Plant Archives Vol. 19, Supplement 2, 2019 pp. 1426-1435 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

ALKALINE PHOSPHATASE AND L - ASPERGENSES ENZYMIC ACTIVITY ASSESSMENT IN DIFFERENT PLANTS

Luma S. Al-Taweel and Gaith A. Alwan
Agriculture College, University of Al-Qadisiyah, Iraq
Corresponding author: luma.altaweel@qu.edu.iq, ghaith.al.jubouri1993@gmail.com

Abstract

In order to study the activity of alkaline phosphatase and L-asparaginase enzymes in the plant, eight different sites in some of their chemical, physical and biochemical characteristics (Diwaniyah, Sunni, Shamia, Shinafiyah, Hamzah Al-Sharqi, Al-Daghara, Afak and Al Badair), were selected. Two types of soils were selected at each site: field soil planted with different plants and Jungle soil planted with Halva plants (as a control). The activity of the enzymes in the shoot and root parts of plants was estimated in all study soil. Results presented that the highest efficacy of basal phosphatase was found in maize plant in the field soil of al-Budair location, where the efficiency of the shoot and root of the plants (145.30 and 122.10) µg P-nitro phenol. $0.1g^{-1}$ plant material. 1 $hour^{-1}$, respectively. The least effective value was recorded in the alfalfa plant in the field soil of the Shinafia site (109.73 and 77.33) µg P-nitro phenol. $0.1g^{-1}$ plant material. 1 $hour^{-1}$, respectively, respectively. Jungle soil has the highest activity values of alkaline phosphatase enzyme in the plant of the flora in the location of the center of Diwaniyah and the lowest in the location of the Daghara. The asparaginase-l enzyme had the highest effective values in the eggplant plant in the field soil of the Diwaniyah center. Its activity was (13.03 and 11.00) µg NH_4^+ - N. g^{-1} plant material. 2 $hours^{-1}$ in both parts of the plant. The lowest values of this enzyme recorded in maize plant grown in the field soil of the location of Afak (7.20 and 4.83) µg $NH4^+$ - N. g^{-1} plant material. 2 $hours^{-1}$, respectively. The activity of the enzyme in the flora plants varied between the eight sites

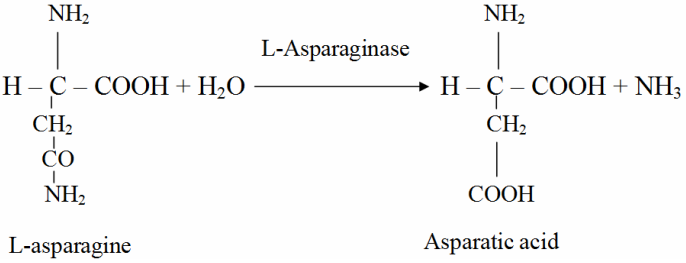
Keywords: Alkaline phosphatase enzyme, asparaginase-L enzymes, plant

Introduction

Soil enzymes are the primary key to soil biochemical interactions as well as the biological interactions of soil and plant roots as all these biological and enzymes stimulate biochemical reactions. Enzymes are catalysts made up of proteins with catalytic properties that increase the speed of reaction without altering enzyme properties after the end of the reaction, Reec et al. (2011). Many enzymes do not appear to be effective in the absence of a non-protein component called Cofactor, Dalai, (1983). The alkaline phosphatase enzyme is a hydrolysis enzyme that dissolves phosphorus esters according to the following equation:

$$R\text{-}O\text{-}P + H_2O \longrightarrow R\text{-}OH + HPO_4^{-2}$$

Plants, microorganisms and soil animals secrete alkaline phosphatase, Banerjee and Sanyal (2012). The basal phosphatase enzyme participates in the phosphorus cycle in the soil and reveals the solubility of phosphorus in the soil, Nannipieri et al. (2011). Renala (2006) presented that the alkaline phosphatase enzyme is excreted abundantly in basal or neutral soils. The enzyme is stabilized by organic colloids and is trapped by humus particles, Burns (2013). The importance of the enzyme in plant nutrition comes from its high efficiency in the area of the rhizosphere compared to the bulk soil area, Tarafdar and Jungk (1987). Since the importance of this enzyme in soil and its important role in plant, nutrition has been studied in soil (Ross and Speir, 1978). The importance of enzyme in plant nutrition comes from its high efficiency in the area of the rhizosphere compared to the Bulk Soil area (Tarafdar and Bala, 1988). The cultivated soil contains alkaline phosphatase in different quantities depending on the density of the microbial community, the amount of organic matter in the soil, mineral fertilizers and organic additive, Banerjee and Sanyal, (2012). L-Aspergenase is an enzyme that is widely spread in nature and is part of a group of hydrolyzed enzymes. The sources of this enzyme are different and include both microorganisms and plants, Bansal *et al*. (2010); Perma *et al*. (2013); Sanaa *et al*. (2012) and Gupta *et al*. (2009). It plays an important role in nitrogen synthesis and stimulates hydrolysis of L-asparagine, which is associated with dissolved organic molecules (Laxman, Raman, 1999, Verma *et al*., 2007). Drobni'k (1956), who indicated that this enzyme stimulates the hydrolysis of L-aspargine acid, the production of L-aspartic acid, revealed the activity of the L-Asparaginase enzyme and ammonia by breaking down the C-N of straight amides Non-peptide as in the following equation:



Pseudomonas fluorescens is a source of this enzyme (Eremenko *et al*., 1975). It has been derived from *Erwinia chrysanthemi*, Miller *et al*. (1993) and from *El-Pseudomonas aeruginosa,* Besooumy *et al*. (2004). Studies have shown that the use of certain crops as a cover plant can alter the activity of enzymes in the soil. In addition, the type of crop itself has a direct effect on the activity of the enzyme through the density of the root mass and the survival of the crop in the soil, Gianfreda and Ruggiero (2006), Pantelitsa and Others (2012), and Mikanova (2006). Studies have focused on the importance of the effect of crop system and system type on enzymatic efficacy, Ulrich *et al*. (2010), Gajda and Martyiuk (2005), and Dinesh *et al*. (2004). Gajda and Martyniuk (2005) found that the highest efficacy of alkaline phosphatase

enzyme and L-asparaginase enzyme is in organic and conventional farming system compared to monoculture (single system). Klose *et al*. (1999) noted that the activity of L-asparaginase enzyme is significantly influenced in soil as to rotate crops and vegetation. They found the highest efficacy of L-asparaginase L is obtained in soil cultivated with grain crops and vegetables (soybeans, maize and vegetables) and the less activity in soils with continuous farming systems (sorghum and soybeans). Gianfreda and Ruggiero (2014) present that the results of the activity of L-asparaginase enzyme under single and rotary farming system are due to the positive effects of varied crop rotation, improved soil composition, almost root area and vegetation throughout the year, climate stability and root density. Long-term field trials by Fang and others (2012) have shown that crop cycles with high carbon content contribute significantly increasing microbial efficiency and thereby increasing the efficiency of enzymes in soil. All agricultural courses produce a different amount of waste, which have different decomposition rates that contribute to the addition of the biodegradable part of the soil organic matter. In a study by Vandana *et al*. (2012) and Hamido *et al*. (2009) and Ting *et al*. (2015) of L- aspergensase and alkaline phosphatase in soil grown with different crops, they showed that the activity of the enzymes increased with the age of the crops as they grown and then decreased significantly reaching harvesting phase. The increase in the activity of L-asparaginase in rice soil ranged between 1.86-4.16 µg NH_4^+-N. g^{-1} plant material. 2 $hours^{-1}$ and sesame soil between 1.88-4.38 µg NH_4^+ -N. g^{-1} plant material. 2 $hours^{-1}$ and yellow maize between 1.86 - 3.96 µg NH_4^+ - N. g^{-1} plant material. 2 $hours^{-1}$. Alkaline phosphatase efficacy ranged between (33.29 - 60.70) µg PNP^{-1} $soil^{-1}$ $hour^{-1}$ in sesame and (61.75-33.37) µg PNP^{-1} $soil^{-1}$ $hour^{-1}$ in rice and (59.77-3.30) µg PNP^{-1} $soil^{-1}$ $hour^{-1}$ in yellow maize. Soil enzymes, including basal phosphatase and L-arsenic, are often more effective in soil with different crops than non-planted locations. This is because cultivated sites have additions of soil organic matter that are likely to increase carbon content and nutrients in the soil, which increases enzymatic activity, Petersen and Barbara, (2005). Leguminous plants are more advantageous to phosphatase compared to cereal crops, Yadav and Tarafdar, (2001). This due to the high requirement of legumes of phosphorus.

Materials and Methods

Soil samples used in this study were collected from the eight different locations that differ in some of their chemical, physical and biological characteristics in Diwaniyah province (Diwaniyah, Sunni, Shamia, Shinafiyah, Hamzah Al Sharqi, Daghara, Afak and Al Budair regions). Two types of soils were selected within the same site. Different agricultural exploitation is the soil of the field and the Jungle of the table (1). Soil samples from the surface layer were taken from (0) to (30) cm and randomly from several different places to each site and stored in nylon bags. Tables (2, 3, 4, 5, 6, 7,8 , and 9) are subjected to a number of chemicals, physical and biological analyzes.

Table 1 : Agricultural exploitation of the studied location.

Location	Sample	Agricultural exploitation
Center of Diwaniyah	Field	Planted with eggplant plants
	Jungle	Contains lots of flora
Sunniya	Field	Planted with wheat plants
	Jungle	Contains flora plants
Shamiya	Field	Planted with wheat plants
	Jungle	Contains flora plants
Shafia	Field	Planted with alfalfa plants
	Jungle	Contains flora plants
Al-Hamza	Field	Planted with yellow maize plants
	Jungle	Contains flora plants
Dagara	Field	Planted with the rice crop
	Jungle	There are many plants of the alliance
Afak	Field	Planted with yellow maize plants
	Jungle	Contains lots of flora
AL-Budair	Field	Planted with yellow maize plants
	Jungle	Contains flora plants

Physical Properties

- **Volumetric distribution of soil separators :** Estimated according to the international pipette method according to the method in Black (1965a).
- **Bulk density :** Estimated according to the Core Sample method that mentioned in Black (1965a).

Chemical properties

- **Soil reaction (pH) :** Measure in 1: 1 (soil: water) extract using a pH-meter using the Black (1965a) method.
- **Electrical conductivity (EC) :** It was estimated at 1: 1 (soil: water) extract using an EC-meter according to the method in Black, (1965a).
- **Cation exchange capacity CEC :** Estimated by Papanicolaou method (1976) through soil saturation with calcium chloride (0.1) standard solution at pH = 7 and displacement with sodium nitrate (0.1) standard.
- **Calcium Carbonate $CaCO_3$** : Calcium carbonate was measured by calculating the loss of carbon dioxide by treating the soil with hydrochloric acid (3 standards), according to the method in Black (1965a).
- **Gypsum $CaSO_4$:** Estimated through sedimentation by acetone and by the method given in Black (1965b).
- **Positive and negative dissolved ions :** Estimated in 1: 1 (soil: water) extract according to the methods stated in Black (1965b).
- **Sodium Na^+ and potassium K^+ :** Estimated by using a flame photometer device.

- **Calcium Ca^{+2} and magnesium Mg^{+2} :** Estimated by the titration with Na2 EDSA.
- **Chloride (Cl) :** Estimated by the titration with silver nitrate 0.005 standards.
- **Sulfates (SO_4^{-2}) :** Estimated according to turbidity method by using barium chloride and through the Spectrophotometer device.
- **Total nitrogen :** Estimated by digesting soil samples with concentrated sulfuric acid then using micro-Kjeldahl steam distillation device according to a method of Bremner (1965) that mentioned in Black (1965b).
- **Available Phosphorus :** Available soil phosphorus was extracted using 0.5 molars of $NaHCO_3$ according to Olsen method. The color was developed with ammonium polysaccharides and ascorbic acid and was evaluated using the Spectrophotometer according to Page and others (1982).
- **Available potassium :** Soil potassium was extracted by using (1) molar of ammonium acetate and then extracted potassium estimated by Flame-photometer device according to the method in Page and others (1982).
- **Organic matter :** Organic matter was estimated according to the method of Walker-Black, Black (1965b) by oxidation with potassium dichromate solution with a concentrated sulfuric acid, and reverse titration with ferrous sulfate using D-phenylamine.
- **Determination of the number of bacteria and total fungi :** A total number of fungi in the soil were estimated by dilution method and counting. 10 grams of soil and were transferred to a dilution bottle containing 90 ml distilled and sterilized water. After that, 1 ml was removed and transferred to another bottle that is containing 90 ml distilled and sterile water. The dilution process continued to obtain a dilute chain from (10^{-1} to 10^{-7}). Dilutions of 10^{-5}, 10^{-6} and $10^{-7}$was used to estimate the numbers of bacteria, which were grown on Nutrient Agar medium in accordance with the Black (1965b) method. To estimate the number of fungi, dilutions of 10^{-3}, 10^{-4}, and 10^{-5} were taken was grown in Martin medium, according to Rashidi (1987).
- **Soil Sampling :** Various plant samples were taken from cultivated fields of all studied sites (eggplant, cowpea, wheat, rice, alfalfa and yellow corn) for the purpose of estimating the activity of alkaline phosphatase and L-asparaginase in the vegetative and root system of these plants. The activity of the enzymes in the flora was estimated within the sample of the Jungle.
- **Determination of the activity of alkaline phosphatase and L-asparaginase enzymes in the plant :** The efficacy of alkaline phosphatase and L-asparaginase was estimated in the vegetative and root systems of selected plants by taking 0.1 g of plant material. The efficacy of alkaline phosphatase was determined according to Eivazi and Tabatabai method (1977) by placing the plant material in a 50 ml flask and adding 0.2 ml of toluene and 4 mL of the regulated solution (MUB) with PH = 11 and adding 1 ml of the *p*- nitrophenyl phosphate. It then kept in a temperature of 37 ° C. The spectrometer is used for measuring at a wavelength of 420 nm. L-asparaginase L was evaluated according to Frankenberger and Tabatabai method (1991) by placing the plant material in a 50 mL volumetric flask and adding 9 ml of the regulated solution THAM. This done at pH = 10 with 1 ml of 0.5 mL of L-Asparaginase as a controlled substance for enzyme and incubation at a temperature of 37 ° C for 2 hours and then measured ammonium ion resulting from the activity of the enzyme using a steam distillation device.

Table 2 : Some chemical, physical and biological properties of the center of Diwaniyah site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.30			7.61			
Ec		2.33			3.21			ds .m^{-1}
Dissolved ions	Ca^{2+}	0.76			0.54			$Cmol_c$ .Kg^{-1} Soil
	Mg^{2+}	0.67			0.66			
	Na^{+}	0.33			0.71			
	K^{+}	0.05			0.07			
	Cl^{-}	1.52			1.31			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.15			0.13			
	CEC	45.27			33.61			
Organic matter		10.68			13.96			g.Kg^{-1} Soil
Organic Carbon		6.20			8.10			
Gypsum		2.10			1.90			
Calcium carbonate		268.1			292.2			
Total nitrogen		0.66			0.71			
Available Phosphorus		13.01			12.66			mg.Kg^{-1} Soil
Available Potassium		108.33			107.79			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		396	200	404	680	240	80	
Soil texture		loam			loam			
Bulk density		1.41			1. 40			$Mg.m^{-3}$
Total bacteria		12.0×10^6			12.2×10^6			CFU. g^{-1} Soil
Total fungi		2.1×10^4			1.47×10^4			

Table 3 : Some chemical, physical and biological properties of Sunniya site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.21			7.60			
Ec		2.80			3.22			ds .m^{-1}
Dissolved ions	Ca^{2+}	1.52			1.27			Cmol$_c$ .Kg^{-1} Soil
	Mg^{2+}	0.91			0.51			
	Na^{+}	0.33			0.57			
	K^{+}	0.06			0.13			
	Cl^{-}	2.10			2.41			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.15			0.122			
	CEC	47.33			35.21			
Organic matter		12.24			10.34			g.Kg^{-1} Soil
Organic Carbon		7.10			6.00			
Gypsum		3.60			3.10			
Calcium carbonate		252.2			221.2			
Total nitrogen		0.70			0.55			
Available Phosphorus		13.30			11.22			mg.Kg^{-1} Soil
Available Potassium		134.77			121.33			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		536	118	346	356	174	470	
Soil texture		loam			loam			
Bulk density		1.**38**			1. **28**			Mg.m^{-3}
Total bacteria		12.2×10^6			7.1×10^6			CFU. g^{-1} Soil
Total fungi		2.6×10^4			1.3×10^4			

Table 4 : Some chemical, physical and biological properties of Shamiya site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.53			7.91			
Ec		2.27			3.52			ds .m^{-1}
Dissolved ions	Ca^{2+}	1.57			2.03			Cmol$_c$ .Kg^{-1} Soil
	Mg^{2+}	0.44			1.02			
	Na^{+}	0.07			0.06			
	K^{+}	1.21			0.07			
	Cl^{-}	2.22			3.20			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.27			0.15			
	CEC	24.01			27.22			
Organic matter		15.68			12.06			g.Kg^{-1} Soil
Organic Carbon		9.10			7.10			
Gypsum		3.10			3.30			
Calcium carbonate		241.1			276.6			
Total nitrogen		0.70			0.60			
Available Phosphorus		15.27			9.33			mg.Kg^{-1} Soil
Available Potassium		101.21			93.12			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		380	196	424	500	316	184	
Soil texture		loam			loam			
Bulk density		1.46			1. 38			Mg.m^{-3}
Total bacteria		17.0×10^6			4.0×10^6			CFU. g^{-1} Soil
Total fungi		2.21×10^4			1.25×10^3			

Table 5 : Some chemical, physical and biological properties of Shinafia site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.21			7.61			
Ec		3.10			4.51			ds .m^{-1}
Dissolved ions	Ca^{2+}	5.91			5.18			$Cmol_c$ .Kg^{-1} Soil
	Mg^{2+}	4.79			1.56			
	Na^{+}	4.61			3.21			
	K^{+}	0.16			0.03			
	Cl^{-}	7.70			7.20			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.634			0.423			
	CEC	30.15			13.17			
Organic matter		12.65			11.37			g.Kg^{-1} Soil
Organic Carbon		9.60			6.60			
Gypsum		19.10			19.60			
Calcium carbonate		333.1			304.4			
Total nitrogen		0.50			0.60			
Available Phosphorus		15.52			12.66			mg.Kg^{-1} Soil
Available Potassium		133.81			93.71			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		496	120	384	430	245	325	
Soil texture		loam			loam			
Bulk density		1.22			1. 40			Mg.m^{-3}
Total bacteria		13.3×10^{6}			3.3×10^{6}			CFU. g^{-1} Soil
Total fungi		7.0×10^{3}			1.6×10^{4}			

Table 6 : Some chemical, physical and biological properties of the West Hamza site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.63			7.75			
Ec		4.72			4.31			ds .m^{-1}
Dissolved ions	Ca^{2+}	1.25			1.70			$Cmol_c$ .Kg^{-1} Soil
	Mg^{2+}	0.55			0.93			
	Na^{+}	2.19			0.22			
	K^{+}	0.22			0.04			
	Cl^{-}	3.37			3.227			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.26			0.25			
	CEC	30.50			34.73			
Organic matter		11.79			10.34			g.Kg^{-1} Soil
Organic Carbon		8.00			6.00			
Gypsum		3.10			3.30			
Calcium carbonate		237.3			257.1			
Total nitrogen		0.76			0.52			
Available Phosphorus		12.19			16.33			mg.Kg^{-1} Soil
Available Potassium		134.41			80.72			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		516	240	244	505	250	245	
Soil texture		loam			loam			
Bulk density		1.30			1. 32			Mg.m^{-3}
Total bacteria		12.7×10^{7}			11.7×10^{6}			CFU. g^{-1} Soil
Total fungi		2.3×10^{4}			1.2×10^{4}			

Table 7 : Some chemical, physical and biological properties of Daghara site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.36			7.51			
Ec		3.13			6.21			ds .m^{-1}
Dissolved ions	Ca^{2+}	1.61			0.74			Cmol$_c$ .Kg^{-1} Soil
	Mg^{2+}	0.76			0.60			
	Na^{+}	0.52			0.67			
	K^{+}	0.09			0.80			
	Cl^{-}	2.093			4.49			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.79			0.67			
	CEC	42.20			34.50			
Organic matter		15.58			12.24			g.Kg^{-1} Soil
Organic Carbon		9.10			7.00			
Gypsum		0.54			0.45			
Calcium carbonate		281.3			211.2			
Total nitrogen		0.77			0.71			
Available Phosphorus		15.03			11.07			mg.Kg^{-1} Soil
Available Potassium		163.01			86.31			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		520	180	300	620	176	204	
Soil texture		loam			loam			
Bulk density		1.40			1. 30			Mg.m^{-3}
Total bacteria		17.0×10^7			12.2×10^6			CFU. g^{-1} Soil
Total fungi		6.0×10^3			4.2×10^3			

Table 8 : Some chemical, physical and biological properties of Afak site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.31			7.61			
Ec		2.61			4.55			ds .m^{-1}
Dissolved ions	Ca^{2+}	0.65			1.30			Cmol$_c$ .Kg^{-1} Soil
	Mg^{2+}	0.35			0.95			
	Na^{+}	0.21			0.31			
	K^{+}	0.06			0.04			
	Cl^{-}	1.60			3.13			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.47			0.48			
	CEC	30.13			21.17			
Organic matter		14.48			10.34			g.Kg^{-1} Soil
Organic Carbon		8.60			6.00			
Gypsum		0.36			0.32			
Calcium carbonate		27**5**. 3			25**1**. 3			
Total nitrogen		0.60			0.63			
Available Phosphorus		14.82			11.13			mg.Kg^{-1} Soil
Available Potassium		138.27			121.71			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		420	235	345	432	238	330	
Soil texture		loam			loam			
Bulk density		1.30			1. 20			Mg.m^{-3}
Total bacteria		13.0×10^6			12.1×10^6			CFU. g^{-1} Soil
Total fungi		5.2×10^3			4.9×10^3			

Table 9 : Some chemical, physical and biological properties of Al-Budair site.

Soils / Traits		Field			Jungle fields			Unit
pH		7.31			7.61			
Ec		2.41			5.12			ds .m^{-1}
Dissolved ions	Ca^{2+}	1.23			1.56			Cmol$_c$ .Kg^{-1} Soil
	Mg^{2+}	0.91			0.71			
	Na^{+}	0.31			0.79			
	K^{+}	0.07			0.02			
	Cl^{-}	4.78			3.20			
	CO_3^{2-}	Nill			Nill			
	HCO_3^{-}	0.63			0.62			
	CEC	44.20			20.41			
Organic matter		13.79			9.44			g.Kg^{-1} Soil
Organic Carbon		8.00			6.00			
Gypsum		11.60			13.50			
Calcium carbonate		333.4			352.1			
Total nitrogen		0.71			0.53			
Available Phosphorus		17.03			16.77			mg.Kg^{-1} Soil
Available Potassium		159.81			97.22			
Soil separators		silt	clay	sand	silt	clay	sand	g. Kg^{-1} Soil
		556	100	344	470	150	350	
Soil texture		loam			loam			
Bulk density		1.30			1. 41			Mg.m^{-3}
Total bacteria		12.5×10^6			17.1×10^5			CFU. g^{-1} Soil
Total fungi		6.0×10^3			2.3×10^4			

Results and Discussion

Effect of alkaline phosphatase enzyme in plant parts

Shoot system

The results in Table (10) show the activity of the alkaline phosphatase enzyme in the vegetative growth of plant samples grown in the study soil. There is a difference in the values of the activity of the enzyme, the highest in the maize plant at the location of the Al-Budair (145.30) µg *P*-Nitro phenol. 0.1g^{-1} plant material. 1 hour^{-1}. The lowest value in the alfalfa plant at the Shinafiyah location (109.73) µg *P*-Nitro phenol. 0.1g^{-1} plant material. 1 hour^{-1}. These values were higher than those found in bush plants in all studied sites. This indicates the role of agricultural exploitation in the difference in enzymatic activity, which is in line with what Al-Taweel (2015) found. The results also showed a decrease in the enzymatic efficiency of the plant of the flora plant among different locations. The difference in enzymatic activity in this plant (although it is the same plant) may due to the different characteristics of the cultivated soil and its different in biological characteristics, Gianfreda and Bollag, (1996). The values of enzyme activity differed significantly at 5% significant level in all soil and location. In general, the efficiency of the enzyme in the cereal crops (wheat, corn and yellow maize) is higher than in the vegetable and leguminous plants, except for the cowpea that surpassed the wheat at the site and the yellow corn at Afak site. This is due to the high needs of leguminous plants for the phosphorus component, which encourages increased secretion of the enzyme. This is consistent with what Yadva and Tarafdar (2001) found.

Root system

The results in Table (11) show the activity of the alkaline phosphatase enzyme in the root system in the field and tuberous soil where the Jungle predominate in the different study sites. There are significant differences at the level of (5%) among plants of different locations. The highest value in the maize plant of Al-Badair site is (122.10) µg *P*-Nitro phenol. 0.1g^{-1} plant material. 1hour^{1}. The lowest values in the alfalfa plant of the Shinafiyah site (77.33) µg *P*-Nitro phenol. 0.1g^{-1} plant material. 1hour^{1}. These findings were consistent with what Juma and Tabatabai (1988) found in their study of the efficacy of alkaline phosphatase in the roots of soybeans and maize. It is consistent also with the table (10) of the total vegetative of these plants, which exceeded the grain crops on leguminous and vegetable plants, except for the cowpea, which exceeds the plant wheat. The highest values of flora plants were in the Diwaniyah center (40.70) µg *P*-Nitro phenol. 0.1g^{-1} plant material. 1hour^{1}. The lowest values were recorded in the site of the Daghara 17.33 The lowest values were recorded in the site of the piglet 17.33 micrograms P-nitro phenol. 0.1 g^{-1} plant material 1 hour^{-1}. This difference between the plants of the flora of different sites, although the same plant may be due to differences in the plant and the extent of development of any difference in the period of taking the plant sample. The plant may be at the beginning or end of growth. This affects the activity of the enzyme. Root secretions are also affected by soil interaction, nutrient availability, plant growth conditions and disease, Hetrenberger *et al*. (2002). This difference between the plants of the flora of different sites, although the same plant may be due to differences in the plant and the extent of development of any difference in the period of taking the plant sample. This affects the activity of the enzyme. Root secretions are also affected by soil interaction, nutrient availability, plant growth conditions and disease, Hetrenberger *et al*. 2002).

Shoot System

The results in Table (12) show the activity of L-asparaginase in the shooting part of the plants in the fields

and Jungle. Results showed that the highest values in the total vegetative of the fields of different sites were in the eggplant plant for Diwaniyah Center site (13.03) µg NH_4^+ - N. g^{-1} plant material. 2 $hours^{-1}$, and the lowest in the maize plant of the location of Afak (7.20) µg NH_4^+ - N. g^{-1} plant material. 2 $hours^{-1}$. The highest values were found in non-leguminous plants and the lowest in legume plants. This is in line with what I found in Al-Taweel (2001) study of the activity of the enzyme Amidez except for maize, which decreased its value in the sites of Hamzah East and Afak. This may be due to the influence of plants on the chemical properties of the soil, including high values of electrical conductivity (Table 6 and 8), which have affected the secretion of this enzyme. This confirms that the yellow maize plant at the Al-Budair site had a higher enzyme efficacy value than the leguminous plants and amounted to (11.93) µg NH_4^+ - N. g^{-1} plant material. 2 $hours^{-1}$, which was the value of electrical conductivity to be low (Table 9), which confirms the effect of soil properties in the secretion of the enzyme. The activity of the enzyme in the shoot part of the plants at the different study sites was highest in the Sunniyah site (7.20) µg NH_4^+ -N. g^{-1} plant material. 2 $hours^{-1}$ and the lowest in the location of the minnow (3.73) µg NH_4^+-N. g^{-1} plant material. 2 $hours^{-1}$. There were significant differences between the values of the activity of the total vegetative of the plant of the alliance for all different sites except the sites (Diwaniyah, Sunniyah, Shinafiyah, and Afak).

Root system

The results in Table (13) show the activity of L-asparaginase in the root part of field plants and Jungle of different sites. The results showed that enzymatic efficacy in non-leguminous plants was higher than in leguminous plants. This is consistent with Al-Taweel (2001) study of the efficacy of amidase enzyme as a hydrolysis enzyme and its efficacy is N-NH_4^+. The highest values in the eggplant plant for Diwaniyah center site were 11.00 µg NH_4^+ - N. g^{-1} plant material. 2 $hours^{-1}$.

The lowest values at the roots of the maize plant for Afak site were (4.83) µg NH_4^+-N. g^{-1} plant material. 2 $hours^{-1}$ and significant differences. It is noted that from the results that the low activity of the roots of yellow maize plant in the sites of Hamzah and Afak due to the high values of electrical conductivity, which affected the growth of the plant and thus the secretion of this enzyme. This confirms the high value of the enzymatic effect of the roots of yellow maize at the site of Al-Budair compared to cowpea, and confirms that the secretion of yellow maize of this enzyme is significantly affected compared to other plants in the secretion of this enzyme. This is consistent with the fact that the roots of the plant stimulate enzymatic activity by forming the conditions for enzymatic activity, as well as with Knauff *et al.* (2003). This is an increase in the number of microorganisms in the rheosphere region results in increasing enzyme activity. As for the plants of the flora, the values of enzyme activity were close. The results also showed no significant differences between the locations of Diwaniyah and Shamiya, Hamza, Afak and Budair. The results of Table (12 and 13) show that the activity of L-aspergens in the shoot and root of the plant of the flora and the low values of it in the field plants. This indicates that the enzyme activity depends on the need of the field plants or that there are other sources that give the product the enzymatic efficacy of the plants (Nitrogen). It is confirmed by the higher enzyme efficiency in the vegetative and root populations of the saline-affected eastern saline site (Table 6).

Table 10 : Effect of *P*-nitro phenol (µg *P*-Nitro phenol. $0.1g^{-1}$ plant material. $1hour^1$ In the shoot system of plants grown in the study soil.

Sample / Location	Plant type	Field	Plant type	Jungle
Center of Diwaniyah	Eggplant	111.50	Flora	62.33
Sunniya	Wheat	119.10	Flora	51.80
Shamiya	Cowpea	120.93	Flora	41.13
Shanafia	Alfalfa	109.73	Flora	26.70
West Hamza	Maze	130.40	Flora	33.20
Al-Daghara	Rice	123.03	Flora	20.43
Afak	Maze	114.03	Flora	27.63
Al Budair	Maze	145.30	Flora	24.83
L.S.D $_{0.05}$	Location	Plant	L*P intraction	
	1.53	0.94	2.65	

Table 11: Effect of *P*-nitro phenol (µg *P*-Nitro phenol. $0.1g^{-1}$ plant material. $1hour^1$ In the root system of plants grown in the study soil.

Sample / Location	Plant type	Field	Plant type	Jungle
Center of Diwaniyah	Eggplant	79.73	Flora	40.70
Sunniya	Wheat	84.70	Flora	35.83
Shamiya	Cowpea	95.83	Flora	30.70
Shanafia	Alfalfa	77.33	Flora	19.90
West Hamza	Maze	114.90	Flora	23.70
Al-Daghara	Rice	111.70	Flora	17.33
Afak	Maze	106.80	Flora	20.20
Al Budair	Maze	122.10	Flora	17.83
L.S.D $_{0.05}$	Location	Plant	L*P intraction	
	1.04	0.64	1.81	

The activity of L-asparaginase enzyme in plant parts

Table 12 : Aspergenase enzyme-L- activity (μg NH_4^+-N. g^{-1} plant material. 2 $hours^{-1}$) in the biomass of plants planted in the study soil.

Sample / Location	Plant type	Field	Plant type	Jungle
Center of Diwaniyah	Eggplant	13.03	Flora	7.00
Sunniya	Wheat	12.23	Flora	7.20
Shamiya	Cowpea	8.13	Flora	6.50
Shanafia	Alfalfa	10.20	Flora	5.30
West Hamza	Maze	8.63	Flora	5.63
Al-Daghara	Rice	11.60	Flora	3.73
Afak	Maze	7.20	Flora	5.30
Al Budair	Maze	11.93	Flora	4.33
L.S.D $_{0.05}$	Location	Plant	L*P intraction	
	0.30	0.18	**0.5**1	

Table 13 : Activity of Aspergenase enzyme (μg NH_4^+-N. g^{-1} plant material. 2 $hours^{-1}$) in the root part of plants.

Sample / Location	Plant type	Field	Plant type	Jungle
Center of Diwaniyah	Eggplant	11.00	Flora	4.33
Sunniya	Wheat	9.83	Flora	4.83
Shamiya	Cowpea	6.20	Flora	4.20
Shanafia	Alfalfa	8.43	Flora	3.73
West Hamza	Maze	5.60	Flora	4.00
Al-Daghara	Rice	8.80	Flora	3.20
Afak	Maze	4.83	Flora	3.43
Al Budair	Maze	6.93	Flora	3.63
L.S.D $_{0.05}$	Location	Plant	L*P intraction	
	0.21	0.13	0.37	

References

Al-Taweel, L.S. (2001). The activity of Amidase and its kinetic properties in some Iraqi soils. Master Thesis. Department of Soil - Faculty of Agriculture - University of Baghdad.

Al-Rashedi, R.K. Microbiology. Ministry of Higher Education and Scientific Research. Albasrah university.

Dalal, B.K. Understanding Enzymes. University of Mosul Press, University of Mosul.

Zubaidi, A.H. (1989). Soil theory and applied theory. Ministry of Higher Education and Scientific Research - University of Baghdad - House of Wisdom Press.

Banerjee, A.; Sanyal, S. and Sen, S. (2012). Soil phosphatase activity of agricultural land: A possible index of soil fertility. Agric Sci Res J., 2(7): 412-419.

Bansal, S.; Srivastava, A.; Mukherjee, G.; Pandey, R.; Verma, A.K.; Mishra, P. and Kandu, B. (2011). Hyperthermophillic asparaginase mutants with enhanced substrate affinity and antineoplastic activity: structural insights on their mechanism of action FASEB J., 26(3): 1161-71.

Black, C.A. (1965a). Methods of soil analysis. Part 1. Physical and Mineralogical Properties. Am. Soc. Agron. In : Publisher, Madison, Wisconsin, USA.

Black, C.A. (1965b). Methods of soil analysis, Part 2. Chemical and Microbiological Properties. Am. Soc. Agron. Inc. Publisher, Madison, Wisconsin, USA.

Boszke, L.; Sipeak, J. and Falandysz, J. (2003). Total MercuryContamination of Selected Organisms in Puck Basy, Baltic Sea, Poland, Polish J. of Environ.l Stud. 12, (3.,275). Burns RG, DeForest JL, Marxsen J, Sinsabaugh RL, Stromberger ME, et al. .2013. Soil enzymes in a changing environment: Current knowledge and future directions. Soil Biol Biochem 58: 216-234.

Castellano, S.D. and Dick, R.P. (1991). Cropping and sulfur fertilization influence on sulfur transformation in soil. Soil Sci Soc Am J 54: 114-121.

Dick, W.A. and Tabatabai, M.A. (1984). Kinetic parameters of phosphatases in soils and organic waste materials. Soil Science 137: 7-15.

Dinesh, R.; Suryanarayana, M.A.; Chaudhuri, S.G. and Sheeja, T.E. (2004). Long-term influence of leguminous cover crops on the biochemical properties of a sandy clay loam Fluventic Sulfaquent in a humid tropical regions of India. Soil Till Res 77: 69-77.

Drobni'K, J. (1956). Degradation of asparagine by the soil enzyme complex. Cesk. Mikrobiol, 11-47.

Eivazi, F. and Tabatabai, M.A. (1977). Phosphatases in soils. Soil Biol. Biochem. 9: 167-172.

El-Bessoumy, A.A.; Sarhan, M. and Mansour, J. (2004). Production, isolation, and purification of L-Asparaginase from Pseudomonas aeruginosa 50071 using solid-state fermentation. J Biochem Mol Biol.; 37: 387-393.

Eremenko, V.V.; Zhukov, A.V. and Nikolaev, A.Y. (1975). Asparaginase and glutaminase activity of Pseudomonas fluorescens during continuous culturing. Microbiology, 44: 550-555.

Fang, H.; Dong, B.; Yan, H.; Tang, F. and Wang, B. (2012). Effects of vegetation of transgenic Bt rice lines and their straw amendment on soil enzymes, respiration, functional diversity and community structure of soil

microorganisms under field conditions. J Environ Sci., 24(7): 1259-1270.

Frankenberger, W.T. and Tabatabai, M.A. (1991a). L-asparaginase activity of soils. Biol. Fert. Soils, 11: 6-12.

Gajda, A. and Martyniuk, S. (2005). Microbial biomass C and N and activity of enzymes in soil under winter wheat grown in different crop management systems.Pol J Environ Stud., 14: 159-163.

Gianfreda, L. and Bollag, J.M. (1996). Influence of natural and anthropogenic factors on enzyme activity in soil. In: Soil Biochemistry. (1stedn), Marcel Dekker Inc., New York, Basel, Hong Kong.

Gianfredam, L. and Ruggiero, P. (2006). Enzyme Activities in Soil. In: Nucleic Acids and Proteins in Soil. (1stedn), Springer-Verlag, Berlin, Heidelberg, Germany.

Gupta, V.V.S.R.; Farrell, R.E. and Germida, J.J. (1993). Activity of arylsulphatases in saskatchewan soils. Can. J. Soil Sci., 73: 341-347.

Hamido, S.A. and Kpomblekou, A.K. (2009). Cover crop and tillage effects on soil enzyme activities following tomato. Soil Till Res (105) 269-274. Stockdale E.A., Watson. C.A. 2009 Biological indicators of soil quality in organic farming systems Renew Agric food Syst. (24): 308-318. 237-240.

Hertenberger, G.; Zampach, P.; Bachmann, G. (2002). Plant species affect the concentration of free sugars and free amino acids in different types of soils. Journal of plant nutrition and soil science 165: 557–565.

Juma, N.G. and Tabatabai, M.A. (1988). Hydrolysis of organic phosphates by corn and soybean roots. Plant Soil. 107: 31-83.

Klose, S.; Moore, J.M. and Tabatabai, M.A. (1999). Arylsulfatase activity of microbial biomass in soils as affected by cropping systems. Biol Fertil Soils, 29: 46-54.

Knauff, U.; Schulz, M. and Scherer, H.W. (2003). Arylsulfatase activity in the rhizosphere and roots of different crop species. Eur J Agron., 19: 215-223.

Laxman, R.M.S.R. and Raman, S. (1999). Effect of moisture and heavy metals on the activity of L-asparaginase in alfisols and vertisols. Journal of the Indian society of soil science. 47: 58-62.

Miller, M.; Rao, J.K.M.; Wlodawer, A. and Gribskov, M.R. (1993). A left-handed crossover involved in amidohydrolase catalysis. Crystal structure of Erwinia chrysanthemi L-asparaginase with bound L-aspartate. Federation of European Biochemical Societies, 328: 275-279.

Nannipieri, P.; Giagnoni, L.; Landi, L. and Renella, G. (2011). Role of phosphatase enzymes in soil. In: Phosphorus in action, Springer-Verlag, Berlin Heidelberg.

Page, A.L.; Miller, R.H. and Kenney, D.R. (1982). Methods of soil analysis. Part 2. Chemical and Microbiological Properties 2nd ed. Am.Soc. Madison, Wisconsin, USA.

Pantelitsa, K.; Niko, M.; George, P.S. and Efimia, P. (2012). The response of properties of soil cropped with shell beans and treated with disinfectant and fertilizer during the plant growing season Biology and Fertility of Soils pages1-9.

Papanicolaou, E.P. (1976). Determination of cation exchange capacity of Calcareous soils and their percent base saturation. Soil Sci., 121: 65-71.

Petersen, C.E. and Barbara, J.A. (2005). Investigation in the Biology 1151 Laboratory. Champaign, IL: Stipes L.L.C. Print.

Prema, P.; Devi, M.N. and Alagumanikumaran, N. (2013). Production of tumor inhibitory L-asparaginase by wild and mutant strains of Pseudomonas fluorescens. International Journal of Advanced Research, 1(4): 163-171.

Rahman, M.H.; Okuba, A.; Sugiyama, S. and Mayland, H.F. (2008). Physical, chemical and microbiological properties of an Andisol as related to land use and tillage practice. Soil Till Res 101: 10-19.

Reece, J.B.; Lisa, A.; Urry, M.L.; Cain, S.A.W.; Peter, V.M. and Robert, B.J. (2011). Campbell Biology. 9th ed. Boston: Benjamin Cummings/ Pearson Education, Print.

Renella, G.; Egamberdiyeva, D.; Landi, L.; Mench, M. and Nannipieri, P. (2006). Microbial activity and hydrolase activities during decomposition of root exudates released by an artificial root surface in Cd-contaminated soils. Soil Biol Biochem, 38: 702–708.

Sanaa, T.; El-sayed, A.A.F. and Amira, M.G. (2012). EldeeImmobilization, properties and antitumor activity of L-asparaginase of Viciafaba and Phaseoulus vulgaris seeds Aus J of Basics and Applied Sciences, 6(3): 785-794.

Speir, T.W. and Ross, D.J. (1978). Soil phosphates and sulphatase. 197-250. In R.G. Buns (ed). Soil enzymes . Academic Press, New York .

Tarafdar, J.C. and Chhonkar, P.K. (1978). Status of phosphatases in the root-soil interface of leguminous and non-leguminous crops. Z Pflanzenernähr Bodenkd, 141: 347-351.

Ting, W.; Peng, Z.; Ke, W.; Ding, R.; Baoping, Y.; Junfeng, N.; Zhikuan, J. and Qingfang, H. (2015). Effects of wheat straw incorporation on the availability of soil nutrients and enzyme activities in semiarid areas Plos. Org., 1-11.

Ulrich, S.; Tischer, S.; Hofmann, B. and Christen, O. (2010). Biological soil properties in a long-term tillage trial in Germany. J Plant Nutr Soil Sci., 173: 483-489.

Vandana, J.L.; Rao, P.C. and Padmaja, G. (2012). Effect of crop cover on soil enzyme activity. The journal of research ANGRAU. 40(4): 1-5.

Verma, N.; Kumar, K.; Kaur, G. and Anand, S. (2007). L-Asparaginase: A promising chemotherapeutic agent.Crit Rev Biotechol., 27: 45-62.

Yadav, R.S. and Tarafdar, J.C. (2001). Influence of organic and inorganic phosphorous supply on the maximum secretion of acid phosphatise by plants. Biol Fertil Soils 34: 140.