© 2017 IJSRSET | Volume 3 | Issue 5 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

Utilization of Biogas waste; as Nanoparticle liquid Bio- fertilizer; as a by product and its application on Plant Growth and Yield of White Flower Cabbage.(Brassica oleracea var. botrytis)

P. V. Dholakia
Assistant Professor, The H. N. S. B. Ltd. Science College, Himatnagar , Gujarat, India

ABSTRACT

Various fertilizers are used in order to increase the yield and quality of the cultivated vegetables. Therefore, products obtained from different sources can be used as fertilizer.The similar cheaper product can be obtain and to utilize as a by-product of Biogas industries waste and used as Fertilizers with nanotechnology is one of it. Fertilizers derived from nanotechnology have started to attract attention in agriculture nowadays. This study was undertaken to use by-product and determine the effects of nanotechnology liquid fertilizer on the plant growth and yield of White Flower cabbage [Brassica oleracea var. botrytis (species of Brassica oleracea)]. The collection of By-product was carried out by Yashraj P. Dholakia(Production Manager) of Bharat Biogas Plant, situated at Sundalpur Village, Dist-Kheda,Gujarat,India in 2016.Then carried out fine filtration; to utilize ; at college laboratory. The doses of (1) 20.0, (2) 30.0 and (3) 40.0 L ha-1 of Nanopartical liquid Bioliquid fertilizer (NLBF) were used as fertilizer source. The plant leaves were sprayed with Nano liquid Bio fertilizer suspension until becoming wet at fifteen day intervals for four times during plant growth in the two hector each NLBF1, NLBF2, NLBF3 for selected area between fifty hector of plantation in all three seasons Summer, Winter and Monsoon; at Prantij Town of Sabarkantha District,gujarat state,India The results showed that the fertilizer treatments significantly improved the yield compared to control. According to the average of years the highest yield occurred in NBF 40.0 L ha-1 application. As a result, this study suggested that the foliar applications of waste by-product NBF could improve the plant growth and yield of White Flower cabbage.

Keywords: Biogas waste, liquid Bio- fertilizer, White Flower cabbage, fruit, chlorophyll content, dry matter, yield.

I. INTRODUCTION

The increasing world population has led to increases in food production. To increasefood production it is necessary to use the different technologies in agriculture together with waste managment . 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].

Nanopartical liquid Bioliquid fertilizer liquid have been obtained from Biogas waste. (NLBF) has natural elements as a new generation biostimulator against stress and soil microorganisms through obtained and produced in organic materials. (NLBF) contains micro humates, amino acids, vitamin, natural biological substances, micro elements and soil microfloras as agricultural useful values to increase vitality of products, activities of life and activities of the plant root zones . Additionally, it has been described that (NLBF) 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 it (NLBF).

There are insufficient studies on fertilizers produced with nanotechnology and waste of Biogas, although we know it has significant impact in agricultural production. The aim of this study was to utilize Biogas waste as by-product and to determine that the effects of nanotechnology liquid fertilizers on the plant growth and yield of White Flower cabbage (Brassica oleracea var. botrytis).

II. MATERIALS AND METHODS

Plant and fertilizer materials. White Flower cabbage (species of Brassica oleracea var. botrytis) was used as the plant material. Biogas waste liquid were used in this study as fertilizer source it was first passes through fine filtration process to remove suspended solid. Biogas waste liquid contains micro humates, amino acids, vitamin, natural biological substances, micro elements and soil microfloras. Additionally, it has been described that (NLBF) is a vitamin and mineral store for agricultural products.

20.0, 30.0 and 40.0 L ha-1 doses of NLBF were made up with irrigation water. Treatments used in the study are: Control (none treatment), NLBF1: 20.0 L ha-1, NLBF2: 30.0 L ha-1, NLBF3: 40.0 L ha-1.

Growth conditions and treatments. The study was carried out selected area between fifty hector of plantetion at Prantij Town (23.4367º N; 72.8528º E), of Sabarkantha District,gujarat state,India in all three seasons like Summer, Winter and Monsoon in the year 2016.White Flower cabbage (Brassica oleracea var. botrytis) plants were grown under natural light and natural atmospheric conditions, approximate day/night temperatures in Summer of 42º/28ºC, in Winter 24º/10ºC and in Monsoon 38º/22ºC also relative humidity during Summer 18%, winter 65% and in Monsoon 82% in the span of the experiment. The experiment was conducted based on a completely randomized design with three replicates area chosen in the just planted White Flower cabbage agricultural field. Seeds(Hybrid, Known as namely **LUCKY** in local area) were sown in the same field in a selected seedling area.

The soil in the experimental area had 12.8% sand, 48.2% silt and 39% clay. Some of chemical properties of the soils were as follows: organic matter 9.0 g kg-1, soil pH 7.2 , plant available P 6.8 mg kg-1, exchangeable K 0.85 g kg-1 and total N 0.7 g kg-1. The basic fertilizers were applied in each plot at the rates 200 kg N ha-1 as ammoniumnitrate, 125 kg P ha-1 as triple super phosphate and 150 kg K ha-1 as potassium sulphate before planting.

About 35 day-seedlings were transplanted to experimental areal at 45 × 45 cm row spacing distances in all three seasons of the years. Plants from each treatment were sprayed with each suspension of fertilizers until getting wet at ten days interval three times during plant growth, beginning two weeks after transplanting. The study was terminated in the 92th day of all seasons.

The effect of fertilizer treatments on the total yield and yield of per plant in cucumber was evaluated. Furthermore, the growth promoting effects of

fertilizer treatments were determined for the average fruit weight, fruit weight per plant, fruit diameter, total soluble solid (TSS) and dry matter of White Flower cabbage fruits.

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 each leaf, 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.

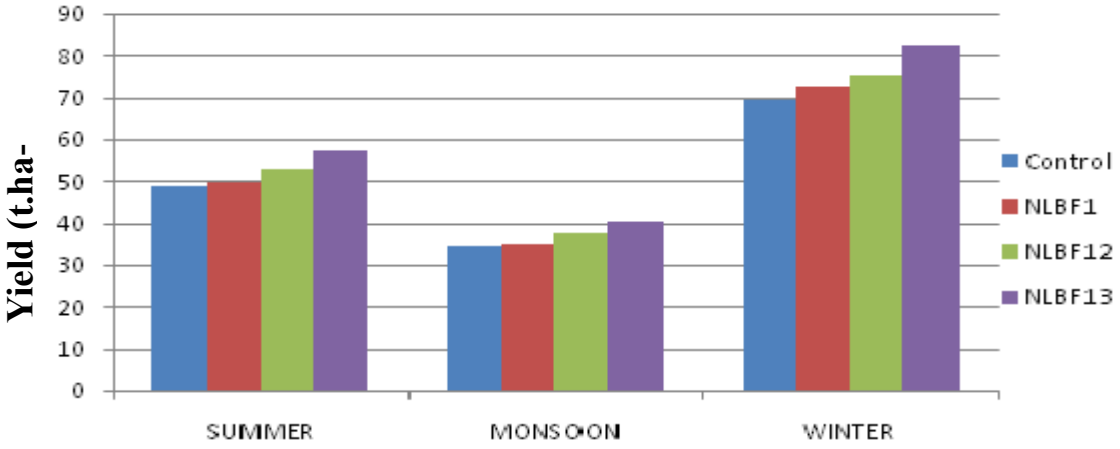
III. RESULTS AND DISCUSSION

The effect of nanotechnology liquid Bio fertilizer on total yield is shown in Fig. 1 and Table 1 , yield per plant, average fruit weight, fruit diameter, TSS, dry matter, plant length, and chlorophyll reading value of White Flower cabbage are presented in Table 1. Nanotechnology liquid Bio fertilizers significantly affected the total yield, yield of per plant, fruit weight and dry matter statistically. While the highest yield (82.338 t ha-1) and yield per plant (1.669 kg plant-1) were obtained from NLBF 40.0 L ha-1 application in Winter seasons of the year (tab. 1). According to the average of all seasons of the years the highest yield (57.512 t ha-1) in Summer, (40.336 t ha-1) in Monsoon, (82.338 t ha-1) in Winter were occurred in NLBF 40.0 L ha-1 application (fig. 1). The effect of nanotechnology liquid Bio fertilizer on the average fruit weight, diameter, TSS, plant length and chlorophyll reading value have changed by season of the year, although the highest values of these parameters were obtained from plants applied with treatments. The lowest values of these parameters were recorded in the control (tab. 1). We observed the highest average fruit weight (1.669 g), fruit diameter(19.2 cm) , the highest TSS (6.67%), the highest dry matter (8.12%) and chlorophyll content (45.32) from NLBF 4.0 L ha-1 applications in Winter season. The result of this study showed that nanotechnology Bio liquid fertilizer (NLBF) treatment increased the parameters of plant yield and growth compared to the control in White Flower cabbage.

Table 1. The effect of nanotechnology liquid Bio fertilizers on growth, some fruit characters, chlorophyll reading value and yield of White Flower cabbage (Brassica oleracea var. botrytis)

Season of Year	Application	Yield (t ha-1)	Yield of per plant (kg)	Average fruit weight (g)	Fruit diameter (mm)	TSS (%)	Dry matter (%)	Plant length (cm)	Chlorophyll reading value
Summer	Control	48.826	0.990	0.990	11.0	5.11	6.81	45.7	41.86
	NLBF1	49.802	1.009	1.009	11.3	5.13	6.84	48.2	42.07
	NLBF2	52.732	1.080	1.080	11.8	5.17	7.23	49.5	43.35
	NLBF3	57.512	1.169	1.169	13.0	5.22	7.48	53.9	43.44
Monsoon	Control	34.476	0.690	0.690	8.7	4.72	5.22	32.5	38.42
	NLBF1	34.958	0.705	0.705	8.8	4.74	5.34	33.0	38.42
	NLBF2	37.578	0.752	0.752	9.4	4.78	5.37	35.4	38.45
	NLBF3	40.336	0.807	0.807	10.8	4.82	5.43	38.0	38.56
Winter	Control	69.192	1.403	1.403	16.2	6.21	7.63	76.2	43.57
	NLBF1	72.652	1.474	1.474	17.4	6.34	7.77	80.0	44.72
	NLBF2	75.419	1.532	1.532	17.8	6.52	7.86	84.3	44.87
	NLBF3	82.338	1.669	1.669	19.2	6.67	8.12	90.6	45.32

NLBF1 – 20.0 L ha-1, NLBF 2 – 30.0 L ha-1, NLBF 3 – 40.0 L ha-1,



Application During Seasons of a Year

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]. This effect is also provided with other plant nutrients. The nutrients which are available for the plant can be encapsulated in nanomaterials (nanotubes or nanoporous materials), coated with thin protective polymer film or added as particles or emulsions of nanoscale [DeRosa et al. 2010, Srilatha 2011, Ditta 2012]. As a result of this study it can be expressed that the fertilizer used in this study showed this effect and becomes available for White Flower cabbage plants.

IV. CONCLUSSION

The changing climate, Waste management, 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 plant growth and yield of White Flower cabbage (Brassica oleracea var. botrytis) together with solving problem

of waste management of Biogas with extra earning which helps to sustain Biogas plant.

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