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The Study of Some Physical and Chemical Characteristics of Soil Cultivated with Peach Trees (Prunus persica) in Three Fields with Different Ages under Organic and Conventional Agricultural Systems at Al-Jouf Saudi Arabia

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Abstract: *This research wasconducted to compare between effects of the organic agricultural system (OAS) and the conventional agricultural system (CAS) practiced at Al-Jouf region, north eastern Saudi Arabia, on soil physical and chemical characteristics under peach (Prunus persica) tree fields. Three peach fields (9, 17, 27 years old) under organic fertilization, and similar three peach fields under conventional fertilization system were chosen for soil study. The results showed that soil pH in both systems is alkaline. There were significant differences between the two systems in soil electric conductivity (EC), cation exchange capacity (CEC), total nitrogen (TN), P, K and Mn andall these parameters were high under OAS except P and Mn which were high under CAS. There were no significant differences between the two systems regarding soil pH, organic carbon (OC%),organic matter (OM%) and calcium carbonate (CaCO3). Also no significant differences between the two systems regarding micro-elements and heavy metals (Cu, Fe, Zn, Ni, Pb, Cd). Regarding soil physical properties, available water (AW) was significantly high under OAS compared to CAS. No significant differences between the two systems regarding field capacity (FC) and wilting point (WP). FC, WP and AW were significantly high in the soil of 17 years old peach field under OAS, and significantly high in soil of the younger field (9 years old) under CAS. FC, WP and AW were significantly high in the soil depth (20-40 cm) compared to the soil surface (0-20 cm) under both systems. Due to scarcity of information regarding soil properties under the organic and conventional systems at Al-Jouf region in the Kingdom of Saudi Arabia, this study was conducted.*

Key words: *organic agricultural system, conventional agricultural system.*

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I. Introduction

Organic agriculture and conventional agricultural systems are practiced worldwide as means of improving soil physical, chemical and biological properties, and increasing agriculture yield. Though there is a lot of research that examined both organic and conventional systems, the comparison between organic and conventional systems is considered to be complex and difficult. In this context, the complexity always arises from the differences in experimental conditions such as soil type, crops, climatic conditions and agricultural practices applied. Therefore, it is very difficult to compare one study to another.

Here in Kingdom of Saudi Arabia there is no available information on the soil properties under the organic and conventional systems that are practiced at Al-Jouf region in the north eastern part.One of the most important soil nutrients source is the soil organic matter (SOM), and it is important for plant growth (Whitehead et al. 2003). The effect of organic amendments on soil properties has received much more attention recently. Studies concerning effects of organic and conventional farming systems onsoil properties show higher OM and macronutrient content for organic farming systems (Edmeades 2003; Herencia et al. 2007). On the contrary, some other studies indicate different results (Gosling & Shepherd 2005). Some research findings demonstrated that organic additives directly affect the availability of micronutrients in the soil(Kabata-Pendias 2001; Rodrı´guez-Rubio et al. 2003), but as others suggested that there are very little information on organic agricultural practices, especially with respect to the use of plant residue compost (Andrews et al. 2002; Herencia et al. 2008). Some researchers admitted that comparisons of organic with conventional systems are complex and difficult (Watson et al. 2008). Some researchers said that organic agricultural systems are inefficient in and their soils are characterized by nutrient deficiency and they produce low yield. Bosatta and Agren., (1994) admitted the difficulty to assess losses or gains in soil organic carbon (SOC) in organic or conventional agricultural system over short- and medium-term partly due to the specific processes governing carbon sequestration, which vary with soil type, climate, and crop rotation. Soil EC value in organically managed field was less than its value in the conventionally managed fields (Daif et al., 2013; Freitas et al., 2011). Total nitrogen (TN) in soil is significantly affected by farming system and the period of organic farming practice (Daif et al., 2013). Regarding heavy metals in soil there were no significant differences in concentrations of Cu, Zn and some other mineral elements in olive field soil under the two agriculture management systems in Greece, (Gasparatos et al., 2011). There was significant increase by 10 times in water infiltration and water storage in organic farming system compared with the conventional farming system (Williams, et al. 2017).

The aim of this study is to assess the changes in the soil quality indicators regarding chemical, physical and biological characteristics under the organic and conventional agricultural systems practiced in six fields of peach trees at Al-Jouf region, Kingdom of Saudi Arabia.

II. Materials and Methods

This work was carried out in Al-Jouf Province at the eastern-northern part of Saudi Arabia. The province is characterized by the cultivation of orchards, particularly olive trees (Olea europaea), peach trees (Prunus persica), date palms, stone fruits, vegetable and crops as wheat, barley, alfalfa, sorghum, tomato, potato and watermelon.

Three peach farms (9,17,27 years) each farm is about 20 ha fertilized with organic fertilizers were chosen. Density of trees was 200 trees/ha and with 8-6 m distance between the tree rows. Another three similar farms under conventional agriculture practices were selected from the adjacent farms in Al-Busaita farms, AL jouf. Province.

Sample Collection

The surface of the soil was cleared of weeds and other debris. Then five soil sub-samples were collected from a depth of 0-20 and 20-40cm from the surface and subsurface. Every five sub-samples from one field were pooled and thoroughly mixed in a large plastic bucket. From this mixture, composite samples of approximately one Kilo gram each were packed in plastic bags, and labeled appropriately. All composite soil samples were dried before transporting them to the laboratory, for analysis.

Soil samples analysis

The soil samples were taken to King Saud University, College of Food and Agriculture Science, Soil Science department laboratories, sieved to pass through 2 mm sieve screen and subjected to analyses of some selected soil physical and chemical based on standard procedures as follows:

a- Soil chemical analysis

1. Electrical conductivity (EC) and soil pH were measured in a 1:1 soil: distilled water (w/v) suspension, where (EC) was measured according to Richards, (1954) and pH was measured according to McLean, (1982).
2. Total Nitrogen (N) titrimetrically measured after the distillation of NH_3 using the Kjeldahl digestion (Bremner and Mulvaney, 1982).
3. Exchangeable cations and the cation exchange capacity (CEC) determined by using an ammonium acetate extraction method (Thomas, 1983).
4. Available P (Olsen, 1954), K (Richards,1954) and micronutrient (Fe, Zn, Cu, Mn) in soil were determined according to Sultan pour and Schwab, (1977).
5. Heavy metals; mainly Cd, Ni, Pb were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) combined with microwave digestion technique (Hossner, L.R. 1996).
6. Soil Organic Matter (SOM) was determined by the method of Walkley - Black, (1934) titration method, that it is one of the classical methods for rapid analysis of organic carbon (OC) in soils and sediments. The method is based on the oxidation of organic matter by potassium dichromate ($K_2Cr_2O_7$) - sulfuric acid mixture followed by back titration of the excessive dichromate by ferrous ammonium sulfate ($Fe_2(SO_4)_2*6H_2O$). The average oxidation number for organic carbon is considered as zero and the reactions involved into the Walkley-Black, titration method.

b- Soil Physical analysis

1. Particle size distribution was carried out using the hydrometer method (Day, 1965, Gee and Bauder, 1994).
2. Bulk density (Bd): the most common method of measuring soil BD is by collecting a known volume of soil using a metal ring pressed into the soil (intact core), and determining the weight after drying (McKenzie et al. 2004).

3. Water holding capacity (WC): the amount of water held by oven dried, sieved soil under 0.33 atm of pressure field capacity and wilting point (Topp et al., 1993).

Statistical Analysis

Data were analyzed as a split – split arrangement under a randomized completed block design, with the system as the main factor, the period as a sub-main factor, and the depth as the sub-sub main factor and replicated four times. Analysis of variance and mean comparisons were carried out based on the LSD test in 5% of probability level using statistics 8.1 software (Analytical software, 2003).

III. Results

Soil chemical properties

The results in Table (1) showed the differences between the studied soil chemical properties under the agriculture systems (organic and conventional) under peach trees. The soil pH value under both agricultural systems is alkaline, with no significant difference between them. There were significant differences between the two systems as regard to soil electric conductivity (EC) and cation exchange capacity (CEC cmol/kg), and they were high under OAS compared to CAS. There were no significant differences between the two systems regarding the other soil characteristics, but with increase insoil CaCO3% in the soil of the organic agriculture system (OAS) compared to the conventional agricultural system (CAS).

Table no1: Mean values of chemical properties of the two system in soil of peach fields

Chemical properties	System		LSD
	Organic Farms	Conventional Farms	
pH (1:1)	7.68	7.64	ns
EC (dS.m-1)	4.74	2.37	2.22
O.C %	0.50	0.58	ns
O.M %	0.87	0.99	ns
CEC (cmol/kg)	10.03	7.97	0.90
CaCO3 %	6.85	5.77	ns

LSD: Least significant difference. ns: not significant

Table (2) is showing the soil chemical analysis of the nutrients and heavy metals under the organic and conventional systems. There were significant differences between the two systems regarding the total nitrogen (TN), phosphorus (P), potassium (K) and manganese (Mn) concentrations, and TN and K were high under OAS compared to CAS, but P and Mn contents were high under CAS compared to OAS. No significant differences between organic and conventional systems regarding the other soil macro and micro element contents and the heavy metal concentration.

Table no2: Mean values of Chemical properties of the two system in soil of peach fields

nutrients & Heavy metals	System		LSD
	Organic Farms	Conventional Farms	
Macro Elements (mg/kg)			
T.N	448.35	174.78	23.56
P	9.21	14.05	3.32
K	294.88	120.12	34.11
Micro Elements (mg/kg)			
Cu	3.47	3.70	ns
Fe	4.08	4.76	ns
Mn	7.99	14.13	5.56
Zn	1.21	1.36	ns
Heavy Metal (mg/kg)			
Ni	nd	nd	nd
Pb	nd	nd	nd
Cd	2.55	2.71	ns

LSD: Least significant difference. ns: not significant. nd: no detected

Table (3) is illustrating the results of the soil chemical properties in the different three fields with difference ages. The results showed no significant differences between the three age different fields under the organic agricultural system and the three different aged fields under conventional system, except with soil pH and CEC, and pH and CEC were highest in the younger field under organic system and lowest in the old field under conventional system, while pH was highest in the old field and CEC was highest in the youngest field under conventional system. It can be noticed that soilEC was high under all three organically managed systems compared to the three fields under conventional system.

Table no3: Mean values of system and time interaction of some chemicals properties in soil of peach fields

Chemical Properties	Organic Farms			Conventional Farms			LSD
	A1	A2	A3	A1	A2	A3	
pH (1:1)	7.75	7.73	7.60	7.53	7.50	7.90	0.22
EC (dS.m-1)	4.22	5.20	4.83	2.14	2.80	2.17	ns
O.C %	0.45	0.38	0.67	0.73	0.58	0.41	ns
O.M %	0.78	0.67	1.16	1.26	1.00	0.72	ns
CEC (cmol/kg)	9.15	10.06	10.87	9.58	7.73	6.60	2.43
$CaCO_3$ %	6.92	6.99	6.64	5.70	4.96	6.66	ns

A1: 9 years. A2: 17 years. A3: 27 years. LSD: Least significant difference. ns: not significant.

Table (4) is showing the averages of macro, micro elements and heavy metals in the soil of the three peach fields (9, 17, 27 years old) under organic and conventional agricultural systems. There were no significant differences between the three different age fields under both two systems regarding concentrations of the macro element P, the micro elements Fe and Zn and the heavy metals Ni, Pb and Cd, except there was significant differences between the three different age fields under both two systems regarding concentration of TN, K, Cu, and Mn. Total nitrogen (TN) was highest in soil of the old peach field under OAS compared to CAS, and K was significantly higher in all fields under OASand Mn concentration was highest in the soil of the youngest field (9 years) under CAS compared to OAS. And it could be seen that P was high in fields under OAS compared to CAS. There were significant differences between the differently aged three fields in both systems, with the oldest field (27 years) under OAS attaining the highest soil T.N content compared to the other two fields, K content was the highest in the medium field (17 years) under OAS, Cu was highest in 9-year-old field under OAS, and Mn was highest under 9-year-old under CAS.

Table no4: Mean values of system and time interaction of some chemicals properties in soil of olive and peach fields

nutrients &Heavy metals	Organic Farms			Conventional Farms			LSD
	A1	A2	A3	A1	A2	A3	
Macro Elements (mg/kg)							
T.N	202.5	178.00	964.60	221.80	163.40	139.10	34.48
P	9.06	4.06	14.52	11.52	12.05	18.56	ns
K	265.30	433.10	186.20	138.00	98.38	124.00	34.32
Micro Elements (mg/kg)							
Cu	5.90	0.46	4.05	3.03	3.13	4.93	2.85
Fe	5.48	4.61	2.14	8.70	3.77	1.82	ns
Mn	13.19	2.57	8.23	20.74	17.42	4.23	6.26
Zn	1.77	0.97	0.90	0.30	2.62	1.16	ns
Heavy Metal (mg/kg)							
Ni	nd	nd	nd	nd	nd	nd	nd
Pb	nd	nd	nd	nd	nd	nd	nd
Cd	2.21	2.15	2.08	2.00	2.48	2.42	ns

A1:9years, A2:17years, A3:27years, ns: not significant, nd:not detected.

Table (5) illustrates average values of the soil chemical properties (pH, EC (dS.m-1), O.C%, O.M%, CEC (cmol/kg) and $CaCO_3$%), in the peach tree fields under OAS and CAS at two different depths. The results showed no significant differences between the soil depths under both agricultural systems except in EC which was highest in the depth (0-20 cm) under OAS, and alsoCEC and $CaCO_3$% were higher in depth (0-20 cm) compared to depth (20-40 cm) under OAS.

D1: depth 0-20cm. D2: depth 20-40cm. LSD: Least significant difference. ns: not significant.

Table no5: Mean values of systems and depths interaction of some chemicals properties in soil of peach fields

Chemical Properties	Organic Farms		Conventional Farms		LSD
	D1	D2	D1	D2	
pH (1:1)	7.68	7.68	7.60	7.70	ns
EC (dS.m-1)	5.74	3.73	2.91	1.83	sd
O.C %	0.58	0.43	0.64	0.51	ns
O.M %	0.99	0.74	1.10	0.88	ns
CEC (cmol/kg)	10.40	9.65	8.49	7.45	ns
CaCO3 %	6.97	6.72	5.34	6.20	0.65

The statistical analysis obtained for nutrients and heavy metals contents in the soil in relation to soil depth under both agricultural systems revealed no significance differences (Table 6). But it is clear that contents of all macro, micro-elements and heavy metals were high in the first soil depth (0-20 cm) compared to depth (20-40 cm) under both agricultural systems, with the macro-elemnts TN and K were highest in D1 under OAS, and all the micro-elements (Cu, Fe, Mn, Zn) and Cd were highest in D1 under CAS.

Table no6: Mean values of systems and depths interaction of some chemicals properties in soil of peach fields

Chemical Properties	Organic Farms		Conventional Farms		LSD
	D1	D2	D1	D2	
Macro Elements (mg/kg)					
T.N	519.50	377.20	209.50	140.00	ns
P	10.18	8.24	13.65	14.44	ns
K	361.00	228.80	130.30	110.00	ns
Micro Elements (mg/kg)					
Cu	4.94	2.00	5.33	2.06	ns
Fe	4.61	3.54	6.19	3.33	ns
Mn	9.46	6.54	14.93	13.33	ns
Zn	1.92	0.51	2.03	0.68	ns
Heavy Metal (mg/kg)					
Ni	nd	nd	nd	nd	nd
Pb	nd	nd	nd	nd	nd
Cd	2.16	2.13	2.34	2.26	ns

D1: depth 0-20cm. D2: depth 20-40cm. LSD: Least significant difference. ns: not significant
nd: no detected

Soil Physical properties

In peach fields, soil texture examined was sandy loam (SL) type of soil except at the younger field (9 years) D2 and 17 years old field D1-D2 in organic farms and 17 years old field D2 in conventional farms which recorded sandy clay loam (SCL) type of soil. Meanwhile bulk density(Bd) was 1.53 g/cm3 for the youngest field under OAS. The soil water content at field capacity (FC) recorded 13.07% as the highest value at depth D2 in the 17 years old field of organic farms while 8.29% as lowest value at depth D1 in the 17 years old fieldunder conventional farms. The soil water content at wilting point (WP) had the highest reading of 7.90% at depth D2 in the youngest fieldunder conventional farms, while the lowest recorded WP was 4.31% in depth D1 of 27 years old field. The analysis of available water(AW) showed that the highest values were 6.74% in D2 of the 17 years old fieldunder organic farms, and the lowest was 3.59% for D1 of the 17 years old field under conventional farms.

Table no7: Mean of physical properties in soil of the two systems under peach trees

Systems	Times year	Depths cm	%			Texture Class	Bulk density g/cm3	WC at FC %	WC at WP %	AW %
			Sand	Silt	Clay					
Organic Farms	A1	D1	71.95		19.30	SL	1.53	9.40	5.40	3.99
		D2	68.20	10.62	21.18	SCL	nd	10.88	6.52	4.40
	A2	D1	68.28	9.36	22.36	SCL	1.46	11.86	5.77	6.10
		D2	65.15	9.37	25.48	SCL	nd	13.07	6.33	6.74
	A3	D1	72.57	11.88	15.55	SL	1.35	9.46	5.61	3.85
		D2	73.20	10.94	15.86	SL	nd	9.78	5.87	3.91
Conventional Farms	A1	D1	73.83	8.74	17.43	SL	1.47	11.90	7.40	4.50
		D2	73.20	8.12	18.68	SL	nd	12.57	7.90	4.67

	A2	D1	72.65	9.06	18.29	SL	1.38	8.29	4.70	3.59
		D2	67.03	9.68	23.29	SCL	nd	9.93	6.15	3.78
	A3	D1	75.08	9.37	15.55	SL	1.49	8.60	4.31	4.28
		D2	74.45	9.69	15.86	SL	nd	10.30	5.75	4.54

A1 :9 years. A2:17 years. A3:27 years D1: depth 0-20 cm. D2: depth 20-40cm. SL: sandy loam. SCL: sandy clay loam. WC: water content. FC: Field Capacity. WP: Wilting Point. AW: Available water

Table (8) showed significant difference between the agriculture systems (organic and conventional) as regards soil available water content, and no significant differences between the two systems regarding soil FC and WP. The highest soil AW was under OAS compared to CAS.

FC: Field Capacity. WP: Wilting Point. AW: Available water LSD: Least significant difference. ns: not

Table no8: Mean values of physical properties of the two system in soil of olive and Peach fields

Physical Properties	System		LSD
	Organic Farms	Conventional Farms	
FC	10.74	10.26	ns
WP	5.92	6.03	ns
AW	4.80	4.09	0.19

significant

Results in table (9) showing soil FC, WP and AW average contents of the three peach fields under each of OAS and CAS. There were significant differences in the contents of these variables between the three differently aged fields under both agricultural systems. The results illustrated that under organic farming system the highest FC, WP and AW% were in the middle aged field (17 years) while in the case of the conventional system these high values were in the youngest field (9 years). under both agricultural systems, and the lower FC, WP, AW were in the oldest fields (27 years) in both agricultural systems. The AW was higher under OAS compared to CAS.

Table no9: Mean values of system and time interaction of some physical properties in soil of peach fields

Physical Properties	Organic Farms			Conventional Farms			LSD
	A1	A2	A3	A1	A2	A3	
FC	10.14	12.47	9.62	12.23	9.11	9.44	1.58
WP	5.96	6.05	5.74	7.65	5.42	5.03	1.19
AW	4.18	6.42	3.88	4.59	3.69	4.41	0.77

T1 :9 years. T2: 17years. T3:27 years. FC: Field Capacity. WP: Wilting Point. AW: Available water LSD: Least significant difference

Result in Table (10) determined the differences in FC, WP and AW% content in soil in the two soil depths (0-20 and 20-40 cm)under the effect of the two systems organic and conventional. The results indicate significant differences between the two soil depths concerning soil FC, WP and AW. Soil depth (20-40 cm) gave the highest FC, WP and AW% content in both OAS and CAS.

Table no10: Mean values of systems and depths interaction of some physical properties in soil of olive and peach fields

Physical Properties	Organic Farms		Conventional Farms		LSD
	D1	D2	D1	D2	
FC	10.24	11.24	9.59	10.93	0.77
WP	5.59	6.24	5.47	6.60	0.47
AW	4.65	5.00	4.12	4.33	0.47

D1: (0-20 cm), D2: (20-40 cm). FC: field capacity. WP: wilting point, Aw: Available water. LSD: Least significant difference.

IV. Discussion

There exist many environmental, edaphic, biological factors different fertilizing systems that make it difficult to assess a comparative study between organic and conventional agricultural systems (Herencia et al., 2008, and Watson et al., 2008). Farming practices in Al-Jouf province, Saudi Arabia depend on chemical fertilization in some farms and on organic fertilization in others, especially in peach trees fields.

In this study no significant difference was found in soil pH between organic and conventional farms planted by peach trees, and pH was alkaline in both systems. This result agrees with that of (Solomou et al., 2010) who reported no significant differences in soil pH between organic fertilized fields and conventional ones, and does not agree with the results ofNessly., (2015), Daif et al., (2013), Freitas et al., (2011) and Sudhakaran et al., (2013) who found significant differences between soil pH values under organic agricultural system (OAS) and conventional agricultural system (CAS).

The soil electric conductivity EC (dS.m-1) and cation exchange capacity (CEC cmol/kg) were significantly high under OAS than CAS, and under old field age (27 years), with less values in younger fields, and also in soil depth (0-20 cm) under OAS. This result disagrees with the finding of (Daif et al., 2013; Freitas et al., 2011) who reported lower soil EC value in organically managed field comparedto conventionally managed fields. And results agree with finding of (Solomou et al., 2010) that the (CEC) of the organic farming system is significantly higher than that under the conventional system. These findings may be probably due to the fact that in the organic agriculture the increased application of manure increases the cation exchange capacity of the topsoil layers (0-30cm) due to the increase in the organic matter. In the same time, soil pH is important for CEC because as pH increases the number of negative charges on the colloids increases, thereby increasing CEC (Eghball 2002).

It is difficult to assess losses or gains in soil organic carbon (SOC) over short- and medium-term and this is partly attributed to the specific processes governing carbon sequestration under management practices, which vary with soil type, climate, and crop rotation (Bosatta and Agren., 1994). There was no significant differences in soil organic carbon (SOC) between organic system compared to conventional system, and also between field ages. But (Jiao et al., 2006) found that the annual addition of manure in amounts exceeding 30 T/ha, increased the SOC in organically fertilized olivefields.

Also there were no significant differences in soil organic matter (SOM) between the organic system and the conventional system, and also between field ages. This result disagrees with that obtained by (Solomou et al., 2010) who found significantly higher percentage of organic matter in the soil of the organically fertilized olive fields compared to the conventionally fertilized fields, in Magnesia Prefecture (Greece). And also disagrees with the results by (Herencia et al., 2008b) who reported significant SOM increase in organic farming systems compared to conventional systems.

Soil organic matter (SOM) showed no significant difference in its levels between the two agricultural systems(Gasparatos et al., 2011) which is consistent with our results. Gossling and Shepherd (2005) results were in parallel with our findings.

Soil calcium carbonate(CaCO3) percentage showed no significant difference between organic and conventional farms, and between field ages under both systems, but it was high in soil depth (0-20 cm) under OAS compared to CAS. This same result was reached by (Solomou et al., 2010) who detected no significant difference between the organically fertilized olive fields and the conventional ones in concentration of CaCO3, and they attributed this to the soil texture in the two farming systems, which might have played a strong effect on the soil chemical indicators.

The total nitrogen concentration (TN) was significantly high in the organic agriculture system than in conventional system, and also highest in the oldest field under OAS and CAS compared to the younger fields. Same result was attained by (Daif et al., 2013) who reported that TN is significantly affected by farming system and the period of organic farming practice. But different result was suggested by (Gasparatos et al., 2011) that total N was not significantly affected by the type of farming system.

Soil phosphorus (P) content was significantly high under CAS compared to OAS.

Available potassium (K) content in the soil was significantly high in soil under organic agriculture than under conventional system, and in soil of the 17 years old field compared to the other fields. This result is similar to the finding of Sudhakaran et al., (2013), they reported that the amount of potassium level was higher in organic farming than conventional farming. But numerous studies have shown a K deficiency in organic farms due to the lower input of nutrients (Stockdale et al., 2001, Berry et al., 2002, Gossling and Shepherd, 2005).

No significant differences were obtained between the OAS and CAS regarding concentrations of micro-elements Cu, Fe, Mn and Zn in the soil, and Cu and Mn were higher in the youngest field (9 years) under organic farming. These findings agree with the results of (Gasparatos et al., 2011), who found no significant differences in concentrations of Cu, Zn and some other mineral elements in olive field soil under the two agriculture management systems. But in contrast with findings of (Sharma et al., 2000), who observed that Zn, Fe, Mn, and Cu were enhanced significantly by crop residues and manure incorporation compared with chemical fertilizer application.

No significant differences were observed in soil heavy metal content of Cd, Pb, Ni, between both agriculture systems at different field ages and depths. Jia et al., (2010) found that there were no significant differences between heavy metals including nickel in soil fertilized with chemical manure and organic manureand this finding was in agreement with these results. Domagała-Świątkiewicz and Gąstoł (2013) reported no significant differences in the concentrations of, Pb between organic and conventional soils in south Poland. Domagała - Świątkiewicz and Gąstoł., (2013) reported no significant differences in the concentrations of the heavy metal, Cd between organic and conventional crop management systems.

The soil physical properties under both OAS and CAS showed that the texture is sandy loam (SL) and sand clay loam (SCL).

The obtained results determined no significant differences between the two agricultural systems in relation to the soil physical propertiesFC, WP and AW contents, and they were highest in the younger field (9 years) under CAS, and in the 17 years old field under OAS. They were also highest in soil depth (20-40 cm) under both agricultural systems. AM was high under OAS compared to CAS. This result agrees with that of (Williams, et al. 2017) who showed significant increase by 10 times in cumulative water infiltration and water storage in organic farming system compared with the conventional farming system. There is controversy about effect of different management systems on soil properties and according to Gosling and Shepherd (2005), the comparison of organically and conventionally managed systems is rather complicated and difficult due to the great overlap in management techniques. Also as proposed by Marinari et al. (2006) and Vakali et al., (2011), agricultural management systems could react in variable manners under different climatic regimes; thus, it is important to evaluate the effect of organic management on the soil properties under a wide range of climatic regimes.

V. Conclusion

This research was conducted to compare between effects of the organically fertilized soil and the conventionally fertilized soilon soil physical and chemical characteristics in peach (Prunus persica) tree fields at Al-Jouf region, north eastern Saudi Arabia, The results showed that soil pH in both systems is alkaline, and the two systems differ significantlyin electric conductivity (EC), cation exchange capacity (CEC), total nitrogen (TN), P, K and Mn which were high under OAS while P and Mn were high under CAS. There were no significant differences between the two systems regarding soil pH, organic carbon (OC%), organic matter (OM%) and calcium carbonate ($CaCO_3$). Also no significant differences between the two systems regarding the micro-elements and heavy metals (Cu, Fe, Zn, Ni, Pb, Cd). As for soil physical properties, the available water (AW) was significantly high under OAS compared to CAS. No significant differences between the two systems regarding field capacity (FC) and wilting point (WP). FC, WP and AW were significantly high in the soil of the 17 years old peach field under OAS, and significantly high in soil of the younger field (9 years old) under CAS. FC, WP and AW were significantly high in the soil depth (20-40 cm) compared to the soil surface (0-20 cm) under both systems. Due to scarcity of information regarding soil properties under the organic and conventional systems at Al-Jouf region in the Kingdom of Saudi Arabia, this study was conducted.

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