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An efficient incentive of Nitrate and Fluoride on Organic highland cropping systems

[1]Mohana Rao Abburi, [2]Mekonen Aregai, [3]Soujanya Kaki, [4]DivyaJyothi Munagala,

[1]*Aksum University, Aksum-Ethiopia*
[2]*Adigrath University-Adigrat-EthiopiaCMR College of Engineering and Technology, kandlakoya(village), Medchal Road, Hyderabad-India*
[3]*Bapatla Engineering College-Bapatla, India*

Abstract: *Exerting necessitated concentrations of Nitrate and fluoride to the organic highland cropping systems is a vital management technique. All the chemical elements of the earth's crust occur in widely differing omnipresent concentrations, due to their different nuclear chemical formation and geochemical history. The use of biological nitrogen and fluoride inputs complicates its balancing act due to dandier uncertainty in inorganic Nitrogen and Fluoride availability. The growers to strike maintain Nitrogen provisioning to support crop growth and retention of limit pollution followed by fluoride associated soils. Due to various activities of the man in domestic field, agriculture area and industrial establishment the environment around us consisting soil, water and air gets polluted. Fluoride inexhaustible concentrations forbid the growth of crop even though nitrates reposit in the cultivated soils. The purpose of this project was to establish kinetics when nitro fluorides associated in the highland soils to different crop systems towards environmental pollutions. Cordia Africana and alfalfa are the plants which make soil to get enrichment of Nitrates and deescalate of concentrations of fluorides from cultivated soils through its decomposition. This entire study went on its conventionally tilled crops followed by Cordia Africana and alfalfa stems and leaf particles. Surface soil nitrate concentrations were measured weekly, biweekly by volumetric analysis and nitrate leaching was estimated from tension Lysimeters which were buried at the soil bedrock interface. Subsequently by using Orion 720A fluoride ion meter, de-escalated concentrations of fluorides have been measured. The demonstrated concentrations of Soil in NO_3 variables, coefficients of variations from the mean concentrations across all samplings have been recorded sporadically. The total area of the soil bed was maintained the same P^H values until project was completed by weigh Lysimeters. The timing of elevated Nitrate concentrations (10-15PPM) and the concentrations of fluoride in deeper soil water corresponds with fallow periods. These dynamics will assist growers in adapting the timing management operations and reduces nitrate departures.***

Keywords: *Highland cultivation, Lysimeters, Orion fluoride Ion, biomasses.*

I. Introduction:

Aksum is one of the holy places in Ethiopia which is situated 2800-3000 ft above the sea level and total area has been occupied by Highlands and lowlands.

Grangers usually cultivate teff (Eragrostic abyssinica) for their traditional food in the highlands. The lands, in which soil fouled with Nitro fluorides which forbid the yield of the teff and quantitative dynamics of the Nitro fluorides, take vital role in this scenario.

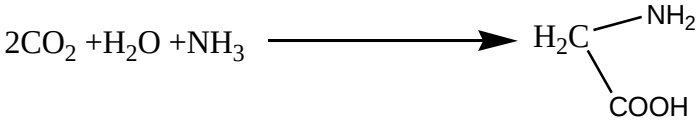
Fluoride contamination of the Aksum water levels at inordinateness is also one of the disadvantages where the farmers getting low yielding of the land cultivation. [1]According to the W.H.O. more than 2.5ppm/lit of fluoride in the water causes unhealthiness to the human beings. A part of it excessive quantities of the Nitrates and fluorides in the soil cause forbidding the growth of the plants. [2]Consumption of the fruits, grains and traditional edible seeds as food offers the most rapid and lowest cost of means of furnishing adequate supplies of vitamins, minerals and fibers to the people who live in the highlands. Vegetables, green seeds and the leafy food stuff are the major sources of the daily intake of nitrate by human beings at 72% to 90% of total intake. [3]Nitrates, having a vital role of synthesize proteins in the plants by nitrogen cycle. Fertilizers, Pesticides, decayed organic substances are the main sources of the nitrates which supplies more strength to the plant organisms. Nitrogen is the limiting factor for most of the fields and nitrate is the major form of the nitrogen absorbed by crop plants. Generally farmers or grangers utilize nitrogen fertilizers for increased crop yielding.

[4]Nitrogen fixation makes nitrogen availability to the plant organisms in the form of ammonia in the atmosphere.

$$N_2 + 3H_2 \longrightarrow 2NH_3$$

Ammonia

Thus obtained ammonia is to be converted amino acids by biosynthesis in the animals especially.



Glycine (Aminoacid)

Fluoride contamination in the soil is also one of the drives to deescalate the crop yielding.

This Project mainly focused on enrichment of Nitrates, diminutions of fluorides in the soils by adding biomasses like Cordia Africana and alfalfa in the soil.

II. Materials and Methods:

This project exclusively carried out in the highlands during monsoon seasons. [5]The samples and sampling soils have been collected randomly for identification and analysis of Nitrates and fluorides in the soils before adding biomasses and later around the acre. Selection of the land which exhibits wet dry conditions during winter season would be advisable for this project.

Preparation of Biomasses

[6]The greened stem parts of the Cordia Africana and alfalfa plants have been allowed to dry made them into powders of the mixture as biomasses.

Soil bed Preparation

Nearly 200sqft of land has been selected and it was divided into six square parts (nearly each part is 33.33sqft) for conducting this experiment during November-January. All sample soils have been collected before adding the biomass and after vice versa. Each experimental reading takes place through the equipments which have been used in the experiment. Nearly 2-3 inches of surface layer of the soil has been utilized for soil examination sporadically at each soil bed.

Experimental Equipments

Soil bed Lysimeter[7]: This is exclusively useful for calibration of Nitrate quantities of Soil samplings. The lysimeter is to be placed down of the semi surface of the soil, so that nitrates quantities can be measured sporadically.

Fluoride ion meter[8]: Orion 720A is used for determination of fluoride concentrations on time intervals.

Maintained P^H: [9] 7.3-7.8 P^H was being maintained during this experiment.

Dil.NaOH Solution: [10]To maintain required PH in the soil, 0.001N NaOH is used during this experiment.

Experimental Operation:

In the first phase of this experiment, randomly collected soil samples have been examined by using lysimeter and fluoride ion for determination of Nitrate and Fluoride quantities.

The nitrates and fluoride quantities have been determined at the level of normal stage in the soils (Table: 1). It shows around 12mg/kg to 13.6mg/kg for nitrates in the soil beds, in fact 33mg/kg to 40mg/kg is required for fertile lands (W.H.O), where as fluoride concentration shows 3.5mg/kg to 4.2mg/kg, according to W.H.O the range of fluoride could be around 1.5mg/kg to 3.0mg/kg, for dandier yield in the lands.

Evaluation of Nitrates step-up in the soil and Fluorides step-down in the same sample soils, Cordia Africana and Alfalfa biomasses added to the respective soils with unequal quantities. One Kg of biomass added to soil bed1, 1.5kg of biomass added to soil bed2, 2.0kg added to soil bed3, and so on. Each of the soil bed has been mixed with 0.5 kg of biomass form soil bed1 to soil bed6 increasing level. Analysis and their observations have been recorded once in a 15 days. Table 2, Table3 and figure2, figure3 show the result of biomass soil beds after 15 days and 30days respectively.

Table 1: Initial quantities of the Nitrates and Fluorides in the soil samples (before adding Biomasses)

	Soil bed No:1	Soil bed No:2	Soil bed No:3	Soil bed No:4	Soil bed No:5	Soil bed No:6
Nitrates (NO_3^-) mg/kg	12.5	12.0	13.1	12.9	13.6	12.3
Fluorides (F^-)mg/kg	3.5	3.9	4.2	3.7	3.9	4.1

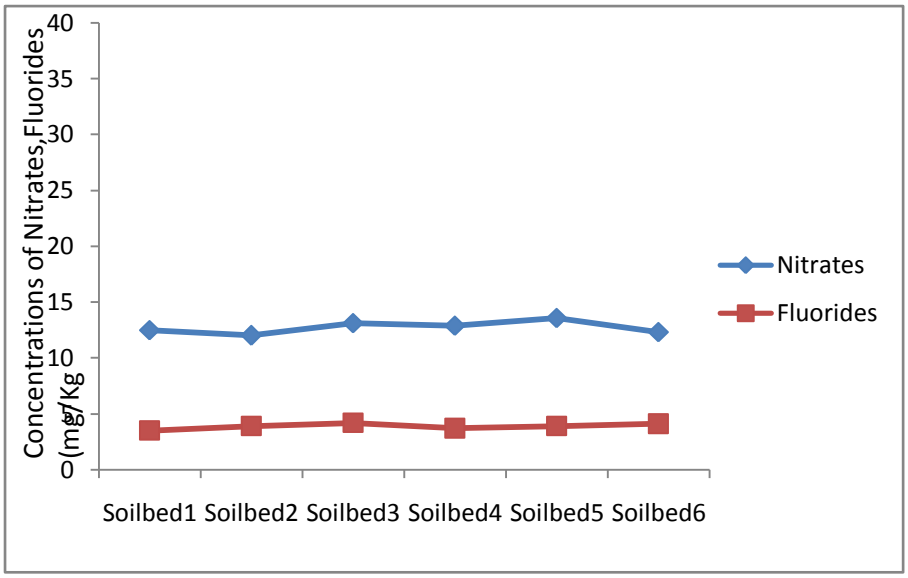


Figure 1 Initial Concentrations of Nitrates& Fluorides in the soil beds

Table.2: Estimation of Nitrates and Fluorides in the soils after adding biomass later 15days.

	Soil bed No:1(1kg mass added)	Soil bed No:1(1.5kg mass added)	Soil bed No:3(2kg mass added)	Soil bed No:4(2.5kg mass added)	Soil bed No:5 (3Kg mass added)	Soil bed No:6 (3.5Kg mass added)
Nitrates (NO_3^-) mg/kg	18.0	20.5	24.6	28.6	29.0	28.8
Fluorides (F^-)mg/kg	3.4	2.9	3.0	2.6	2.2	3.9

Figure 2Concentrations of Nitrates &Fluorides in the biomass Soil beds after 15days

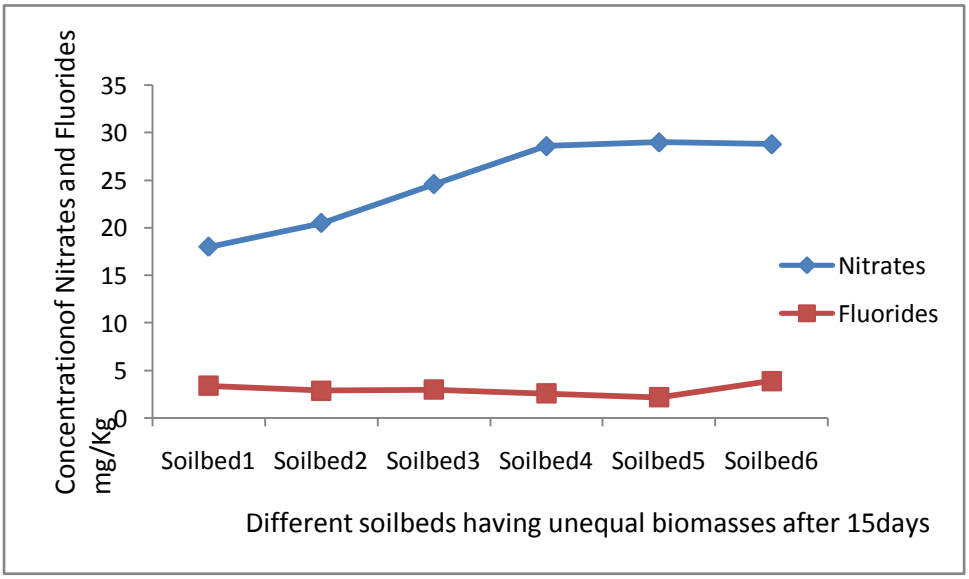
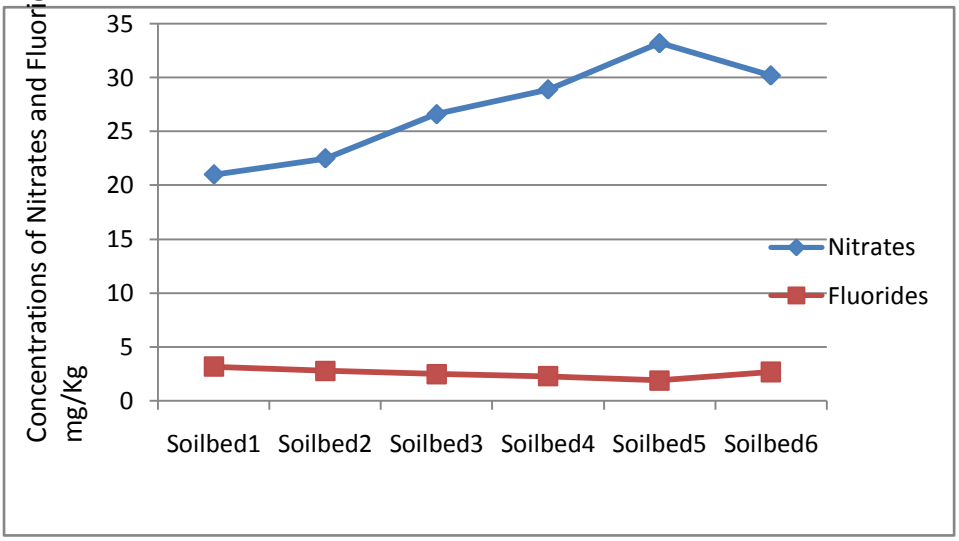


Table.3: Nitrates and Fluoride Concentrations in the biomass soils after 30days.

	Soil bed No:1(1kg mass added)	Soil bed No:1(1.5kg mass added)	Soil bed No:3(2kg mass added)	Soil bed No:4(2.5kg mass added)	Soil bed No:5 (3Kg mass added)	Soil bed No:6 (3.5Kg mass added)
Nitrates (NO_3^-) mg/kg	21.0	22.5	26.6	28.9	33.2	30.2
Fluorides (F^-)mg/kg	3.2	2.8	2.5	2.3	1.9	2.7

Figure 3Concentrations of Nitrates &Fluorides in the biomass Soil beds after 30days



III. Results and Conclusions:

This experiment exclusively concentrates on escalating the quantities of Nitrates and De-escalates of Fluorides in the fertile high lands by adding biomasses at 19^0C-25^0C followed by 7.3-7.8P^H. Targeted Soil beds showing initially 12-13.6mg/kg of nitrates and 3.5-4.2mg/kg fluorides by lysimeter and fluoride ion meters, subsequently biomasses have been added to the Soil bed1-1kg, Soil bed2-1.5kg, Soil bed3-2.0kg, Soil bed4-2.5kg, Soil bed5-3.0kg, Soil bed6-3.5kg. All soil beds and soil layers have been set properly and 2-3" of soil each bed has been taken for analysis. Appraisal of nitrates and fluorides have been observed after 15days as nitrate quantities escalating way as 18.0mg/kg to 29mg/kg and fluorides 3.9mg/kg to 2.2mg/kg de-escalating way been observed (table.2, figure.2) by biomass adsorption of soils.

Especially soil bed5 shows 29.mg/kg, where as soil bed6 shows 28.8mg/kg, indicates that 3.0kg of soil adsorbed in the soil at saturated level as 3.5kg of biomass gave 28.8mg/kg on hyper saturation. The concentrations of fluorides also decreased at distinguishable quantities as up to 2.2mg/kg. 1.5mg-2.5mg/kg of fluoride in the soils gives dandier yield of the fertile crops. Similarly Nitrates and their quantities enhanced by adsorption of the biomass after 30days up to 33.2mg/kg. Fluoride concentration also decreased at optimal level from 4.1mg/kg to 1.9mg/kg (table.3).

When the nitrate concentrations maintain around 34mg/kg to 40mg/kg the crop would be better yield followed by fluoride concentrations as much as less than 2.5mg/kg.

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