SOME RESULTS OF STUDY DYNAMICS CONCETRATION OF FOSFAT JONIC AFTER MINERAL FERTILIZATION OF FISH-POND WITH THREE- CALCIK PHOSPHAT $Ca_3(PO_4)_2$

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Astract

Certain chemical substances are used for mineral fertilization of rearing reservoirs Ammonium nitrite, urea and sodium nitrate are used as source of nitrogen. The monocalcic phosphate is used as phosphorus source. For this purpose we can use lime (calcium oxide). In some rearing systems potassium compounds are used to enlarge its concentration in water. Intervals of distribution for inorganic fertilizers in water ponds are dependent on the velocity of their active substance exhausting and on their period of application. During the periods of bloom of phytoplankton, this velocity is higher and so the intervals of distribution are more frequent. In periods when we have a drop in feeding rates (e.g. in low temperatures of water), the fertilizing must be interrupted. Using chemicals as water fertilizers must very often be accompanied with organic fertilizers. The fertilizer detritus contains a great amount of microorganisms, which produce carbon dioxide during their life activity. This compound (CO_2) is indispensable for biosynthesis activity of saprophyte algae.

Key words*:* fertilization, algae, intensification, phosphates, phytoplankton, zooplankton

INTRODUCTION

The necessity of enriching water basins with phosphorus stems from the fact that its contents in natural waters are relatively low. According to the Stangenberg, M data., the total amount of phosphorus that is contained in water basins is very low if compared with its amount that is to be found in the make-up of water animals and plants as well as in the sediments the watersheds. Only in the body of fish caught in a 1 hectare of pond at a depth of one meter m, when production is at 10 kv / ha the amount of is phosphorus is 4 to 7 times much bigger.

The experience of rearing/cultivation in semi-intensive systems shows that the use of organic and mineral fertilizers, with the view to increasing the concentration of dissolved mineral phosphorus meets this goal very well only but for short intervals only. Knud-Hansen CF, (1993,1996,1998) notes that the reduction of phosphorus concentration for several days after the use of phosphoric mineral fertilizer is not caused so much by its consumption by the otherwise self-feeding species. A large part of phosphorus dissolved in water is removed by being transformed in the indigestible form, as this is "associated" with the composition of iron and aluminum to be found in the bottom deposits

The so far mentioned fact has served us as a motive for studying phosphorus concentration dynamics in the course of the experimentation of the artificial addition to its content in the water of fish rearing ponds to increase after the application of fertilization by super-phosphate.

MATERIAL AND METHODOLOGY

The tests were administered in two fish ponds at the Experimental Center for Cultivation of Fish pertaining to the carp family - Tapizë, (Fushe Kruje), during the breeding period of 2004-2005. The experimented concentrations of $PO4^{3-}$ stood at 1 mg / l and 0.5 mg / l. The analysis were performed at regular 24-hour periods.

To determine the amount of chemicals which is to be thrown into the water basins, in order to gain the required concentration to experimental ion, the calculations were done by applying the formula:

$$A = \frac{(K - k) \times 100}{P} \quad mg/l$$

A: the amount of fertilizing chemical to be distributed in order to gain the experimented phosphate concentration
K: The experimental concentration of phosphate ions
K: the existing concentration of phosphate ions in water basins
P: content (in %) of active matter in the composition of chemical fertilizers.

RESULTS AND DISCUSSION

1. Some hydro-chemical indicators of trial-out ponds

In Table No. 1 we present the results arrived at by way of analysis for some chemical indicators of water and land ponds, which have a direct influence on the dynamics of phosphorus in water and in the soil and thus they do affect the distribution timelines of super-phosphate

Table No. 1. Fundamental hydro-chemical indicators of trial ponds

No of ponds	pH water	HPO_4^{2}- water(mg/l)	HPO_4^{2}- land/soil (mg/1kg)	Fe (tot.) land (mg/1kg)	Al (tot.) land (mg/1kg)
P. 1	6.6-7.3	0.022-0.030	0.60-1.12	1.28-1.76	3.22-6.36
P. 2	6.3-7.2	0.026-0.032	0.43-0.94	1.34-1.79	4.10-5.68

Note: The data on the content of Fe and Al have been obtained from analysis carried out by Prof. Cara K. Soil Research Institute, Tirana (2005).

From an analysis of the data it is proven that the differences in values of hydro-chemical indicators between the two testing basins/ponds of evidence are very small. In this way, a necessary methodological requirement is being satisfied and to be more specific the establishment of two variants of the experiment under the same conditions. The presence of pH values from being neutral to basic facilitates the bringing to the fore of the action of the chemical fertilizer on the photo-*syntactical hydrobyonte.*

2. Determination of consumption speed of Ionian phosphate ($PO4^{3-}$)

For both concentrations being experimented we conducted two successive fertilizations. Results of the study were these:

♦ average daily consumption (mg / l) of phosphorus in two basins of the evidence was:

Days	0 – 4	5 – 9	10 – 16
Pond No.1 (dosage 1 mg $PO4^{3-}$/l)	0.1175	0.0600	0.0185
Pond No2 (dosage 0.5 mg $PO4^{3-}$/l)	0.0585	0.0302	0.0124

♦ Following closely the Ionian phosphate consumption (see graphs No.1 and No.2) the concentration of this ion at the level found prior to fertilization could be reached in these timelines:

No.1 basin 16 to 17 days
No. 2 basin 11 to 12 days

♦ The strongest decline of phosphorus concentration dissolved in water, in both versions of the experiment, were observed into the first eight days right after fertilization. In some test performed with the use of radioactive phosphorus (G. Vinberg, 1965) it has been shown that more intensive consumption of phosphorus in mineral form, after fertilization of ponds with super-phosphate, is found in the first week after the distribution of fertilizers. The researchers note that the biggest part of the phosphorus removed from the water is associated with land.

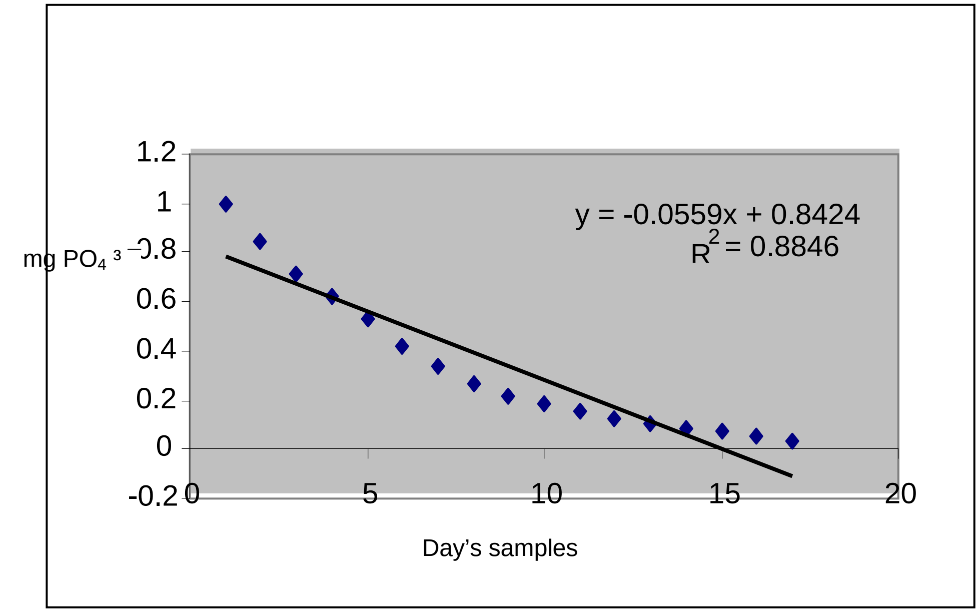

Figure No. 1. The dynamics Decrease of phosphate ion concentration, after fertilization of the water pond with super-phosphate, in version with 1 mg / l PO_4^{3-} (fertilization First) (r = 0.94).

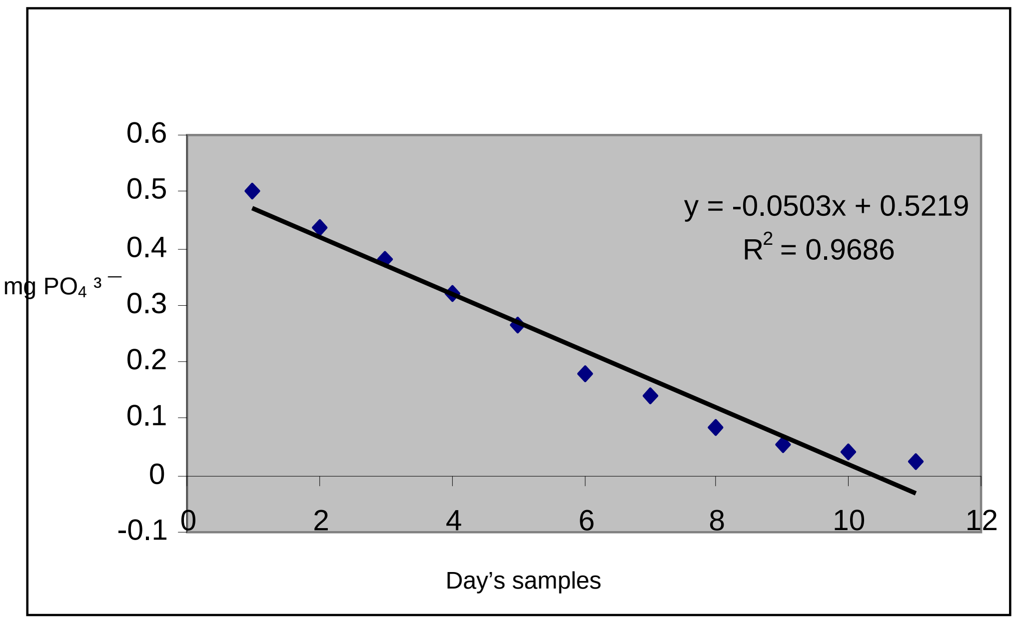

Figure No 2. Dynamics of decrease of phosphate ion concentration, after fertilization of the water basin with super Phosphate, in the version with the 0.5 mg / l PO_4^{3-} (fertilization first) (r = 0.98)

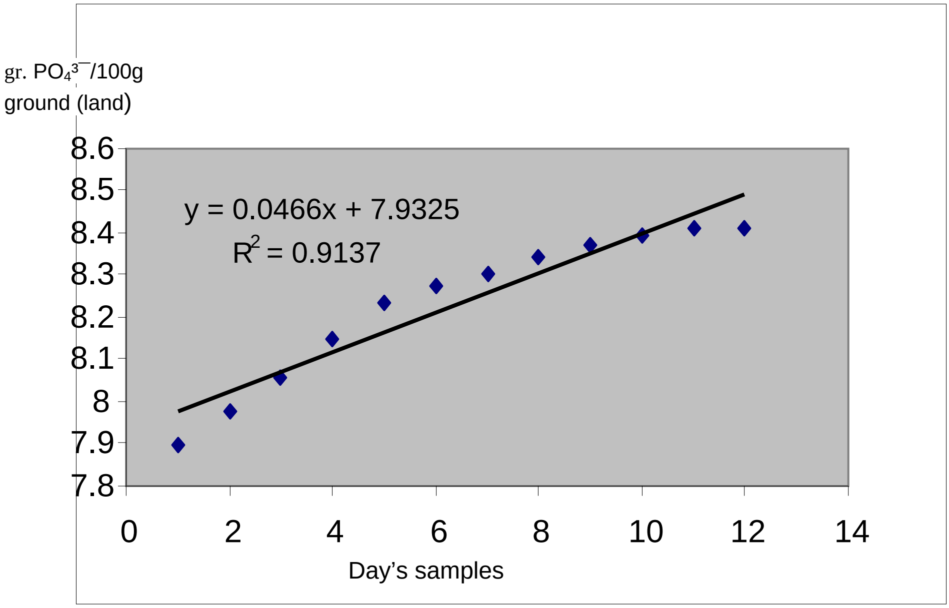

Figure No. 3. Increasing the phosphorus content in recent sediments in the basin of the first eleven days after fertilization with super-phosphate, the version with $PO_4{}^{3-}$ 1mg / l (fertilization First) (r = 0.95).

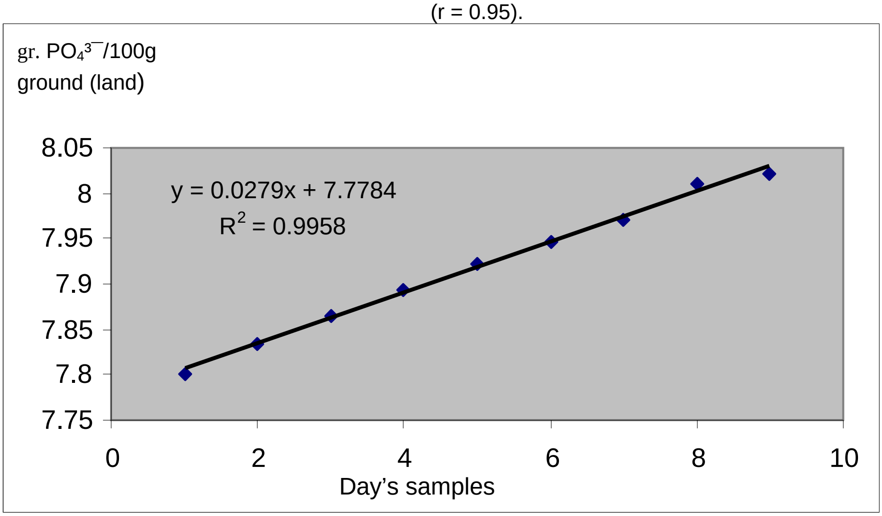

Figure No. 4. Increasing the phosphorus content in recent sediments in the basin first week after fertilization with super-phosphate, the version with $PO_4{}^{3-}$ 0.5mg / l (fertilization First) (r = 0.99)

In order to be able to judge the degree of linkage of phosphorus mineral with the recent deposits, immediately after the super-phosphate distribution in the two versions of the experiment, we have analyzed the phosphate content in recent sediments for eleven consecutive days.

The dynamics of the increase of phosphorus content in soil is shown in the graphic No. 3 and No. 4.

From the analysis carried out and by tracking the dynamics of "connectivity" of dissolved phosphorus with the soil *colloids* can draw these comments:

♦ In the variant of fertilization with concentration fixed at 1 mg $PO4^{3-}$ / l eleven days after scattering of super-phosphate the content of phosphorus in the soil is increased from 7900 g/100 g in the soil to 8.4142 g/100 in the soil. So the loss of phosphorus from water due to the shifting into insoluble state for this variant was at 0.5142 mg / l or at 51.42% of the content as provided for by mineral fertilization. Acknowledging that the rest of the phosphorus that was supplied by the fertilizer has been made use of by *photosynthetic* organisms, the active daily consumption of phosphorus has been at around 0.0304 mg / l. Eleven days after fertilization the "connection" of phosphorus with the deposits of soil has been insignificant.

♦ In the second variant of the experiment the passage of dissolved phosphorus into an insoluble state has experienced significant intensity in the first 6-7 days after fertilization. The content of phosphorus in the soil in this time interval has increased from 7800 g/100 g (soil) to 8.0215 g/100 g soil. The amount of phosphorus that is related to recent deposits was at 0.2215 mg / l or 44.3% of the total amount of phosphorus scattered in water to secure the concentration at $PO4^{3-}$ 0.5 mg / l. The daily active consumption of phosphorus from algae and macrophytes of water, in this variant of the experiment was at about 0024 mg / l.

♦ It is noted that there exists a limit of the content of dissolved phosphorus in the water when the intensity of "swallowing" from the recent colloids of the water basin is almost equal to zero. Since the connection of mineral soluble composition of phosphorus from recent sediments of watershed is conditioned by complex chemical processes, from the physical interactions of absorption and from the biological fixing of phosphorus from several species of land, it is difficult to render an explanation with regard to the above observation as to the detailed analysis of influential factors.

Thus it is not clear whether the interruption of the expiration of phosphorus from the soil to water is triggered by "exhaustion " of the circumstances that favor this passage or if there exists such a lower level of concentration of dissolved phosphorus in water that does not favor the activity of the main mechanisms that lead to "swallowing" of phosphorus from the soil of the basin. The first circumstance relates to the completion of free connections of the iron and aluminum composition, a connection in which are "trapped" the phosphate ions dissolved in water. Based on the minimum values of phosphate concentrations after the application of fertilization and the very fact that the structures of aluminum and iron occupy a significant percentage of the watershed bed, there is little opportunity for ‘glutting” of ties to occur between phosphorus and colloids composition of the afore-mention metals.

It’s an established fact that the process of transferring of phosphorus from water to soil is more intensive in the first days after the application of fertilization which gradually decreases. But the repetition of the first test, with two variants of fertilization, showed that it is possible that second circumstances, that is the existence of a minimum level of phosphorus concentration which does not allows for the further transferring of this element from the dissolved form into the “connected” form of "related" should have greater importance in maintaining the determined values of the phosphate ion dissolved in water.

The following graphs (Fig No. 5 and No. 6) show the change of phosphorus content in the recently deposited sediments of the basins being tested after the application of the second fertilization with super-phosphate.

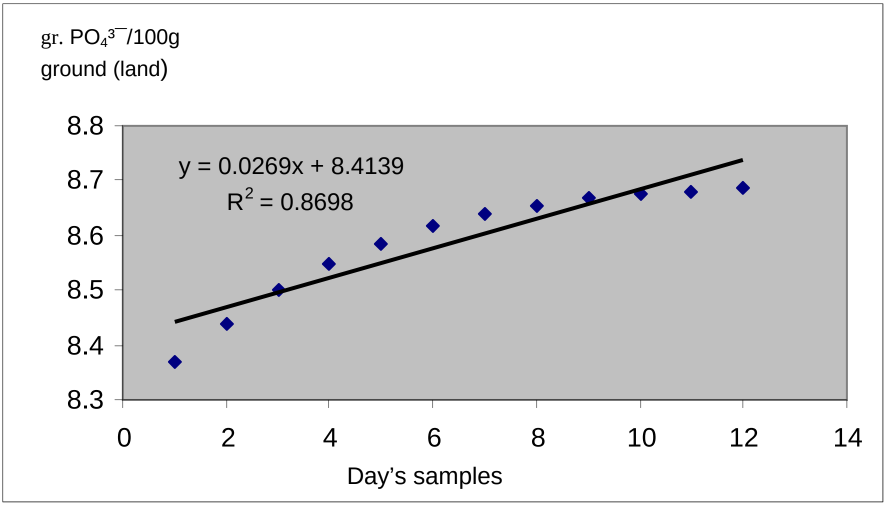

Figure No. 5. The Increase of the phosphorus content in recent sediments in the basin in the first eleven days after fertilization with super-phosphate, in the version with PO_4^{3-} 1mg / l (second fertilization) (r = 0.93)

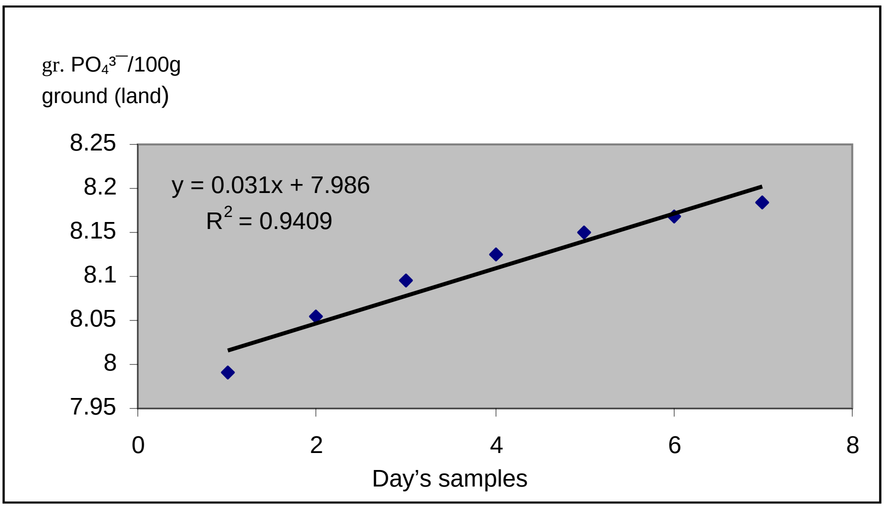

Figure No. 6. The Increase of the phosphorus content in recent sediments in the basin in the first week after fertilization with super-phosphate, in the version with 0.5 mg PO_4^{3-} l (Second fertilization) (r = 0.97)

♦ After the second fertilization we are able to notice a re-activation process of the transferal of phosphorus from water into the basin soil, but as tests have shown the intensity of this phenomenon has been less pronounced. In the version with a concentration $PO4^{3-}$ 1mg / l in the first eleven days after fertilization phosphorus content in the soil has increased from 8:37 g/100 g to 8.6853 g/100 g in the soil. The loss of phosphorus from water due to its passage into insoluble state, only for this variant, was at 0.3153 mg / l or 31.53% of the content provided for by the mineral fertilization. The average value of the daily active consumption of phosphorus after application of the second fertilization with super-phosphate was at 0038 mg / l. The initial state of the phosphorus content was determined after a period of 15-16 days (see Fig. No. 7)

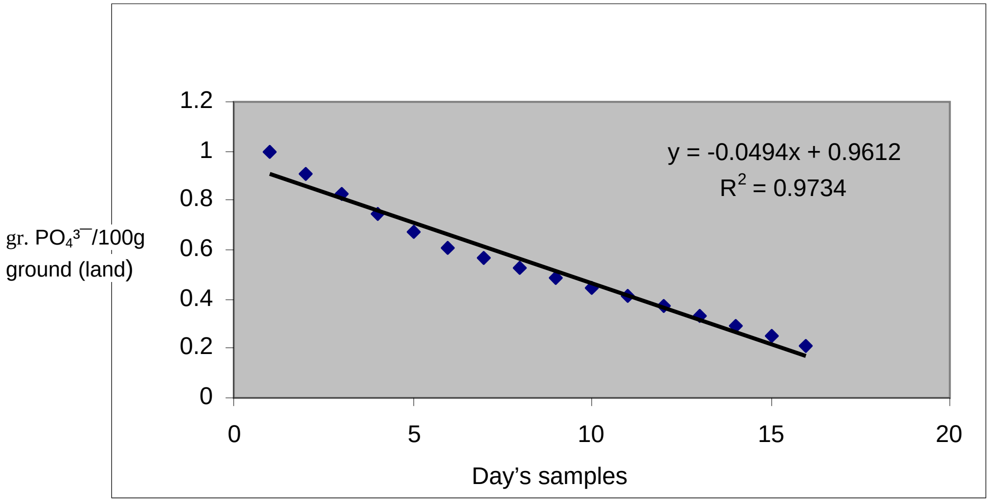

Fig. No. 7. The decrease of concentration of phosphate ions, after fertilization of the water basin with super Phosphate, nversion with 1mg/lPO_4^{3-} (second fertilization)(r=0.98)

♦ In the version of concentration at 0.5 mg³ PO_4 ³ ‾ / l the largest amount of phosphorus that has passed onto recent deposits is estimated at a period of 3-4 days in the wake of application of the second fertilization with super-phosphate. Six days after fertilization (see Fig,. No. 6) and phosphorus content in recent deposits increased from 7.99g/100g soil to 8185 g/100 g soil. So the loss of phosphorus from the water has been at 0.195 g / l or 39% of the amount that was obtained after the super-phosphate distribution. The average value of active daily phosphorus consumption was at 0031 mg / l. The initial state of the phosphorus content, in this variant of fertilization, is determined after a period of 10 days (see Fig. No.8).

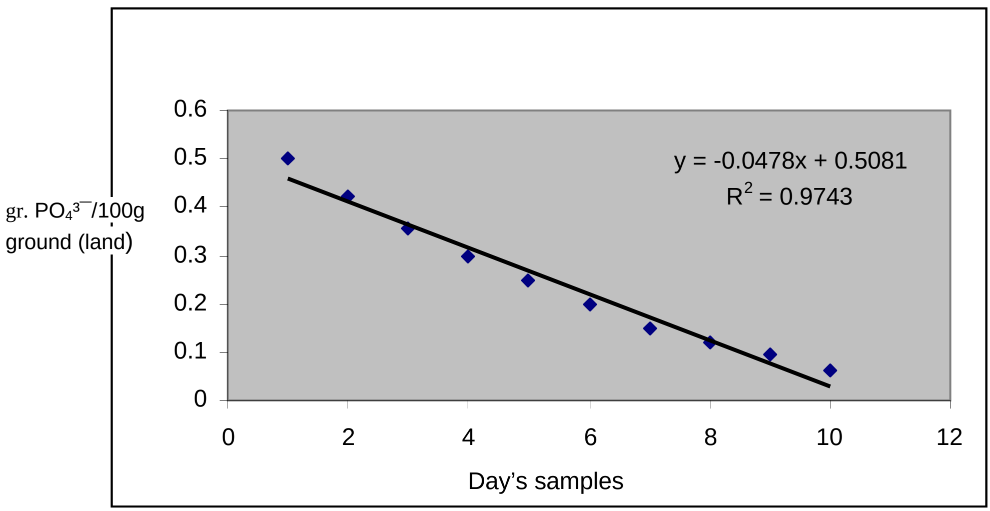

Fig No.8. The decrease of concentration of phosphate ions, after fertilization of the water basin with super phosphate, in the version with the 0.5 mg / l $PO_4{}^{3-}$ (second fertilization) (r = 0.98).

♦ The figures show that with the second fertilization, relative to the first one, the biggest part of phosphorus as supplied by super-phosphate has gone to the benefit of photosynthetic species of the basin. In fact we observed that the biomass of algae has grown from the start of the super-phosphate distribution in the first fertilization and until natural phosphate concentration is determined, 10 days after fertilization of the second version at the 0.5 mg PO_4^{3-} / l and 16 days after this dose of fertilization in the version with PO_4^{3-} 1mg / l. The hydro-biological indicators, particularly those pertaining to *clorofit phytoplankton* have shown that the decrease of phosphate concentration after the second fertilization is mainly caused by the consumption of such ions by the algae of plankton. Is highly likely that a part of the phosphate that passes into the soil and which is not related chemically to certain components, but enters into microbiological processes, can be used yet for a second time by the macro-phytes, after the dying of the relevant bacteria.

CONCLUSIONS:

♠ The main factors leading to the decrease of the concentration of phosphate ions after application of mineral fertilization with super-phosphate, are the chemical bond of phosphorus compounds dissolved in water with colloids compounds of iron and aluminum and consumption of such a ion by the autotrofe species

♠ The survey results indicate that with the second fertilization with super-phosphate, relative to the first, a good part of the phosphorus as provided for by chemical fertilizers has gone to the sole benefit of photo-synthetic species of the basin.

♠ In order to ensure photo-synthetic hydro-bionts, through fertilization, the concentration of the phosphate ions of 0.5 mg/l (this concentration has been considered by Friedman, H.A. 1972, Ljahnovic, P.V., 1972, Jensen, J.W. 1985, Anderson, R.O. & Tave, D. 1993, Lannan, J. E. 1993, Boyd, C., Tucker, C., 1998, Knud-Hansen, C.F., 1998) as the most suitable in terms of satisfying the physiological needs of clorophyte algae for phosphorus), it is necessary that in the first 2 to 3 fertilizations there should be a distribution of the amount of super-phosphate that guarantees the concentration of 1 mg / l PO_4^{3-}

♠ In the first two versions of the test it is observed that the return of natural phosphorus content after fertilization with super-phosphate, was done after 16-17 days and 10-12 days respectively. Taking into consideration these figures we recommend that fertilization with super-phosphate, after calculating the appropriate dose of fertilizers, be made in an interval of 10-15 day.

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