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Preparation of Nanopartical Liquid Organic Fertilizer and its Effect on Various Crops

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ABSTRACT

There is huge quantity of biomass produced; such as, by food processing industries, agricultural waste, meat industries waste etc available which is a great source of Plant nutrients and goes unexploited and generating Green house Gases(CHG). Management of landfills has always been a great challenge for urban local bodies. These landfills produces great amount of methane gas naturally by anaerobic fermentation process, which currently is not harnessed properly. These Biomass can be converted to utilization as an Organic fertilizer and thereby contributing towards overall agricultural revolution and reducing use of chemical Fertilizer. Fertilizers produced with nanotechnology are one of them. Fertilizers derived from nanotechnology have started to attract attention in agriculture nowadays. This study was undertaken to produce nanotechnology liquid organic fertilizer (NLOF) from various Biomass and its effects on the plant growth and yield. The experiment was carried out at Ahmedabad, Gujarat State of India. The fertilizer preparation results showed that an excellent analytical result achieved and the fertilizer treatments significantly improved the yield compared to control.
Keywords : Nanopartical Liquid Organic Fertilizer, Production of organic fertilizer.

I. INTRODUCTION

The increasing world population has led to increases in food processing industries and Biomass waste. Now a day the major problem is to overcome the waste management and to reduce the GHG Emission. To increase food production and to reduce the GHG Emission it is necessary to use the different technologies in agriculture. Nanotechnology can be used as an alternative technology in a wide scientific area. Nanotechnology has been described as relating to materials, systems and processes which operate at a scale of 100 nanometres or less [Mousavi and Rezai 2011, Srilatha 2011, Ditta 2012]. Nanotechnology provides a lot of benefit in the area of pollution sensing and prevention, by exploiting novel properties of nanomaterials [Baruah and Dutta 2009, Srilatha 2011].

Nowadays, nanotechnology has been used in many agricultural fields such as production, processing, storing, packaging and transport of agricultural products [Mousavi and Rezai 2011, Ditta 2012]. Fertilizer derived from nanotechnology has started to attract attention in agriculture. Nanotechnology can have a profound impact on energy, the economy and environment, by improving fertilizer products [DeRosa et al. 2010]. Nanofertilizer can be encapsulated inside nanomaterials, coated with a thin protective polymer film, or delivered as particles or emulsions of nanoscale dimensions [DeRosaet al. 2010].

Nanotechnology Liquid Organic fertilizer (NLOF) liquid fertilizer have been obtained by nanotechnology from Biomass waste. NLOF has natural elements as a new generation biostimulator against stress and soil microorganisms through obtained and produced in organic materials.

NLOF contains growth promoters, plant vitamins, micro humates, amino acids, polysaccharides, enzymes, and macro and micro elements. soil microfloras as agricultural useful values to increase vitality of products, activities of life and activities of the plant root zones. Due to its high concentration, the rate of fertilizer use is 0.5-1 litre per 1 hectare. The organic nature NLOF makes it suitable for use on all crops. Due to the unique composition, NLOF is a powerful plant development activator. Application NLOF provides fast root growth and active development of vegetative mass in general, allowing the crops to fully realize their potential, thereby the rate of basic NPK fertilizer application can be reduced by 25-50%.

Additionally, it has been described that nanonat is a vitamin and mineral source for agricultural products to induce chemical dressing using as 30–50% with biological nitrogen, phosphorus, potassium, calcium, magnesium and the elements in NLOF. There are insufficient studies on fertilizers produced with nanotechnology, although we know it has significant impact in agricultural production. The aim of this study was to produce and determine that the effects of NLOF on the plant growth and yield of various agricultural crops.

II. MATERIALS AND METHODS

Production of fertilizer and Raw materials. Raw materials used to produce NLOF are Cow dunk, press cack of sugar industries, sugarcane molasses, soybean cack from soybean oil industries, castor cack from castor oil industries, potato waste from potato food industries, tapioca vinasse, tobacco plant stem, neem leaves, microbial culture.

All materials first added in a calculated amount to collection vessel and mixed well; then a thick slurry of it added in a digester; which is fulfilled by proper agitator and hitting assembly together with gas discharge facility. The digester temperature is maintain at 33^0 C to 35^0 C. After proper digestion the slurry is filtered through filtration assembly. The filtrate collected and reduce quantity of it is insure from free suspended solid. The final filtrate is used as NLOF.

Treatments and Growth conditions. The study of NLOF was carried out on variety of crops as per its seasons of farming in the deferent farming area at different places. Results of some of them are given here with. NLOF were used in this study as fertilizer source. NLOF contains nano humates, amino acids, vitamin, natural biological substances, micro elements and soil micro floras, Enzymes, Trace elements etc.. The analytical results of NLOF is given in Table-1. The experiment was conducted based on a completely dependent on seedlings were transplanted to experimental area by farmer; after getting information of transplantation from each farmer the experiments are taken in action. NOLF is absorb through foliage of plant.Hence NOLF needs to be sprayed. Depending on the crop, one needs between one litre (extensive crop) and three (intensive crops).

The effect of NOLF fertilizer treatments on the total yield and yield of per plant of each crop was evaluated. Furthermore, the growth promoting effects of NOLF treatments were determined for the average fruit weight, fruit weight per plant, plant length, fruit diameter and length, total soluble solid (TSS) and dry matter of crop. Chlorophyll reading value; a portable chlorophyll meter (SPAD-502; Konica Minolta Sensing, Inc., Japan) was used to measure leaf greenness. SPAD-502 chlorophyll meter estimates total chlorophyll amounts in leaves in a non-destructive method [Neufeldet al. 2006]. For each plant, measurements were taken at four locations on eachleaf, two on each side of the midrib on all fully expanded leaves [Khan et al. 2003].

Data analysis. All data was subjected to Duncan's multiple range tests using SPSS statistical software.

III. RESULTS AND DISCUSSION

The concentrated liquid NLOF received at the end of process from disaster was analyse by various test and the test results shown in table-1 as bellow. The test results shows that the final product contain basic required element for plant growth like nitrogen (N), phosphorus (P), and potassium (K) nutrients required for healthy plant growth; Amino acids – NLOF composition includes 17 amino acids, most of which are essential, are responsible for cell division and actively influence the shape of the root system and ripening of the fruit; Trace elements: like Iron - is a part of many enzymes. Without iron, formation of genes and growth of nuclei is not possible. Zinc - has an important role in plant metabolism, because it is a component of more than 300 enzymes. For plants, especially important is the zinc involvement in the synthesis of the amino acid tryptophan - precursor of phytohormone auxin. Copper - affects the hydrocarbon and nitrogen metabolism via enzymes. Manganese - takes part in the photolysis of water during photosynthesis. Molybdenum - in a plants is a component of the reductase enzyme series. It is closely connected with nitrogen metabolism. The most important enzymes that contain molybdenum are nitroreductase and nitrogenase. Boron - one of the essential trace elements. Lack of boron damages the exchange of sugars. Polysaccharides are sources of energy; Enzymes - catalysts of biochemical processes. Humic and fulvic acids are commonly used as a soil supplement in agriculture, The ability to chelate positively charged multivalent ions (Mg, Ca, Fe and other "trace minerals" of value to plants) is probably the most important role of humic acid, with respect to your soil. and less commonly as a human nutritional supplement. Vitamins: like Ascorbic acid - a strong reductant, antioxidant. Vitamin E (tocopherol) - increases fertility. Carotenoids - prevent excessive top growth.

Table-1. The analytical results of NLOF

Sr.No.	Parameter	Unit	Results
1	Colour of Liquid		Dark Black Colour
2	Odour		Odour less
3	Density	Gm/Lt	1.18g
4	Suspended Solid	%	Nil
	Organic Parameter		
1	Organic Matter	%	22
2	Carbon	%	12.79
3	Nitrogen	%	5.88
4	Phosphorus	%	2.94
5	Potash	%	5.26
6	C/N Ration	%	2.17
	Cations & Anions		
1	Calcium	ppm	712
2	Magnesium	ppm	780
3	Sulphate	ppm	945
4	Potassium	ppm	526
	Micronutrient		
1	Iron (Fe)	ppm	323.01
2	Manganese (Mg)	ppm	78.46
3	Copper (Cu)	ppm	36.26
4	Zinc (Zn)	ppm	64.71
5	Manganese (Mn)	ppm	72.46

Sr. No.	Parameter	Unit	Results
6	Borron(B)	ppm	4.27
7	Molibledenam (Mo)	ppm	Nil
8	Cobalt(Co)	ppm	3.24
9	Nickle(Ni)	ppm	Nil
1	Humic Acid	ppm	635
2	Fulvic Acid	ppm	364
3	Alganic Acid	ppm	Nil
	Amino Acids		Ultra Concentrate
1	Alanine	ppm	53

2	Histidine	ppm	140
3	Threonine	ppm	24
4	Methionine	ppm	13
5	Valine	ppm	53
6	Lysine	ppm	71
7	Cystine	ppm	31
8	Leucine	ppm	65
9	Phenylalanine	ppm	34
10	Tryptophan	ppm	7
11	Isoleucine	ppm	15
12	Serine	ppm	18
13	Glycine	ppm	25
14	Glutamine	ppm	62
15	Proline	ppm	22

As per guideline by ICAR and FCO (2006) The variation of analysis results +/- 0.5% or 0.2ppm

Effects NLOF on various plans are concluded as bellow:

Tomatoes plant yield of control 16.4 t/ha and by NLOF 22.3 t/ha, increased by 35.97%,White cabbage flower(in winter) yield of control 69.2 t/ha and by NLOF 94.5 t/ha increased by 36.56% , Sunflower yield of control 22.5 t/ha and by NLOF 30.4 t/ha increased by 35.11%,Simmilarly by NLOF increased in compare to control for Potatoes 42.31%, for Maize 32.64%, for Wheat 36.21%, for Sugarcane 46.73%. On an average increase in yield found around 38% approximately. Together with yield the values like dry mass, chlorophyll, root growth, plant height, number of leaves also increased in comparisons to control. In short the plant produces more energy needed for its growth and for accumulation of reserves (grain, fruits, roots). Due to its systemic action and transportation effect, NLOF promotes better distribution of minerals throughout the plant in a short time. NLOF stimulates the redistribution of nutrients and reserve substances to young parts that show active growth. The product increases the intensity of photosynthesis and prolongs the life of the plant's photosynthetic apparatus. Better bioavailability of mineral elements (complementary effect). High absorption rate by the plant. Its also affects as a pesticide and insecticide.

There are insufficient studies on fertilizers produced with nanotechnology, although nowadays it is known to have a significant impact in agricultural production. It was reported that Ferbanat applications as foliar can be increased 25–45% in the number of tomato fruit and flowers [Ferbanat 2013]. Previous studies reported that 3.0 L ha-1 doses of Nanonat and Ferbanat applications have improved the yield, plant growth and quality of tomatoes [Ekinci et al. 2012]. Ferbanat application with a sprinkler and drip irrigation system have increased development root of the plant and the number of buds and weight of cucumber plant [Ferbanat 2013]. It was determined that Ferbanat application increased yield in potatoes with 35–40% and in cabbages with 38–42% [Ferbanat 2013]. In another study it was shown that nano-preparation coated nitrogen fertilizer increased the yield of rice and nitrogen absorption amount of rice (35.2% and 42% respectively).

Moreover, previous studies reported that the effects of applications on leaf chlorophyll and dry weight of rice were not significant [Wang et al. 2001]. In a study that examined the effects of nanomaterials on pepper germination, it was determined that the activation time of a 1 hour treatment (water treated with nanomaterial) promoted pepper germination [Wu et al. 2012]. Nitrogen, which is one of the most important nutrients in agricultural production, might be given only very few parts to plant and soil need, although it has been reported that the use of very small nanofertilizer particles is more effective than this rate [DeRosa et al. 2010].

IV. CONCLUSSION

The changing climate, sustainable use of natural resources, environmental factors, urbanization, accumulation of pesticides and over use fertilizers are the most important problems of modern agriculture. New techniques and methods have been used in order to avoid the detrimental effects of these factors. The nanomaterial is one of the new technologies that into almost all areas of our lives and being to be used in agriculture production. The researchers indicate many of the potential benefits of nanotechnology. This study has identified that fertilizers can have important effective on the plants growth and yield of various plants. together with solving problem of waste management of Biomass and reduced Green house Gases(CHG).

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