An Experimental Investigation of Cow Dung And Fish Waste As Organic Fertilizers To Cultivate Crops

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Abstract- *This study was conducted out to use the cow dung manure and fish waste in a useful manner as fertilizer on agricultural crops, leading a pollution free environment.The sample collection of cow dung from shelter and fish wastes from fish markets. The sample of cow dung was subject to undergo compost. Cow dung adds organic matter into the soil, increase the water holding capacity of soil, thus increase the growth of plant and sustain the productivity. Even though methane, a greenhouse gas is emitted from cow dung when it is being processed. It should be controlled by adding only trace amount of cow dung on soil. So to control these and to avoid environmental pollution due to the fish or fish waste disposal in water bodies, it is used as fertilizer along with cow dung manure on plants. The fish waste consists of traces of amino acid, which is used for fertilizer purpose. The fish waste is the main sample collected for utilizing in this study. Fish wastes are used in this project in an useful way for avoiding the disposal of fish waste in to water bodies which gives serious impact on environmental. Bioaccumulation is the accumulation of substances, such as pesticides, or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost by catabolism and excretion. Further on, using these wastes as fertilizers on vegetables, by making the essential nutrient needed for the better growth of the plant. Some particular plant was choose, as it is the suitable crop that can be cultivated in both summer and monsoon or rainy season. For this experiment, planning was made to check physiochemical properties of the fertilized product. Also analysing soil properties of the study plants, testing these in the durations of three months and planned to note the growth level of plant on various stages the major proportion of the nutrients in vegetable are absorbed from the time of flowering. The soil testing is made to find N, P, K, pH, Ca,Mg, S., ect. These analysis indicates whether the soil requires nutrients and how much is needed is analysed.*

Keywords- cow dung, fish waste, fertilizer, cow dung manure, fish amino acid.

I. INTRODUCTION

The India marine capture fisheries contribute more than 50%of the total India fish production. About 70% of fish isprocessed before Final sale, resulting in 20-80% of fish waste depending on the level of processing and type of fish.

Fig. 1.1 fish waste

Processing of fish leads to enormous amounts of waste. It is estimated that fish processing waste after filleting accounts for approximately 75% of the total fish weight. About 30% of the total fish weight remains as waste in the form of skins and bones during preparation of fish fillets. This waste is an excellent raw material for the preparation of high value products including protein foods. The utilization of fish wastes help to eliminate harmful environmental aspects and improve quality in fish processing. Fish processing generates solid wastes can potentially generate additional revenue as well as reduce disposal costs for this material that can be as high as 50-80% of the original raw material. Skin and bone are sources of high collagen content. An important waste reduction strategy for the industry is the recovery of marketable by-products from fish wastes. Hydrolysed fish wastes can be used for fish or pig meal as well as fertilizer components. The three most common methods for utilization of aquatic waste (either from aquaculture or wild stock) are the manufacture of fishmeal and oil, the production of silage and the use of waste in the manufacture of organic fertilizer. The utilization of by-products is an important cleaner production opportunity for the industry, as it.

There are other potentially valuable uses. One low-investment possibility is the elaboration of agricultural products by composting the fish remains. Fish waste can also be used for production of various value added products such as proteins, oil, amino acids, minerals, enzymes, bioactive peptides, collagen and gelatine. The fish proteins are found in all parts of the fish.

There are three types of proteins in fish:

- structural proteins,
- sacroplasmic proteins and
- connective tissue proteins.

The fish proteins can be extracted by chemical and enzymatic process. In the chemical method, salts (NaCl and LiCl) and solvents (isopropanol and aezotropic isopropanol) are used, whereas during the enzymatic extraction, enzymes (alcalase, neutrase, protex, protemax and flavorzyme) are used to extract proteins from fish. There are 16-18 amino acids present in fish proteins. The amino acids can be produced from fish protein by enzymatic or chemical processes. The enzymatic hydrolysis involves the use of direct protein substrates and enzymes such as alcalase, neutrase, carboxypeptidase, chymotrypsin, pepsin and trypsin. In the chemical hydrolysis process, acid or alkali is used for the breakdown of protein to extract amino acids.The fish wastes degrade rapidly in warm temperatures.If not appropriately stored or managed, fish wastes create aesthetic problems and strong odours as a result of bacterial decomposition. The organic components of the waste have a high biological oxygen demand and, if not managed properly, high oxygen demand poses environmental and health problems. Some fish wastes are transported for disposal at sea, which reduced oxygen levels in the seawaters at the ocean bottom, burial or smothering of living organisms and introduction of disease or non-native and invasive species to the ecosystem of the sea floor.

Generally for better growth of plants, it requires essential nutrients. Growing plants take nutrition from soil, water and air. Unless there are enough of the right nutrients in the soil, the plant's growth will suffer. Farmers turn to fertilizers because these substances contain plant nutrients such as nitrogen, phosphorus, and potassium.Fertilizers are simply nutrients applied to agricultural fields to supplement required elements found naturally in the soil. Mostly cow dung used as organic fertilizer. Even though, plants take more time to get nutrients from cow dung. So it's better to use both cow dung manure and fish waste fertilizer. The sample of fish waste used in this study was collected from the fish markets. The fishing sector produces large amounts of waste in fish markets and processing industries. These by-products are mainly used in the manufacture of fish meal. However, there are other potentially valuable uses. One low-investment possibility is the elaboration of agricultural products by composting the fish remains.

II. MATERIALS AND METHODOLOGY

a) NEED FOR THE PRESENT STUDY

Generally cow dung is used as fertilizer in agricultural field. It has better practices now a day in the usage.The mainpurpose or need ofthis study was to avoid environmental pollution due to the dumping of fish waste as well as usage.

b) FERTILIZER

The plant's nutrients we supply are commonly called fertilizers. Fertilizers have been used since the start of agriculture to supply one or more plantnutrients essential to the growth of plants.

c) ADVANTAGES OF APPLYING FERTILISERS TO THE LAND

It increases crop yield and improves poor quality land.Manure improves soil texture, recycles nitrogen and introduces essential bacteria.Pasture is improved so animals fatten up quicker.Once marshland is drained, fertilizers can help reclaim that land for pasture.

d) ORGANIC FERTILIZERS

Organic fertilizers contain only plant- or animal-based materials that are either a by-product or end product of naturally occurring processes, such as manures, leaves, and compost.

e) APPLICATION METHODS OF FERTILIZERS

Fertilizers are applied in several ways.Basal dressings are those fertilizers which are incorporated in the soil just before sowing or planting.In general half the dosage of N, full dosage of P_2O_5 and full dosage of K_2O are applied as basal dressing in most crops.Top dressing are fertilizers added to the soil surface but not incorporatedSuch fertilizers must be soluble and not fixed by soil because the nutrient is carried to the roots by soil water.Foliar feeding is the spraying of a liquid fertilizers in suitably diluted form to be taken up through leaves.This technique is usually restricted to the application of micronutrients.Major nutrients are also supplied through foliar feeding, if deficiencies noted in the field.

F) SANDY LOAM SOIL

Sandy loam is a type of soil used for gardening. This soil type is normally made up of sand along with varying amounts of silt and clay. Many people prefer sandy loam soil for their gardening because this type of soil normally allows for good drainage

g) PH OF SANDY LOAM SOIL

Pounds of ground agricultural limestone per 100 square feet need to raise the pH

Type of soil	Sandy loam soils	Silty-clay loam soils
	To pH 6.0	To pH 6.5
From pH 6.0	None	5.5
From pH 5.5	2.5	11.5
From pH 5.0	4.5	17.0

h) COW DUNG

Cow dung which is essential to agricultural field. Cow dung, also known as cow manure, is the waste product of bovine animal species These species include domestic cattle ("cows"), bison ("buffalo"), yak, and water buffalo. Cow dung is the undigested residue of plant matter which has passed through the animal's gut. The resultant faecal matter is rich in minerals. Colour ranges from greenish to blackish, often darkening soon after exposure to air.

i) PREPARATION OF COW DUNG MANURE

Composted cow manure fertilizer makes an excellent growing medium for garden plants. When turned into compost and fed to plants and vegetables, cow manure becomes a nutrient-rich fertilizer. It can be mixed into the soil or used as top dressing. Most composting bins or piles are located within easy reach of the garden. Heavy manures, like that of cows, should be mixed with lighter materials, such as straw or hay, in addition to the usual organic substances from vegetable matter, garden debris, etc. Small amounts of lime or ash may also be added. An important consideration when composting cow manure is the size of your bin or pile. If it's too small, it won't provide enough heat, which is essential for the composting process. Too big, however, and the pile may not get enough air. Therefore, frequently turning the pile is necessary. Composted cattle manure adds significant amounts of organic material to the soil. With the addition of cow manure fertilizer, you can improve the overall health of your soil and produce healthy, vigorous plants.

j) *FISH AMINO ACID*

The Fish Amino Acid (FAA) is a liquid made from fish. FAA is of great value to both plants and microorganisms in their growth, because it contains an abundant amount of nutrients and various types of amino acids (will constitute a source of nitrogen (N) for plants). Blue, back colour fishes will get good FAA. It is absorbed directly by the crops and it also stimulates the activity of microorganisms.

k*) INGRIDIENTS FOR FISH AMMINO*

1kg of fish waste
1kg of solid jiggery

l) *PREPARATION OF FISH AMINO ACID*

Fish amino acid (FAA) is an effective organic liquid fertilizer. Its making is very easy and we can make it cheaply. It's made from fish and solid jaggery. Do not use liquid type jaggery for this, use only solid. Cut fish waste or fish parts into pieces and put in a clay pot or plastic jar (black coloured fish are good because they contain high amounts of amino acid).Add jaggery of an equal amount (1:1 weight ratio). For example, for 1kg fish you need 1kg jaggery. Fill the jar up to 2/3 of its volume .Cover the opening by air tight lid. Keep It away from direct sun light. You need to keep this for 30 days as the fish waste for time to ferment. This fish waste will ferment in 25 days. Extract the solution and use the liquid to crops. These 2 are only the ingredients of this cheap liquid fertilizer. For better result use small type of fish.

m)APPLICATION OF FISH AMINO ACID

You can apply the prepared fish amino acid to soil or to the leaves of the plant. Do not directly apply this, you need to dilute this. I mean you can 30 ml of the fish amino acid can use with 1 litter water.

Fig 2.1 AddingJagger

Fig 2.2 Added Jaggery and fish waste

Fig 2.3 mixture of Jaggery and fish waste

Fig 2.5 filtering

Fig 2.6 fish amino acid

n)PLANT NUTRIENTS

Although plants absorb a large number of elements, all of them are not essential for the growth of crops. The elements are absorbed became they happen to be in the soil solution. And those taking active part in the growth and developmental processes are called the Essential ones. Some of these are required in large amounts and some in traces.

These are Classified as major and micro nutrients, and are further classified as follow :

Major nutrients

Group A: Carbon, hydrogen and oxygen.
Group B: Nitrogen, phosphorus, potassium

Secondary Nutrients

Calcium, magnesium, sulphur

Micro nutrients

Iron, manganese, boron, zinc, copper, molybdenum and chlorine.

III. RESULT AND DISCUSSION

An experimental study on crops was carried out to analyse whether the prepared organic fertilizer was successes in avoiding diseses to crops and their effect on crops was absorbed to known their benefits.So far that analysis three crop was choosed. They are brinjal,okra,chilli.

a) BRINJAL

Brinjal (Solanummelongum L.) is an important vegetable crop and widely grown in India. Under mild climate of southern states its bearing period is prolonged whereas

under northern conditions it is shortened. In hilly areas, it is cultivated only in summer. Brinjal occupies 8.14% of total area and produces 9% of total vegetable production of The country.

b) *OKRA*

These vegetables depend on organic nutrients already in the soil and additional fertilizer to achieve maximum production. Understanding the basic nutrient needs and the best methods for providing them helps ensure fruitful okra plants all season long.

c) CHILLI

Chilli is also a good source of Dietary Fiber, Thiamin, Riboflavin, Niacin, Folate, Iron, Magnesium, Phosphorus and Copper, and a very good source of Vitamin A, Vitamin C, Vitamin K, Vitamin B6, Potassium and Manganese.

d) AGRICULTURAL TRIALS

Soil sample is tested for knowing the nutrient content present in it. Here two soil sample is taken one is normal soil with cow dung compost and other one is mixing of cow dung compost and prepared organic fertilizer which is fish amino acid.

This Table 3.1 shows the nutrient content present in the soil sample for kilo/acre. Soil sample I contain nutrient content larger than soil sample 2, because soil sample 1consists of organic fertilizer which is the prepared fish ammino acid.

Table 3.1

COMPOUND	SAMPLE 1	SAMPLE 2
NITROGEN	182 k/acre	98 k/acre
PHOSPHROUS	22 k/acre	12 k/acre
POTTASSIUM	116 k/acre	64 k/acre
IRON	7.33c k/acre	7.44c k/acre
MANGANESE	10.22 k/acre	4.27 k/acre
ZINC	0.96 k/acre	1.06 k/acre
COPPER	1.27 k/acre	1.22 k/acre

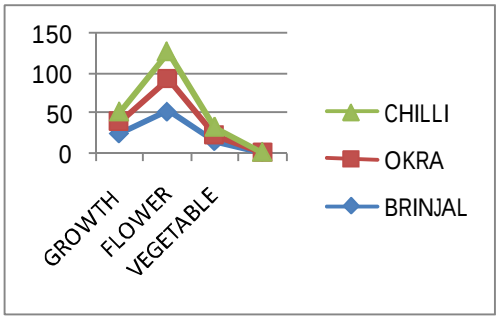
The below Table 3.2 shows the better growth, flowering, fruiting stages than the chemical fertilizer that is inorganic fertilizer.

TABLE 3.2

CROP NAME	GROWTH DAYS	FLOWERING DAYS	FRUITING DAYS
BRINJAL	24 DAYS	52 DAYS	15 DAYS
OKRA	15 DAYS	40 DAYS	8 DAYS
CHILLI	16 DAYS	35 DAYS	10 DAYS

Fig 3.1 Brinjal farming

Fig 3.2Chilli farming



IV. CONCLUSION

Processing brinjal ,okra ,chilli crops in agricultureral filed to benefit from the application of the fish amino acid fertilizer to the same extent as traditionally now a days used chemical fertilizer. This organic fertilizer plays an extent role to acquire environmental condition.Synthetic and organic chemicals build up in the environment when decomposers cannot break them down through the biodegradation process. Bioaccumulation is the gradual build-up of these chemicals in living organisms. A chemical will accumulate if it is taken up and stored faster than it is broken down and excreted. Chemicals enter organisms through food intake, skin contact, or respiration. If the accumulation of a substance is too high, it can be harmful. Some chemicals are temporarily stored in fat tissue but are released from storage when fat is burned for energy. Biomagnification, also known as bioamplification or biological magnification, is the increasing concentration of a substance, such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain. This health issues can be minimized by using organic fertilizer in the agricultural field.

However, further work would be required in order to validate the result before any general recommendations for fish amino acid fertilizer use could be made.

REFERENCE

[1] F.B.Verkleij, Biol. Agric. Hortic., 8(1992)309.
[2] G. Blunden, European Seaweed Resources: Uses and Potential, M.D. Guiry& G. Blunden eds., J. Wiley and Sons, Chichester, UK, (1991)65.
[3] Kris-Etherton PM, Harris WS, Appel LJ; American Heart Association Nutrition Committee. (2002) Fish consumption, fish oil, omega-3 fatty acids, and cardiovascular disease. Circulation 106: 2747-2757.
[4] Khoddami A, Ariffin AA, Bakar J, Ghazali HM (2009) Fatty acid profile of the oil extracted from fish waste (Head, intestine and liver) (Sardinellalemuru). WorldAlied Sciences Journal 7: 127-131.
[5] M.E. LópezMosquera, and P. Pazos, Biol. Agric. Hortic., 14(1997)199.
[6] Ministerio de MedioAmbiente y Medio Rural y Marino (MARM), Anuario de Estadística 2008, Secretaria General Técnica, Subdirección General de Estadística, Ministerio de MedioAmbiente y Medio Rural y Marino, Madrid, Spain, 2009
[7] N. Lampkin, Agriculturaecológica, Mundi-Prensa, Madrid, Spain, 2001.
[8] P.H. Liao, L. Jones, A.K. Lau, S. Walkemeyer, S. Egan, and N. Holbek, Bioresource Technol., 59(1997)163.
[9] R.E. Kinnunen, M.C. Gould, and P. Cambier, Composting Commercial Fish Processing Waste from Fish Caught in the Michigan Waters of the Great Lakes, Michigan State University Extension, USA, 2005.
[10] Tawfik MS (2009) Proximate composition and Fatty acids profiles in mostcommon available fish species Saudi market. Asian Journal of ClinicalNutrition 1: 50-57.
[11] V. Cuomo, I. Perretti, A. Palomba, and A. Cuomo, J. Appl. Phycol.(1995)479. L. Frederick, R. Harris, L. Peterson, and S. Kehrmeyer, The Compost Solution to Dockside Fish Wastes, University of Wisconsin, SeaGrant Institute, USA, 1989.
[12] W.F. Brinton, E. Evans, M.L. Droffner, and R.B. Brinton, BioCycle, 36(1995)64.