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Effect of Fertilizer Type and Growth Periods in Nitrate Concenteration (Oxidation, Reduction and Rhizosphere) Layers in Rice Plant

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Abstract
In order to study the effect of DAP fertilizer on Nitrate ion concentration during the different growth periods of the rice plant, the experiment was carried out in one of the rice fields located in Ghamas district / Diwaniyah governorate in the summer season of the year 2019 using the complete randomisation design (CRBD). The experiment included the use of DAP fertilizer (mineral DAP, organic DAP and high potash DAP). The seeds of the Jasmine variety were planted on 6/10/2019 and the 33 Anber variety on 6/15/2019 to study the effect of the type of fertilizer and the growth periods in the form of the Nitrate ion in the rhizosphere of the rice plant during the growth periods of the plant (45,75,105) days from planting. The results showed that the highest concentration of Nitrates for Anber rice 33 was achieved when organic DAP fertilizer (25.43) mg kg^{-1} in the oxidation layer during the period of time (75) days from planting, but during the two periods (45,105) days from planting, its concentration reached (24.00 and 22.70) mg kg^{-1}, respectively, which indicates that the place of production of nitrates is this layer and its spread from it to the rest of the layers. Its concentration decreased in the rhizosphere during the periods of time (45,75,105) days from planting. As for Jasmine rice, the highest concentration of Nitrates was achieved when organic DAP fertilizer was (25.03) mg kg^{-1}in the oxidation layer during the period (105) days from planting, and during the two periods (45,75) days from planting, its concentration reached (20.93,22.63) mg kg^{-1} in relay. Its concentration decreased in the treatment of high-potash DAP (6.53,7.20,10.03) mg kg^{-1} in the rhizosphere during the growth periods and it was the lowest in Nitrate processing compared to the rest of the types of DAP. The results also showed that the absorption of the Anber plant (its high concentrations) was less than the jasmine plant (its low concentrations) at the two periods (45,75) days from planting, then the opposite happened at the period (105) days of planting, and this is due to the different Nutritional requirements of the two plants.
Keywords: Fertilizer type, growth periods, nitrate, oxidation, reduction, rhizosphere, rice plant

Introduction

Rice *Oryza sativa L.* The genus of the Veeel family Poaceae (formerly known as Gramineae), an herbaceous plant around which it grows to a height of 0.5-2 m and

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exceeds in wild species, its leaves are long and flat and are carried on hollow hollow stems, often The total is wide and diffuse fibrous radical, the panicle or inflorescence (Flower clusters) is made up of spikelets that carry flowers that produce grains, and rice varieties vary greatly in the length, shape and weight of the dales. Total plant productivity (Mwingi,2011).

The damp is an effective fertilizer as it is a source of nitrogen and phosphorus to feed the plant and high soluble in water to release the phosphorus and amonium (IPNI, 2014). P and N are essential nutrients that the plant needs in large numbers for its important roles in the construction of proteins, nucleic acids, various membranes and energy (Krikby and Mengel,1982). The quantities needed by each crop of nutrients depending on the type of soil or medium in which the plant grows, the type, type, production capacity and capacity of each crop(Havlin and others, 2005) .

Resisphere is the soil area affected by root secretions and microscopic soil biology. Soils that are not part of the reissophores are known as non-Rhisphere soil or Bulk Soil. In this region, protozoa and nematodes abound on bacteria, so most nutrients and plant cycles inhibit and inhibit iets occur in the area adjacent to the roots (Giri et al., 2005) .Nitrogen is exposed in the form of nitrates resulting from added nitrogen fertilizers, or from the process of converting ammonium into nitrates in the soil to continuous washing processes that move away from the root areas of the plant, as nitrates are the most washable image of not being caught by colloidal separates in the soil, because they dislau with clay surfaces and return them to the soil solution away from the gronomy surface and thus be easy to move when heavy rains and irrigation water (Frye) are available. , (2005) .Between Nelson and Huber,(2001) The process of washing Nitrates from important processes in which nitrogen is lost from added manure and increases in coarse-tissue soils, the high susceptibility of nitrate ion to movement through the soil is beneficial in obtaining a rapid spread of nitrates through the soil, so plant roots will consume less energy to develop roots to obtain a need for the nitrogen crop. , while the disadvantages of the speed of movement of nitrates are their movement with soil moisture away from the root area of the plant. Gehl et al., (2005) found that the rate of nitrogen lost by nitrate washing was between 146-74 kgN.e 1 when three levels of nitrogen fertilizers (185, 250 and 300) kgN.e1 were used in sandy soils when irrigation was higher than the evaporation rate of the plant's latent erosion. Atiyah (2005) found that nitrate movement reached a depth (90-60) cm despite the addition of irrigation water to a depth of 40 cm in the advanced stages of plant growth. Hadithi (1983) also found an increase in nitrate concentration NO_3^- and a decrease in $CaCO_3$ concentration of the addition of Ammonium-containing nitrogen fertilizer to the soil.

Based on the research objective to study the effect of the types of DAP fertilizer (mineral, organic and high potash) in the concentration of Nitrate ion in the rhizosphere of rice plant class (Anber 33 and Jasmine) during the various growth periods (45,75,105) days of agriculture.

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Materials and methods

The experiment was carried out in one of the rice fields located in The Ghamas district/ Diwaniyah governorate during the summer season of the year 2019. The field soil was ploughed, softened, settled and divided into experimental units, the experimental unit area (2.25x2.25 m), the distance between the experimental unit and the other (1m), the work of sub-irrigation channels and the connection to a major irrigation channel, and a pre-planting sample for the purpose of conducting and estimating some of the physical and chemical properties of the soil in the ways in Jackson (1958), Black (1965), Page et al (1982) and shown in Table (1). The experiment was designed in accordance with the complete randomized Block Design (C.R.B.D) using four experimental transactions (control treatmente, metal DAP treatment, organic DAP and high potash DAP treatment) and three repeats per transaction, and randomly distributed transactions to experimental units to the number of units (12) experimental units for each type of rice plant (Anber 33 and Jasmine) i.e. the total units (24) units .In 2019/6/10, dry rice seeds (Jasmine variety) were planted and on 2019/6/15 dry rice seeds (Anber class 33) obtained from the rice research station in al-Mashkhab district/ Najaf governorate, and by 120 kg h^{-1} seeds in the manner of direct scattering directly on the pre-prepared ground and then covered with soil. The field was irrigated with the first (prolific) and then left to dry for 3-4 days and then again irrigated the wild germination and then the irrigation process continued every 3 days until the plants reached the appropriate height, the fertilizer of the DAP was added at 120 kg h^{-1} for each treatment of rice trays (Anber 33 and Jasmine) and the addition was in two batches (35 days of agriculture and 30 days from the date of the first batch). 2019. After 3-4 days of grafting, the field was dried for 3 days .The irrigation process then continued until the flowering phase began on 21 September 2019, and the bush was manually combated by weeding whenever needed. Nitrates were estimated for oxidants, shorthand and resizophonics during periods of plant growth after (45, 75 and 105) days of cultivation. The Nitrate ion was reduced using The Devarda Plumber and then the Macrocendal device according to the Bremner method (1965) described in Black,(1965). The results analysed statistical lycee analysis system-SAS (2012) in data analysis by CRBD to study the impact of DAP fertilizers and compared the moral differences between averages by testing the less significant difference (LSD) and at a moral level of 0.05.

Table (1). Some chemical and physical properties of field soil before planting

properties	quantity	measruing unit
Soil pH reaction	7.53	——
ECe electrical conductivity	4.98	$ds.m^{-1}$
Cation exchange capacity	28.34	Cmol. Kg^{-1}
Carbonate minerals	328.7	$g.kg^{-1}$
Organic matter	6.9	$g.kg^{-1}$

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Nitrogen		23.0	$mg.Kg^{-1}$
Phosphorous		3.24	$mg.Kg^{-1}$
Potassium		93.0	$mg.Kg^{-1}$
Dissolved Calcium Ca^{+2}		30.0	$mmol.L^{-1}$
Dissolved Magnesium Mg^{+2}		13.5	$mmol.L^{-1}$
Dissolved Sodium Na^{+1}		8.25	$mmol.L^{-1}$
Dissolved Bicarbonate HCO_3		2.5	$mmol.L^{-1}$
Dissolved Carbonate CO_3^{-2}		Nil	---
Dissolved Potassium K.		4.25	$mmol.L^{-1}$
Bulck density		1.68	$Mg.m^{-3}$
Soil Fractions	sand	308	$g.kg^{-1}$
	Silt	388	$g.kg^{-1}$
	Clay	304	$g.kg^{-1}$
Soil texture		CL	

Results and discussion

Nitrate ion concentration in Anber rice:

Table (2) shows the concentration of Nitrate ion in the oxidation layer, The results showed that the highest values were in the treatment of organic DAP in the oxidizing layer and amounted to (22.70) mg kg^{-1} the lowest in the treatment of control in the rhizosphere layer and reached (9.73) mg kg^{-1} and with moral differences in the oxidizing layer, the highest values in the treatment of organic DAP and non-moral in the treatment of mineral dampand potash in the reduction layer as well as in the reduction layer. 5% morale Between transactions and the treatment of control and between them also and that this may be due to the availability of nitrate-producing organisms in the oxidized layer, as the region of risesphere and depression are not suitable for production (taget) on the one hand and because there is a pull on it by the roots of plants and neighborhoods around them on the other hand and the absence of differences between the fertilizer of the mineral DAP and high potash in these areas indicates the lack of processing of them in these circumstances and the existence of balance and transmission between them or washing of nitrates around them on the other hand. It is held by soil colloids and minerals while the organic DAP was the stable processor of this ion under these conditions. He took the highest preparation for nitrate ion according to the DAPy fertilizer as follows :

Organic DAP > Metallic DAP > High potash DAP

While the highest layer of nitrates was present ,

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Oxidation layer > Reduction layer > Rhizosphere layer

We also find from the results the superiority of the oxidation layer with the concentration of Nitrate ion compared to the two layers of reduction and rhizosphere in all treatments. This is consistent with what he found (Al-Tamimi, 1999).

Table (2) Nitrate ion concentration (mg $kg^{-1)}$ for Anber rice soil after 45 days of planting.

list	Sampling	Sampling area		
		Oxidizer	Rhizosphere	Reduction
1	**Control**	16.40	9.73	11.70
2	**Organic DAP**	22.70	19.20	20.33
3	**Metallic DAP**	20.53	9.93	10.63
4	**High Potash DAP**	20.50	9.83	10.40
	LSD 0.05	**1.0928**	**0.5126**	**0.6783**

Table (3) shows the concentration of Nitrate ion in the oxidation, reduction and rhizosphere layer after 75 days of cultivation in the Anber rice soil. The results showed that the highest values were in the organic DAP treatment in the oxidation layer and reached 25.43 mg kg^{-1} and the lowest was in the control treatment in the rhizosphere, reaching 5 70 mg kg^{-1} with significant differences in the three layers, except for the two treatments of metallic DAP and high potash in the reduction layer, where it was not significant at a 5% significant level between the treatments and the control treatment and between them as well, and that this may be due to the spread and speed of movement of the Nitrate ion because it is a negative ion which It reduces its hold on colloid surfaces, and the amount was higher than the ammonium ion in all the periods studied for the occurrence of oxidation of the Ammonium ion by the nitrification process (Al-Jayashi, 2020), Jarallah and Fatimah, (2020b). From the process of transforming ammonium into nitrate in the soil to continuous washing processes in which it is removed from the roots of the plant (Frye, 2005). We also find from the results that the oxidation layer is superior to the concentration of nitrate ion compared to the two layers of reduction and rhizosphere. T in all transactions.

Table (3) Nitrate ion concentration (mg kg^{-1}) for Anber rice soil after 75 days of planting.

list	Sampling	Sampling area		
		Oxidizer	Rhizosphere	Reduction
1	**Control**	13.93	5.70	7.73
2	**Organic DAP**	25.43	20.33	21.80
3	**Metallic DAP**	19.10	7.13	7.43
4	**High Potash DAP**	17.60	7.03	7.23

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	LSD 0.05	**0.7048**	**0.6344**	**0.6131**

Table (4) shows the concentration of Nitrate ion in the oxidation, reduction and rhizosphere layer after (105) days of cultivation in the soil of Anber rice. The results showed that the highest values were in the treatment of organic DAP in the oxidation layer and reached 24.00 mg kg^{-1} and the lowest in the control treatment in the rhizosphere, reaching 5.60 mg kg^{-1} with significant differences in the three layers, except for the two treatments of mineral DAP and high potash in the reduction layer, where it was insignificant at a significant level of 5% between the treatments and the control treatment and between them as well, and that this may be due to the importance of organic fertilization with DAP fertilizer and dispensing with the amount of Of nitrogenous fertilizers to preserve the environment and human health by improving the agricultural product as well as reducing production costs. Vessey (2003). We also find from the results the superiority of the oxidation layer with the concentration of the Nitrate ion compared to the reduction layer and the rhizosphere in all treatments, and we note from the results the superiority of organic DAP in all time periods and among other types of DAP fertilizers, and it took the following order in terms of the nitrate ion

Organic DAP > Metallic DAP > High potash DAP

Table (4) Nitrate ion concentration (mg kg-1) for Anber rice soil after 105 days of planting.

list	**Sampling**	**Sampling area**		
		Oxidizer	**Rhizosphere**	**Reduction**
1	**Control**	12.03	5.60	7.70
2	**Organic DAP**	24.00	19.43	21.30
3	**Metallic DAP**	18.93	7.03	7.40
4	**High Potash DAP**	16.70	6.60	6.93
	LSD 0.05	**0.4092**	**0.4212**	**1.0958**

And based on the results in tables (2, 4,3) and Fig. (1) the superiority of organic DAP in Nitrate concentration in Anber rice with measurement periods (45,75,105) days of cultivation in soil oxidation, rhizosphere and reduction, and for all treatments, where the highest height was during The period is (75) days from planting in the treatment of organic DAP in the oxidation layer. We note from the results an increase in the concentration of Nitrates during the periods (75 and 105) days of planting, which indicates a decrease in its absorption in these two periods by the plant on the one hand and an increase in its processing of organic bear as a result of its continued decomposition by microorganisms on the other hand (Abu Haila, 2019; Al-Taweel And Abu Haila, 2020), which is confirmed by the decrease in its concentration during these two periods in the treatment of metal DAP and high potash.

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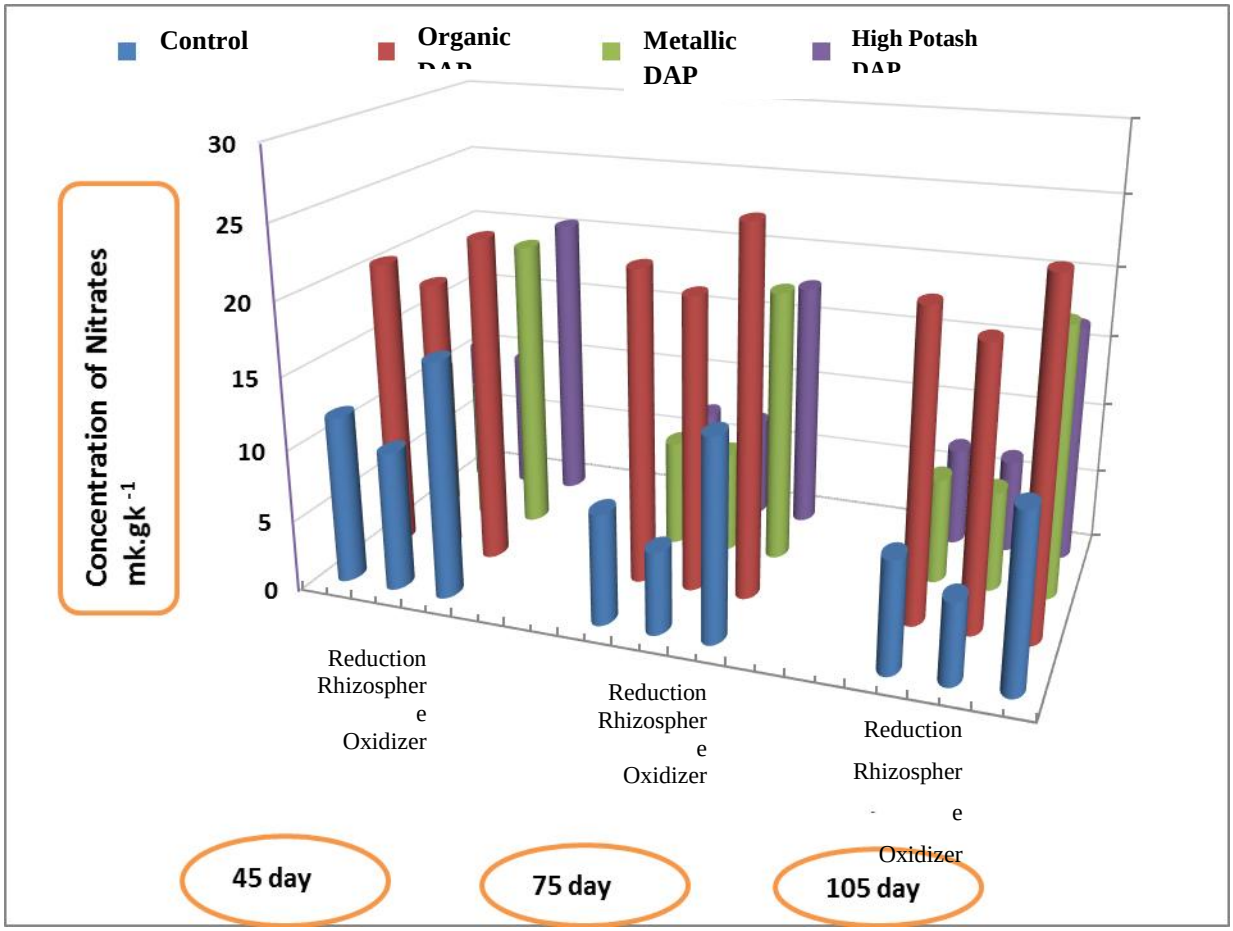

Figure (1) Nitrate ion concentration during Anber rice growth periods.

Nitrate ion concentration in Jasmine rice:

Table (5) shows the concentration of Nitrate ion in the oxidation layer, The results showed that the highest values were in the treatment of organic DAP in the oxidizing layer and amounted to 22.63 mg kg^{-1} the lowest in the treatment of high potash DAP in the rhizosphere and amounted to 7.20 mg kg^{-1} and with moral differences in the three layers except my 5% moral level between transactions and control and among them, and that this may be due to the availability of producing conditions for the contamination in the layer. Oxidation, which provides the right conditions for its production Abu Hila, (2019) long and waiting,(2020), Jarallah and Fatimah,(2020b). As well as the absorption of nitrates by the roots of plants and self-nourishing microbiology under the conditions of dissonance in the regions of rhizosphere and reduction (Tamimi, 1999). As a result, the concentration of nitrates in these two layers is lower than in the oxidation layer, and this situation has been repeated in all fertilizer transactions .

Table (5) Nitrate ion concentration (mg kg^{-1}) for Jasmine rice soil after 45 days of planting.

list	Sampling	Sampling area		
		Oxidizer	Rhizosphere	Reduction
1	Control	14.40	10.33	10.73

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2	**Organic DAP**	22.63	12.80	13.30
3	**Metallic DAP**	16.40	8.63	9.10
4	**High Potash DAP**	15.63	7.20	7.40
	LSD 0.05	**0.296**	**0.4553**	**0.65**

Table (6) shows the concentration of Nitrate ion in the oxidation, reduction and rhizosphere layer after (75) days of cultivation in Jasmine rice soil. The results showed that the highest values were in the treatment of organic DAP in the oxidation layer and reached 20.93 mg kg^{-1} and the lowest was in the treatment of high-potash DAP in a layer. The rhizosphere reached 6.53 $mgkg^{-1}$ with significant differences in the three layers, except for the two treatments of mineral DAP and high potash in the rhizosphere and reduction classes, where the differences were not significant at the level of 5% significance between the treatments and the control treatment and between them as well, and that may be due to increased plant absorption in these Duration, balance and transfer of Nitrates between the two layers of reduction and rhizosphere in addition to the decrease in Nitrate preparation with the increase in growth periods of mineral and high potash compost of DAP compared to organic DAP, and the oxidation layer was superior to the concentration of Nitrate ion in all layers and all sources of DAP. This indicates an increase in its absorption during the flowering period.

Table (6) Nitrate ion concentration (mg kg^{-1}) for Jasmine rice soil after 75 days of planting.

list	**Sampling**	**Sampling area**		
		Oxidizer	**Rhizosphere**	**Reduction**
1	**Control**	10.63	7.20	7.50
2	**Organic DAP**	20.93	15.90	16.3
3	**Metallic DAP**	17.33	7.30	7.50
4	**High Potash DAP**	15.33	6.53	6.80
	LSD 0.05	**1.1183**	**0.5853**	**0.8298**

Table (7) shows the concentration of Nitrate ion in the oxidation layer, The results showed that the highest values were in the treatment of organic DAP in the oxidizing layer and amounted to 25.03 mg kg^{-1} the lowest in the treatment of control in the rhizosphere layer and reached 6.40 $mgkg^{-1}$ and with moral differences in all classes at a moral level 5% between transactions and control and among them also, this may be due to this increase in the concentration of nitrates in this period to the absorption of By the plant for this ion according to its needs on the one hand in addition to its lack of absorption in the maturity period on the other .

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Table (7) Nitrate ion concentration (mg kg^{-1}) for Jasmine rice soil after 105 days of planting.

list	Sampling	Sampling area		
		Oxidizer	Rhizosphere	Reduction
1	**Control**	13.03	6.40	8.00
2	**Organic DAP**	25.03	21.40	22.93
3	**Metallic DAP**	20.20	11.03	11.70
4	**High Potash DAP**	19.83	10.03	10.33
	LSD 0.05	**0.486**	**0.3176**	**0.0666**

Based on the results contained in tables (5, 6,7) and Fig. (2), we find that the Nitrate concentration of Jasmine rice increased during the 105 days of cultivation in the treatment of organic DAP for all layers. The highest absorption of Nitrates during the (75)day period of cultivation, which led to a decrease in its concentration.

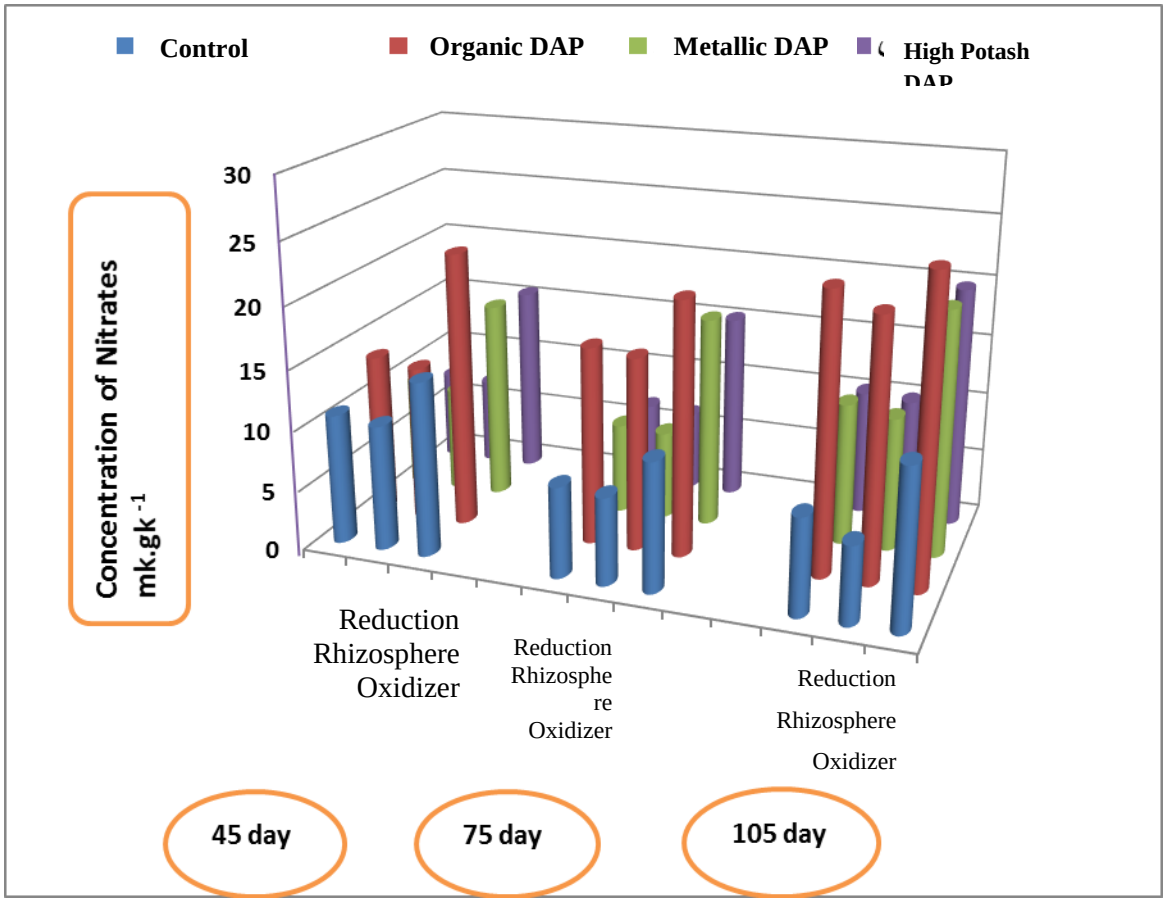

Figure (2) Nitrate ion concentration during Jasmine rice growth periods.

We can notice from Figures (1 and 2) the high Nitrate concentration in both periods (45 and 75) days and its decrease in the period (105) days in Anber rice than in Jasmine rice, and this indicates a decrease in absorption in the first two periods and its increase in the last period (105) days. Specific growth on the other hand.

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