 3 days, then oven-dried at 60°C for 24 hours and ground to pass through 0.2 mm sieve screen, labeled, freezed and kept for analysis.

A- Physical analysis:

1-Temperature

Temperature was recorded daily using long- spil thermometer at 85 Cm from the base of piles.

2-Carbon dioxide

Carbon dioxide percent (CO_2 %) were measured daily by Brigon-CO_2-indicator in the bottom of the heap (30 Cm from the base of the heap).

3-Moisture content

Moisture content was measured daily by tenax mini moisture tester.

B- Chemical analysis:

Chemical characteristics were determined by the methods described by (Page *et al.*, 1982). Electrical conductivity was measured in 1: 2.5 water extract by using a pH glass electrode according to (Jakson, 1973). Organic carbon and organic matter contents were determined by the wet oxidation methods (Walkley and Black , 1934). Total nitrogen was determined by the modified Kjeldal methods (Cottenie *et al.*, 1982). Total phosphorus was estimated calorimetrically by spectrophotometer using molybdenum blue method according to (Jackson, 1973). While total potassium was measured by flame-photometer using (Page *et al.*, 1982) method.

Mechanical and chemical analysis of the experimental soil is shown in Table (3).

The temperature °C and Compost carbon dioxide (%) were measured every 4 days till maturity (Table 4). The compost piles were turned when CO_2 % and temperature were more than 10 % and 60 °C respectively the moisture content was readjusted to about 50-60 % if needed according the methods described by (Rynk *et al.*, 1992).

Table (3): Main characteristics of soil additives for compost piles

Mechanical Analysis	Value
Sand %	58.30
Silt %	7.41
Clay %	34.29
Texture	Sand clay loam
Chemical Analysis	
pH 1 : 2.5 water ext.	8.10
Electrical conductivity 1 : 2.5 water ext.	1.51
Organic carbon %	1.32
Organic matter %	2.28
Total nitrogen %	0.16
Total phosphorus %	0.20
Total potassium %	0.04
$CaCO_3$ %	2.16
Soluble cations meq/L	
Na^+	8.40
K^+	0.11
Ca^{++}	2.20
Mg^{++}	0.49
Soluble anions meq/L	
CO_3^{--}	0.00
HCO_3^-	3.40
Cl^-	4.80
SO_4^{--}	3.00
CEC meq/100 g	18.25

Table (4): Temperature and carbon dioxide changes during composting process

Composting time (days)	Compost temperature				Compost carbon dioxide (%)			
	C1	C2	C3	C4	C1	C2	C3	C4
4	64	52	43	29	5.5	1.5	0.7	0.5
8	69	70	55	43	15.2	6.1	5.0	1.2
12	68	69	58	53	11.4	8.3	6.8	4.5
16	65	71	66	58	4.6	16.4	11.2	6.8
20	65	63	66	63	7.0	16.3	8.4	5.6
24	62	64	65	52	12.3	10.7	9.1	4.2
٢٨	55	67	66	62	5.1	16.0	16.5	8.1
32	52	56	65	68	7.3	4.1	7.1	6.1
36	47	55	68	67	2.0	4.8	8.8	9.3
40	43	52	67	68	2.0	5.3	10.0	11.4
44	40	49	66	70	2.1	5.9	13.7	16.5
48	37	45	63	67	1.6	2.4	5.8	15.8
52	36	42	65	71	1.5	2.5	7.2	16.0
56	36	42	65	69	1.5	2.9	9.0	15.5
60	36	38	50	70	1.6	2.1	3.4	13.6

RESULTS AND DISCUSSION

A-Effect of compost varieties:

1- Physical parameters:

Data in Table (5) show that moisture content of compost varieties significantly decreased by increasing the olive cake percentage. The highest value was recorded at 20 % olive cake (C1), whereas the lowest value was obtained in case of 50 % olive cake (C4). *The increment* of olive cake percentage from 20 to 50 % in compost production led to increase of carbon dioxide as shown in Table (5). The difference between olive cake treatments was significant. These results are in accordance with those reported by (Zucconi *et al.,* 1981).

The data illustrated in Table (6) clear that temperture of producing compost was increased consistently with increasing olive cake percentage in compost from 20 to 50 %. Increasing olive cake percentage up to 50 % resulted in a significant increase in temperture of compost production. The above-mentioned data agree with (Kaloosh, 1994) who reported that the temperature in heaps rose to nearly 60 °C and decreased to temperature close to ambient temperature within two to three months.

2- Chemical parameters:

Results in Table (6) indicate that there was a marked depression in the total nitrogen % of compost varieties with increasing olive cake percentage from 20 to 50 %. Compost production at high level of olive cake percentage (50 %) reduced the total nitrogen % of compost as compared to compost production at low level of olive cake percentage (20 %) by 17,59 % total nitrogen % of compost varieties was significantly affected by increasing the olive cake percentage from 20 to 50 %. These results are in agreement with those found by (He *et. al.,* 1992).

Table (5): Effect of periods and compost varieties on moisture content (%) and carbon dioxide (%) of compost .

Parameters	Moisture content				Mean	Carbon dioxide				Mean
Periods / compost var	30 days	40 days	50 days	60 days		30 days	40 days	50 days	60 days	
C1	27.65	27.39	27.08	26.6	27.18	8.70	9.30	9.80	10.50	9.58
C2	26.36	26.12	25.8	25.36	25.91	9.40	10.60	10.90	11.30	10.55
C3	25.04	24.89	24.58	24.21	24.68	12.20	12.80	12.90	13.40	12.83
C4	24.77	24.35	24.05	23.69	24.22	13.70	13.20	12.40	12.10	12.85
Mean	25.96	25.69	25.38	24.97		11.00	11.48	11.50	11.83	

LSD at 5% 0f	Moisture	Carbon dioxide
Period	0.48	0.19
compost varieties	1.58	0.16
Periods x compost varieties	N.S	0.37

Table (6): Effect of periods and compost varieties on temperture and total nitrogen % of compost .

Parameters	Temperature				Mean	Total nitrogen %				Mean
Periods / compost var	30 days	40 days	50 days	60 days		30 days	40 days	50 days	60 days	
C1	52.00	43.00	37.00	36.00	42.00	0.99	1.05	1.09	1.18	1.08
C2	56.00	52.00	45.00	42.00	48.75	0.91	0.97	1.02	1.05	0.99
C3	65.00	63.00	63.00	61.00	63.00	0.79	0.93	0.97	1.03	0.93
C4	68.00	65.00	65.00	63.00	65.25	0.80	0.87	0.92	0.96	0.89
Mean	60.25	55.75	52.50	50.50		0.87	0.96	1.00	1.06	

LSD at 5% 0f	Temperature	Total nitrogen
Period	1.48	0.05
compost varieties	3.00	0.12
Periods x compost varieties	2.95	N.S

Data presented in Table (7) indicate that there was a reduction in total organic carbon in producing compost with increasing olive cake percentage in compost. Increasing the olive cake percentage from 20 to 50 % depressed significantly the total organic carbon of compost by 18,04 %. The highest value was obtained at 20 % (C1). The results summarized in Table (7) indicate that olive cake percentage showed significantly responses in all different compost varieties to C / N ratio. Increment of olive cake percentage from 20 to 40 % increased C / N ratio by 4.78 %. The lowest value was obtained at 50 % (C4).

Results in Table (8) indicate that there was a consistent depression in total phosphorus and potassium in producing compost with increasing the olive cake percentage in compost. Increasing the olive cake percentage in compost from 20 to 50 % reduced the total phosphorus and potassium of compost by 11.39 and 29.33 respectively. total phosphorus and potassium of compost production decreased significantly with increasing olive cake percentage in compost. These results are in agreement with those found by (El-Gizawy, 2005).

The results in Table (9) show that increasing olive cake percentage up to 50 % to compost production led to significant decrease in means of organic matter %.and pH. It could be concluded that increasing olive cake percentage from 20 to 50 % depressed significantly the organic matter %.and pH by 16.42 and 6.87 % respectively.

The data illustrated in Table (10) clear that EC and Pb in producing compost were increased with increasing olive cake percentage in compost from 20 to 50 %. Increasing olive cake percentage up to 50 % resulted in a significant increase in EC and Pb of producing compost. Similar results were obtained by (Saviozzi *et al.* 1993 and Paredes *et al.* (2002).

Data in Table (11) indicate that olive cake percentage had a significant effect on Cd and Zn in producing compost. Increasing the olive cake percentage in compost from 20 to 50 % increased the cadmium (Cd) and lead (pb) of compost by 71.74 and 35.43 % respectively. Similar results on other plant species were obtained by (Paredes *et al.*, 1987; Pe´rez *et al.*, 1992 and Linares *et al.*, 2003).

Table (7): Effect of periods and compost varieties on total organic carbon % and C / N ratio of compost

Parameters	Total organic carbon %				Mean	C / N ratio				Mean
Periods / compost var	30 days	40 days	50 days	60 days		30 days	40 days	50 days	60 days	
C1	33.87	32.69	32.15	29.43	32.04	34.21	31.13	29.5	24.94	29.95
C2	31.75	30.55	30.10	28.65	30.26	34.89	31.49	29.51	27.29	30.80
C3	30.23	29.80	27.91	27.25	28.80	38.27	32.04	28.77	26.46	31.38
C4	27.13	26.50	25.77	25.63	26.26	33.91	30.46	28.01	26.7	29.77
Mean	30.75	29.89	28.98	27.74		35.32	31.28	28.95	26.35	

LSD at 5% 0f	Total organic carbon	C / N ratio
Period	0.13	0.15
compost varieties	0.13	0.24
Periods x compost varieties	0.27	0.30

Results in Table (12) show that phenol content of compost varieties significantly increased by increasing the olive cake percentage. The highest value was recorded at 50 % olive cake (C4), whereas the lowest value was obtained in case of 20 % olive cake (C1). Similar results were obtained by (Saviozzi *et al.*, 1993 and Paredes *et al.*, 2002).

Table (8): Effect of periods and compost varieties on total phosphorus (%) and total potassium (%) of compost

Parameters	Total phosphorus				Mean	Total potassium				Mean
Periods / compost var	30 days	40 days	50 days	60 days		30 days	40 days	50 days	60 days	
C1	0.69	0.72	0.76	0.79	0.74	1.40	1.48	1.53	1.60	1.50
C2	0.65	0.69	0.70	0.74	0.70	1.36	1.42	1.47	1.56	1.45
C3	0.63	0.67	0.68	0.71	0.67	1.31	1.37	1.43	1.49	1.40
C4	0.60	0.63	0.66	0.69	0.65	0.95	0.99	1.06	1.22	1.06
Mean	0.64	0.68	0.70	0.73		1.26	1.32	1.37	1.47	

LSD at 5% 0f	Total phosphorus	Total potassium
Period	0.03	0.10
compost varieties	0.06	0.12
Periods x compost varieties	N.S	N.S

Table (9): Effect of periods and compost varieties on organic matter % and pH of compost.

Parameters	organic matter				Mean	pH				Mean
Periods / compost var	30 days	40 days	50 days	60 days		30 days	40 days	50 days	60 days	
C1	58.43	55.21	52.12	50.35	54.03	6.77	7.50	7.63	7.77	7.42
C2	57.95	53.89	50.93	49.95	53.18	6.73	7.03	7.47	7.57	7.20
C3	54.57	52.54	50.14	48.58	51.46	6.93	7.07	6.93	7.33	7.07
C4	46.67	45.57	44.30	44.10	45.16	6.73	6.87	7.03	7.00	6.91
Mean	54.41	51.80	49.37	48.25		6.77	7.50	7.63	7.77	7.42

LSD at 5% 0f	organic matter	pH
Period	1.01	0.15
compost varieties	1.20	0.22
Periods x compost varieties	2.02	0.30

Table (10): Effect of periods and compost varieties on EC (dS/m) and lead (pb mg/g) of compost .

Parameters	EC				Mean	Pb				Mean
Periods / compost var	30 days	40 days	50 days	60 days		30 days	40 days	50 days	60 days	
C1	3.21	3.85	4.20	4.95	4.05	4.87	4.67	4.15	3.98	4.42
C2	3.92	4.52	4.89	5.23	4.64	5.11	5.03	4.86	4.64	4.91
C3	4.10	4.41	4.96	5.35	4.71	5.95	5.61	5.44	5.29	5.57
C4	4.37	4.77	5.43	6.12	5.17	6.21	6.02	5.77	5.49	5.87
Mean	3.90	4.39	4.87	5.41		5.54	5.33	5.06	4.85	

LSD at 5% 0f	EC	Pb
Period	0.18	0.38
compost varieties	0.10	0.60
Periods x compost varieties	N.S	N.S

Table (11): Effect of periods and compost varieties on cadmium (Cd %) and zinc (Zn mg/g) of compost .

Parameters	Cd					Zn				
Periods / compost var	30 days	40 days	50 days	60 days	Mean	30 days	40 days	50 days	60 days	Mean
C1	0.58	0.49	0.41	0.37	0.46	110	101	95	89	98.8
C2	0.65	0.61	0.55	0.50	0.58	123	118	110	106	114.3
C3	0.79	0.73	0.68	0.62	0.71	132	127	122	117	124.5
C4	0.89	0.82	0.74	0.71	0.79	141	135	130	129	133.8
Mean	0.73	0.66	0.60	0.55		126.5	120.3	114.3	110.3	

LSD at 5% 0f	Cd	Zn
Period	0.30	3.0
compost varieties	0.50	3.9
Periods x compost varieties	N.S	N.S

Table (12): Effect of periods and compost varieties on total phenol g/100g.

Parameters	Phenol content				Mean
Periods / compost var	30 days	40 days	50 days	60 days	
C1	1.53	1.45	1.41	1.35	1.44
C2	1.66	1.58	1.51	1.45	1.55
C3	1.73	1.64	1.61	1.53	1.63
C4	1.91	1.87	1.82	1.73	1.83
Mean	1.71	1.64	1.59	1.52	

LSD at 5% 0f	Phenol
Period	0.02
compost varieties	0.02
Periods x compost varieties	N.S

B-Effect of periods:

1- Physical parameters:

It is clear from Table (5) that Extending the periods of compost production from 30 to 60 days reduced moisture content by 3.81 %. Moisture content under study was significantly affected by prolonging the periods from 30 to 60 days. On the other hand, Increasing periods of compost production from 30 to 60 days increased carbon dioxide by 7.55 5 for compost (Table 5).

Data in Table (6) show that temperture of compost significantly decreased by increasing the periods. Increasing periods from 30 to 60 days decreased temperture of compost by 12.86. The above-mentioned data agree with (Kaloosh, 1994) who reported that the temperature in heaps rose to nearly 60 °C and decreased to temperature close to ambient temperature within two to three months.

2- Chemical parameters:

Widening the the periods of compost production from 30 to 60 days days increased significantly the total nitrogen in compost. The highest value was obtained at 60 days (Table 6).

Data presented in Table (7) indicate that widening the periods had a reducing effect on total organic carbon and C / N ratio of compost. Total organic carbon and C / N ratio decreased significantly with increasing intervals from 30 to 60 days from compost production.

Data in Table (8) show that total phosphorus and potassium of compost were significantly affected by widening the periods of compost production from 30 to 60 days Prolonging the periods from 30 to 60 days increased the total phosphorus and potassium by 14.06 % and 16.67 % respectively.

Organic matter % of compost was shown to be decreased as the periods of compost production increased to 60 days and the differences were significant (Table 9). On the other hand, Increasing intervals up to 60 days caused a significant increase in the pH of compost. The decrease in pH could be explained due to the production of CO_2 and organic acids result in microbial activity (Ben sassi *et al.*, 2001).

The results summarized in Table (10) indicate that periods showed significantly responses in EC of compost. Increment of intervals from 30 to 60 days increased EC by 38.72 %. However, Pb in compost decreased significantly with increasing the periods. The highest value of Pb was obtained at 30 days.

Results in Table (11) show that there was a reduction in percentage of Cd and Zn of compost with increasing pireods. Widening the intervals from 30 to 60 days depressed significantly the Cd and Zn of compost.

C= Effect of the interaction between compost varieties and pireods:

1- Physical parameters:

Data in Table (5) show that the interaction between compost varieties and pireods had a significant effect on carbon dioxide of compost and insignificant effect on moisture content. The highest value of carbon dioxide was obtained at C4 and 60 days interval, while, lowest ones was at C1 and 30 days.

The results in Table (6) indicate that the interaction between compost varieties and pireods was significant on temperture of compost. The highest value of temperture for compost was recorded with C4 and 30 days

2- Chemical parameters:

The interaction between compost varieties and pireods had insignificant effect on total nitrogen in compost (Table 6). On the other hand, total organic carbon and C / N ratio of compost were affect significantly by compost varieties when interacted with pireods (Table 7). Data in Table (8) show that the interaction between compost varieties and pireods was not significant on total phosphorus and potassium of compost.

Results in Table (9) show that the interaction between compost varieties and pireods was significant on the organic matter and pH of compost .The highest value of organic matter was obtained with C1 and 30 days, while the highest value of pH was obtained with C1 and 60 days. The interaction between compost varieties and pireods had an insignificant effect on the EC, Pb, Cd and Zn of compost (Tables 10 and 11).

The best results were obtained when use 20 % olive cake in compost for pireods 60 days. These treatments gave the lowest valus of heavy metals such as Pb, Cd and Zn as well as phenol content, Carbon dioxide, temperture and heighest valus of total nitrogen, total phosphorus, potassium and pH.

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انتاج كومبوست للاستخدام الزراعى من مخلفات عصير ثمار الزيتون

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استهدفت الدراسه انتاج كومبوست للاستخدام الزراعى من مخلفات ثمار الزيتون التى تحتوى على نسبه عاليه من الملوثات الاروماتيه. اجريت هذه الدراسه بمزرعة شركة سيكم ببلبيس محافظة الشرقيه خلا موسم ٢٠٠٧ لانتاج كومبوست من خلال استخدام اربعة نسب من تفلة الزيتون (٢٠% تفلة زيتون + ٢٠% سماد بلدى + ٥٠% مخلفات زراعيه + ١٠% تربه) – (٣٠% تفلة زيتون + ١٥% سماد بلدى + ٤٥% مخلفات زراعيه + ١٠% تربه) – (٤٠% تفلة زيتون + ١٠% سماد بلدى + ٤٠% مخلفات زراعيه + ١٠% تربه) – (٥٠% تفلة زيتون + ٥% سماد بلدى + ٣٥% مخلفات زراعيه + ١٠% تربه) و اربعة مواعيد من تصنيع الكومبوست (٣٠ و ٤٠ و ٥٠ و ٦٠ يوم) على بعض صفات الكومبوست Ec و PH و الكربون العضوى و النيتروجين و نسبة الكربون الى النيتروجين و الماده العضويه و الفسفور و البوتاسيوم و درجة حرارة الكومبوست و ثاني اكسيد الكربون للكمبوست و محتوى الرطوبه و العناصر الثقيله مثل الرصاص و النحاس و الكاديوم و الزنك و الفينول و من اهم النتائج :

١- ادت زيادة نسبة تفلة الزيتون فى الكمبوست الى نقص معنوى فى الPH و الكربون العضوى و النيتروجين و الماده العضويه و الفسفور و البوتاسيوم و المحتوى الرطوبى و على الجانب الاخر زادت المحتويات الاتيهAC و درجة حرارة الكومبوست و العناصر الثقيله مثل الرصاص و الكادميوم و النحاس و الزنك و الفينول.

٢- ادت اطالة فترة الكمر من ٣٠ الى ٦٠ يوم الى زيادة معنوية فى EC وPH و النيتروجين و الفسفور و البوتاسيوم و ثانى اكسيد الكربون للكومبوست و نقص معنوى فى الكربون العضوى و نسبة الكربون الى النيتروجين و الماده العضويه و درجة حرارة الكومبوست و محتوى الرطوبه و العناصر الثقيله مثل الرصاص و الكاديوم و النحاس و الزنك و الفينول.

٣- ادى التفاعل بين نسب تفلة الزيتون و المواعيد الى استجابه معنويه فى ال PH و ثانى اكسيد الكربون للكومبوست و الكربون العضوى و نسبة الكربون الى النيتروجين و الماده العضويه و درجة حرارة الكومبوست.