RESEARCH PAPER

Influence of *Vitis vienefera* L. Cultivars on Some Physicochemical Characters and Enzyme Activities of Soil

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A B S T R A C T:

This study was carried out in order to evaluate the impacts of grape (*Vitis vienfera* L.) cultivars on soil physicochemical and enzyme activity.The soilsamples at root zones of various grape cultivars (Kamala, Kshmishy, Rashmiry, Doshawe, Halwany, Rashme and Bedenka) were collected in four different farm conditions. The experiment was designed in a completely randomized design (CRD) with three replicates. The results revealed non-significant variation (p≤0.01) among   grape cultivars for(pH, organic matter% and water content%)of soil the total mean value (7.50, 16.55% and 11.41% were recorded respectively while Bedenka cultivar has recorded a highest porosity cultivars and the total mean value of all cultivars was (23.31%)However there was a significant variance among cultivars in soil electrical conductivity the total mean of all cultivars is(222.14μS.cm^{-1}) which not cause soil salinity .there was not significant variance recorded in soil enzymes among the grape cultivars for each (urease μgN.g^{-1} soil ,dehydrogenase **μ**gTPF.g^{-1}and catalase). Rashme cultivar has a highest dehydrogenases value of soil statistically compared to other cultivars and the total mean value of all cultivars is (116.67 **μ**gTPF.g^{-1},).

1.INTRODUCTION:

Grape (*Vitis vinifera* L.) belong to family Vitaceae. itis one of the commercial fruit in world as well as in Kurdistan there are numerous cultivars and clones in the country. The latest statistic which provide by Food and Agriculture Organization in Kurdistan region there are more than 46 varieties of grapes.(Ahmed *et al.,* 2015,Atrushy *et al.,* 2016 and Mariappan *et al.*,2017).Soil is a dynamic system in which continuous interaction takes place between soil minerals, organisms and organic matter(Khudhur ,2018).

Falling plants' leaves are the most important plant residues that generate organic soil matter, improve physical properties of the soil, preserve organic carbon content increase nutrient availability and provide microbial activity and growth with nutrients and energy, as they contain more than 60% cellulose, decomposition of cellulose is a fundamental action for soil bacteria. (Killum and Jim, 2015).The tests of soil enzyme may give information about the potential of soils carrying out some biochemical processes in the height of enzymatic action is one of the for most not worthy pointers of the characteristics and the quality of soil . Urease enzyme is an extracellular enzyme that catalyzes the hydrolysis of the urea forming ammonia and CO_2, which is retained by organic and inorganic colloids of the soil. Catalase enzyme is an enzyme that is a result of metabolic events and respiratory evets of living organisms that separates cytotoxic hydrogen peroxide (H_2O_2)

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into water and oxygen. (Kuscu *et al.*, 2018).Dehydrogenases play a significant role in the biological oxidation of soil organic matter by transferring hydrogen from organic substrates to inorganic acceptors (Wolinska and Stepniewska, 2014). This study aimed to assessment Influence of *Vitis vienefera* L. Cultivars on Some Physicochemical Characters and Enzyme activities of Soil effects of grape (*Vitis vienfera*) cultivars on soil enzyme activity.

2.Materials and Methods:
2.1 Description area:
In general,Iraqi Kurdistan region is consists of a mountains and the foothills. The area primarily amplified over the Zagross mountain up to the Taurus mountains in Turkey. The region shores areborders are Iran in the East, Syria in the West and Turkey in the North.The locations of the studied areas (chnarok) is located at a distance of 95 kilometers from Erbil and 15 kilometers northeast of koya.Chnarok summer resort is

located next to Haibat sultan mountain (1260 meter)on the old road between Koya and Dokan.
2.2 Description of grape varieties
Grapes wide spread in the area of mid and north of Iraq, the vineyard under study were (9±1) years old. The cultivars are grown on its own root with conical cluster shape, ranged from small to large sizes, leaves arranged from three to five lobes depending on types of grape varieties, the flowers are hermaphrodite (perfect), the fruits start to ripens in the end of July and into August (Atrushy,etal.,2016).
2.3Soil sampling
Two soil samples were collected from farm of grape varieties; Kamalay and Kshmishy.The second two samples from the farm of Rashmiry and Doshawe. As well as one soil sample collected from Halwany.Finally,two soil samples had been collected from Rashme and Bedenka farm.The soil samples were taken by using auger from surface layer $0 - 30$ cm at different location as shown in table (1) and figure (1).

Table 1. Soil samples geographical locations

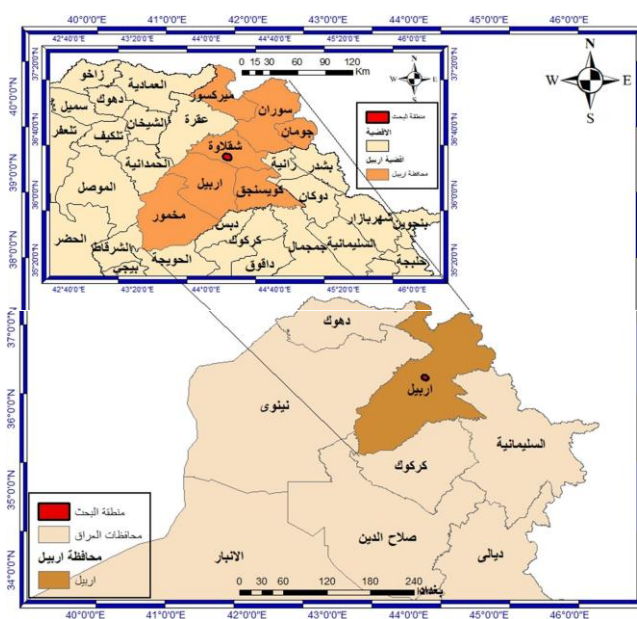| Site No.	Site name	Coordination Location	
		North	East
S1	Farm 1	36° 06' 50"	44° 39' 46 "
S2	Farm 2	36° 06' 51"	44° 39' 59"
S3	Farm3	36° 06' 46 "	44° 39' 42"
S4	Farm4	36° 06' 45 "	44° 39' 51"

Figure (1): Soil samples collection areas of Iraqi Kurdistan region

2.2. Determination of soil physicochemical properties

Hydrometer method was used for particle size distribution and determination of soil textural classes using ISSS triangle. The pH and EC of the soils were determined in 1:5 (soil: water suspension) using a calibrated pH-meter (JENWAY 3505) and an electrical conductivity meter (JENWAY 4510) according to the method given in (Rayan *et al*., 2001). Gravimetric method was used for soil moisture content determination as described by (Jaiswal, 2003). Soil porosity was determined by placing samples into the core weighing and then putting them oven at 105 for 24hrs rather that, the dried samples were weighed again, then put it in water bath until they were dried, later the samples were weighed according to (Allen, 1974).Walkly-Black procedure 1934 was followed for determination of soil organic matter as given by (Pansu and Gautheyrou, 2006).

2.3.Estimation of soil enzyme activity
Estimation of dehydrogenase

The dehydrogenase activity was determined by the modified procedure of Casida 1977 given by (Anjaneyulu et al.,2011). For 5g of soil in a test tube 2.5 ml sterile distilled water and 1ml of 3% aqueous solution of triphenyl tetrazolium chloride (TTC) was added and incubated at 30^0C for 24 hours.The triphenyl tetrazolium formazan end product was measured at 485 nm. The results expressed as μg TPF g-1 dry weight soil.

Estimation of urease

Urease activity was determined by modified method of Hoffmann and Teicher 1961 described by (Uzun and Uyanoz,2011).For1g of soil,0.25 ml toluene,0.75 ml citrate buffer (pH 6.7) and 1ml of 10% urea substrate solution were incubated for 3 hours at 37^0C .Formation of ammonium was found out spectrophotometrically at 636 nm (Bashour and Sayeg,2007).Results expressed us μg N g-1 dry soil.

Estimation of catalase

The catalase activity was determined by $KMnO_4$ titration method as described by (Kumar, 2004).Two grams of oven -dried soil was mixed with 40 ml of distilled water and put in a rotary shaker. Then 5ml of 0.3 % H_2O_2 was added and the slurry was shaken for 20 minutes at 150rpm.The remaining peroxide was stabilized by adding 5ml 3N H_2SO_4 and 25 ml filtered aliquots which were titrated with 0.1 N $KMnO_4$. Results

were expressed as ml of 0.1 N $KMnO_4$dry soil.20 min^{-1}, equivalent to peroxide decomposed per gram of oven – dry soil.

2.4. Statistical Analysis

This study was carried out according to Completely Randomized Design (CRD) with three replicates. Data were analyzed statically using Statistical Package for Social Science (SPSS version 24). Duncan's Multiple Range Test was used for the comparison of treatment means at 1%for laboratory parameters (AL-Rawi and KHalafulla,1980).

3. Results and discussions:

Data presented in table (2) indicate the effects of grape (*vitisvienfera*) cultivars on some physical and chemical properties of soil Kamala, Kshishy, Rashmiry, Halwany,Rashme and Bednka; onphysical and chemical soil enzyme activity. The results indicate the non-significant variation (p≤0.01) among the grape cultivars in pH, organic matter% and water content % of soil, the total means value (7.50, 16.55% and 11.41%) for (pH, organic matter% and water content%) respectively. The minimum and maximum mean value of (pH, organic matter %, and water content %) were ranged between (7.18-7.75, 8,9-27.61% and 6.42-14.77%) respectively. While the Bedenka cultivar has a highest porosity % which is superior significantly to other

cultivars General means of porosity for all cultivars is (23.31%), the minimum and maximum mean value of (porosity%) was ranged between (16.56-35.50%).The results revealed significant variance(p≥0.01) among cultivars in soil electrical conductivity, the general mean of all cultivars was (222.14μS.cm^{-1}) Which indicates that the soils do not reach salinity, while minimum and maximum value ranged between (162.15-287.42 μS.cm^{-1})Electric conductivity (EC)is measurement of total amount of soluble salts present in soil, this amount revealed that organic residues contain soluble salts and the presence of more exchangeable calcium, magnesium and potassium in the soil, When rich- nutrient, plant residues decompose, salts and ions in the soil and in its liquid phase are increased. Such changes exert and influence on soil EC, which is regulated by several soil fertility attributes, such as pH, P, K, Ca, Mg, OM, cation exchange capacity (CEC)and by the contents of other soluble salts and organic ligands.This result agreed with (Carmo, *et al*.,2016)who showed that EC-soil property

interactions are not easily identified, since the magnitude of the interactions regulating soil EC levels are complex and dynamic, thus, it's important to investigate the change in EC in soils treated with different wastes, bearing in mind that EC reflects that the sum of salts and ions in the soil solution, the levels of which are regulated by the type, composition and the amount of waste added to the soil. While for other physicochemical properties' farms have the same climatic condition such as temperature and precipitation which cause some different soil properties while weathering in pedogenesis process and soil formation also have a great role effects on chemical and physical properties of soil. The chemical and physical nature of the carbonates(e.g.,particle size and mineralogy (carbonates exerts a major effect on soil chemical properties in calcareous soils, such as nutrient availability.This result similar to the result of (Killum and Jim,2015) notice that the fall leaves of grape plant is most important plant residues in which provide soil organic matter, improve physical properties of soil, sustain organic carbon content and can also enhance the availability of nutrient and provide the nutrient and energy for microbial activity and growth because contain more than 60 % cellulose the decomposition of cellulose is a key activity for soil bacteria

Data present in table (3) and figure (1) indicate the effects of grape (*vitisvienfera*) cultivars on soil enzyme activity (urease $\mu g N.g^{-1}$ soil ,dehydrogenase $\mu g TPF.g^{-1}$, and catalase) of soil cultivated by various grape cultivars (Kamala, Kshmishy, Rashmiry, Doshawe, Halwany, Rashme and Bedenka).The result show that there was non-significant variation ($p \leq 0.01$) among the grape cultivars on urease $\mu g N.g^{-1}$ soil ,dehydrogenase $\mu g TPF.g^{-1}$, and catalase of soil, the total means value (161.19, 116.67 and1.14) of (urease $\mu g N.g^{-1}$ soil ,dehydrogenase $\mu g TPF.g^{-1}$, and catalase)respectively, as well as the minimum and maximum mean values of (urease $\mu g N.g^{-1}$

soil ,dehydrogenase $\mu g TPF.g^{-1}$, and catalase were ranged between (78.60-243.00, 67.30, -222.40, and 0.07-1.83) respectively. The result indicate that the Rashme cultivar has a highest dehydrogenases value of soil compared to other cultivars and the total mean value of all cultivars was (116.67), the minimum and maximum mean value of (dehydrogenase) is ranged between (67.30-222.40). These results indicate enzyme activity of soil linked with mineral and organic matter occurring in the soil and the amendment, on the other hand the present of microbial activity. Furthermore, it contains essential micro and macronutrients for plant growth, (The reason might be due to fact that the application organic residues in soils is useful source of plant nutrients, particularly nitrogen and phosphorous and also potentially improve soil biological activity, physical and chemical properties. This result similar to the result (Akmal et al., 2012) who showed that the activity of soil enzymes is also affected by different biotic factors such as temperature, moisture, soil pH, and oxygen content. Kujar et al., 2012)reported that the variation in soil enzymes activity was significantly attributed to differences in soil texture.C, N,P content,bulk density,water holding capacity,moisture content and soil pH.Comparative analysis of soil enzyme revealed that there was gradual increase in amylase,invertase, protease and dehydrogenase activity from a nutrient deficient situation (fresh mine soil) compared to an enriched soil (fresh soil).(Berber *et al.*2014),reported that the relationship between urease enzyme activity was not related significantly to pH, organic matter(O.M) electrical conductivity (EC) and calcium carbonate (CaCo3)is not statistically significant.(Kuscu et al., 2018) the relationship between urease and pH was found to be statistically significant.

Table 2.influence of *vitisyvienefera* L. cultivars on some physicochemical characters of soil farms .

Grapes cultivars	pH	EC$\mu S.cm^{-1}$	Organic matter%	Water content%	Porosity%
Kamalay	7.44a	198.13dc	17.71a	11.72a	20.30b
Kshmishy	7.67a	177.76d	16.43a	11.13a	21.50b

Rashmiry	7.52a	200.17c	12.37a	11.97a	22.92b
Doshawe	7.49a	249.73b	17.60a	12.03a	20.91b
Halwany	7.48a	277.54a	18.52a	11.91a	24.72b
Rashme	7.50a	246.54b	13.63a	11.14a	22.32b
Bedenka	7.39a	205.13c	19.56a	9.98a	30.53a
Total means	**7.50**	**222.14**	**16.55**	**11.41**	**23.31**
Minmum	**7.18**	**162.15**	**8.09**	**6.42**	**16.56**
Maximum	**7.75**	**287.42**	**27.61**	**14.77**	**35.50**

Table 3. infleunce of *vitisyvienefera* L. cultivars on enzymes activity of soil farms

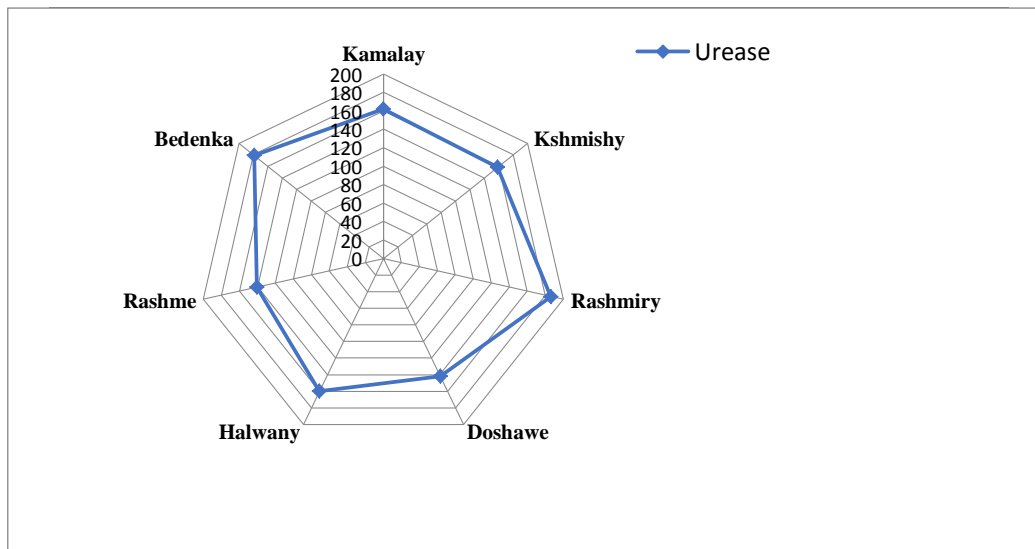| Grapes cultivars	Urease	Dehydrogenase	Catalase
Kamalay	162.17a	96.47b	0.85a
Kshmishy	158.20a	104.53b	1.10a
Rashmiry	186.37a	90.73b	1.25a
Doshawe	142.03a	126.37b	1.19a
Halwany	159.67a	122.83b	1.37a
Rashme	140.63a	185.93a	1.18a
Bedenka	179.28a	89.83b	1.05a
Total means	**161.19**	**116.67**	**1.14**
Minmum	**78.60**	**67.30**	**0.07**
Maximum	**243.00**	**222.40**	**1.83**

Figure (2):Influence of *Vitisvienefera*L.cultivars on urease activity of soil farms

4. Conclusion

The study was mainly focusing on the effects of grape (*vitisvienfera*) cultivars on physicochemical and enzyme activity of soil in 4 different farms cultivated various grape ;(Kamala, Kshmishy, Rashmiry, Doshawe, Halwany, Rashme and Bedenka). The results revealed the non-significant variation among the grape cultivars in pH, organic matter and water content of soils, while Bedenka cultivar recorded the highest porosity of soil which is superior significantly to other cultivars .Also there is non-significant variation among the grape cultivars for (urease µgN.g^{-1} soil dehydrogenase **µ**gTPF.g^{-1}, and catalase of soil

respectively ,but Rashme cultivar has a highest dehydrogenases value of soil statistically compared to other cultivars.

5.References

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