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CO –COMPOSTING OF COCONUT HUSK WITH POULTRY EXCRETA AND ITS EFFECT ON GREEN GRAM PLANTS

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ABSTRACT

A major problem facing the poultry industry and coconut husk are the major dumping of wastes of excrta and litter which may impose pollution problems leads to environment and economical sustainable management technologies are introduced. Most of the excreta from the poultry farm is currently translocated to agricultural field which contain nutrients and soil amendment. When poultry excreta is directly implement under soil and do not favour fixation of the supplements of nutrients directly to soil. Poultry excreta and coconut husk mixture provide a good source of nitrogen, phosphorus and trace nutriets for production of crops indicating that land application of this valuable resource. The composting of coconut husk having few nitrogen content and more C: N ratio with the birds excreta having huge nitrogen and less C : N ratio has been carried out to reduce the current situation in coconut husk composting. The high moisture was observed in coconut husk (86%) but it reduced to 23% in treatment with poultry manure. The maximum growth in terms of height was observed in S_4 treated plants and moderate growth was found in equal proportion of coconut husk and poultry excreta. This was due to limited supply of NPK which support the growth of green gram plants.

Keywords: poultry excreta, coconut husk, manure

INTRODUCTION

Coconut is an important crop and its products implicates on the agrarian economy of India. The coconut husk is the raw material is coir industry. Coconut oil is widely used in the production of shops, hair oil cosmetics and coconut water a famous quencher of health nutritive. Coconut husk has been widely used in agriculture due to its porous nature and WHC rendering it suitable for employing as planting materials even in drought stress (Anbuselvi,2010).. The coir pith and coconut husk contain high carbon to nitrogen (C/N) ratio, 70/ 185, together with 35% to 54% lignin content (Ravindranath (1991,George Thomas,2013). Coconut husk is highly resistant to biological degradation. *Anabaena sp* of *c*yanobacteria was found to involved in maximum degradation of coconut husk(Anbuselvi,2009). Coconut husk enables to maintain high amounts of nitrogen and the absorptivity K,Na, Ca and Mg complex of exchangeable. It has also been marked for its huge potassium content and little bulk density and particle density (Sudarut,2012).

The exhaustion of nutrient reserve of soil through organic manures are to consistent increase in agriculture production. Indian soil is a combination of sand silt and clay. The crop releases large quantity of plant nutrients of NPK at rapid crop rotation has been estimate at125kg/annum and in depletion of the nutrient reservervoir of soil(George Thomas,2013) .The quality of agriculture in the environment with latest technology and eco-friendly procedures is to make manure and making conditioner of soil at a cheaper rate without use of chemical fertilizers (Sims and Wolf 1994; Bernal,1998, Moore et al., 2006).

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There are many conditions associated with land application of waste by-products in the form of manure have impact on the spoilage of water in ground as well as with nitrogen and phosphorus Enujeke et al., 2005). The decomposed by-products may also having trace elements (Bolan et al., 2003; Jackson et al, 2003; N.S.Bolan,2010; Epstein and Moss, 2006; Toor and Hunger, 2006).Organic manures stimulated the physicochemical and microbiological properties of the soil in technical farming. The repeated recycling of organic wastes in the soil most significant method of maintaining maximum levels of soil should become a common feature of technically based agriculture. In many generations the plant and animal waste can be used as a raw material for manuring which supply nutrients for plant growth in India.

Poultry manure contains nutrients which can be intermixed into biofertilizer making programs of soil fertility management inorder to show the imbalance of nutrients and its reduction and with soil spoilage. Value of poultry manure depends on nutrient composition and availability. The quantity of composting coir pith with solid poultry manure was carried out alongwith lime and rock phosphate (George Thomas,2013).The composting of coconut husk having minimal N content and huge C : N ratio with the poultry excreta having high N content and less C: N ratio has been carried out to solve the current scenario in composting.. The scope of the current work was to evaluate the co-composting of coconut husk with solid poultry excreta and to check the quality of compost manufactured by comparing with other animal excreta for its use in agriculture.

MATERIALS AND METHODS

Coconut husk was collected from a coconut fiber extraction unit at Nagercoil, Tamil Nadu used for the study. Solid poultry excreta was collected from a broiler poultry plant, Nammakkal which forms a mixed farming system at Selaiyur, Chennai .The experimental setup was carried out in large cement tanks in an aerated condition in the yard . The temperature was in the range of 25°C to 30°C and relative humidity (85% - 95%). The experiment was performed completely randomized design of five treatments thrice replications. The treatments were: S_1 – coconut husk (1 kg) +poultry manure (9 kg); S_2 – coconut husk (1.5 kg) + poultry manure (8.5 kg) + S_3 – coconut husk (2. kg) +poultry manure (8 kg); S_4 – coconut husk (2.5 kg) + poultry manure (7.5 kg) S_5 – coconut husk (5. kg) +poultry manure (5 kg); and C_1-control coconut husk and C_2- poultry excreta.(10 kg). The dimensions of length, breadth and height 1.6 × 1.0 × 0.40 m were constructed .The bedding material having moisture was maintained approximately 50% by water spraying on the surface using a spray can for every two days. The composting process was maintained for 45 days. The air dried product was collected and stored in polythene bags used for experiments. The physicochemical properties of compost manure were analyzed. This manure was subjected for growth of green gram plants.

RESULTS AND DISCUSSION

PHYSICAL CHARACTERSITICS

Table 1: Phyical features of composting of coconut husk and poultry manure

Test Samples	**pH**	**Temperature**	**Moisture content (%)**	**C:N ratio**

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S_1 – coconut husk (1 kg) +poultry manure (9 kg)	6.8	39	57	20.3
S_2 – coconut husk (1.5 kg) + poultry manure (8.5 kg)	6.5	38	49	22.6
S_3 – coconut husk (2. kg) +poultry manure (8 kg)	6.3	40	38	27.4
S_4 – coconut husk (2.5 kg) + poultry manure (7.5 kg)	7.0	37	32	30.8
S_5 – coconut husk (5. kg) +poultry manure (5 kg)	6.5	38	23	23.5
C_1-control coconut husk(10kg)	7.5	36	86	26.6
C_2- poultry excreta.(10 kg)	6..5	38	63	.18.6

The visual observation of texture, color and odor were noted during the whole period of composting. The composting materials appeared as a smaller particles and brown in color. The compost became loose, pulverize ,humus fragrance and blackish brown color at the end of maturing period.

Temperature

According to Golueke (1991) the temperature evolution directly indicated the bio-oxidative phase. The temperature of all compost having greater than 40ºC and maintained for atleast 5 days to the pathogenic microbes. The temperature of all treatments was rapidly declined to that of ambient temperature. The temperature remain constant with slight variation indicating the maturation stage and color became brown and loose in character(Kuo,2010,Diaz and Savge,2007). This composting could reactivates the process by increasing the oxygen availability to microbes (Cayuela et.al,2006). The temperature of all samples were rapidly reduced after 10 days of composting except free coconut husk and poultry treatments(Table1). The co-composting has significantly raisng interest as a method of different livestock based fertilizers (Ogunwande et.al, 2008).

Moisture

The moisture content of coconut husk was found to be 86%.. This was due to WHC and translocation of nutrients(Anbuselvi,2010). The poultry excreta showed 63% before treatments and reduced to 20-23% after treatments with different proportions of coconut husk.. The moisture loss was carried out at the maturation stage with increased rate of C:N ratio when composting of raw chicken manure - saw dust mixture.(Ogunwande et.al,2008). The composting of coconut husk with poultry manure reflected physicochemical changes enzyme activity and decline in water extractable carbon, inorganic nitrogen and and phytotoxicity loss.(Tiquia et.al.2001)

pH

The pH of coconut husk and poultry manure was found to be slightly acidic at initial stage. In any compost preparation, pH raised from 4.5 to 6.2 on the first day to 7.2-8.0 on second weeks and

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slowly reduced to neutral on last stage of composting. pH was found to be gradually increased due to catabolic activity with the release of organic acids (Salisha and devarajan,2007) and mechanism of ammonia formation takes place during breakdown of organic matter (Mahimai raja et.al,1994). The pH of compost were rapidly declined after two weeks of composting, due to the secretion of organic acids and phenolswhich obtained during lignocelluloses biodegradation in the compost (Salisha and Devarajan,2007). The addition of bulking agent of coconut husk optimizes space,WHC, moisture, C:N ratio, particle density, pH and structural changes on composting rate (Neves et.al.,2009,Z.Anwar et.al,2015).

C:N ratio

Carbon to nitrogen proportion is a main factor in the composting(Gloueke,1991). The C:N ratio ranges from 11 to 105 depends on the source (Ghosh et.al.,2007). The starting material having high C:N ratio will cause a decline rate of composting (Tuomela et.al.,2000). The coconut husk has 26.6 and poultry excreta has 18.6 C:N ratio and 20.3-30.8 in S_1 to S_4 samples and utilization of C:N ratio of 23.5 in equal proportion of coconut husk and poultry excreta. The reduction of C:N ratio implies an raise in the degree of humus. This was served until third week of post composting and became stable.

NPK Levels

Addition of composted poultry coconut husk significantly increased the growth factors in the green gram plants, indexing its use as an organic input. This modern techniques can be adopted for making the organic rich manure produced by coconut and poultry based small scale industries , high quality manure which can be used in farming at local levels. The results reflected that the composting technique was rapidly stimulated by poultry manure.

The nitrogen content detected gradual raise in all samples and the values raised to S_4, poultry manure. The coconut husk and poultry excreta contained 0.22mg kg-1 and 0.35 mg kg-1 of nitrogen. Some researcher also reported that the total N from 1.7-2.1 mg kg-1 raised in the composted raw poultry litter and vegetables waste Hachicha *et al*. (2009) .The coconut husk was at the starting period 0.74mg kg-1) of phosphorus. These treatments showed slight raise of P from 0.46 mg kg-1 to 0.91 mg kg-1 in all samples except S_5. Similar findings of Cooper band *et al.* (2002) who observed huge P values in the litter of poultry after treatments. Potassium level of coconut husk was found to be 0.5mg kg-1 when compared with raw poultry excreta(0.22mg kg-1). The sudden declined state was noted at the early stage and reached maximum of 1.42mg kg-1 in case of potassium(Fig 1).

Figure1: NPK levels of co-composting coconut husk and poultry excreta

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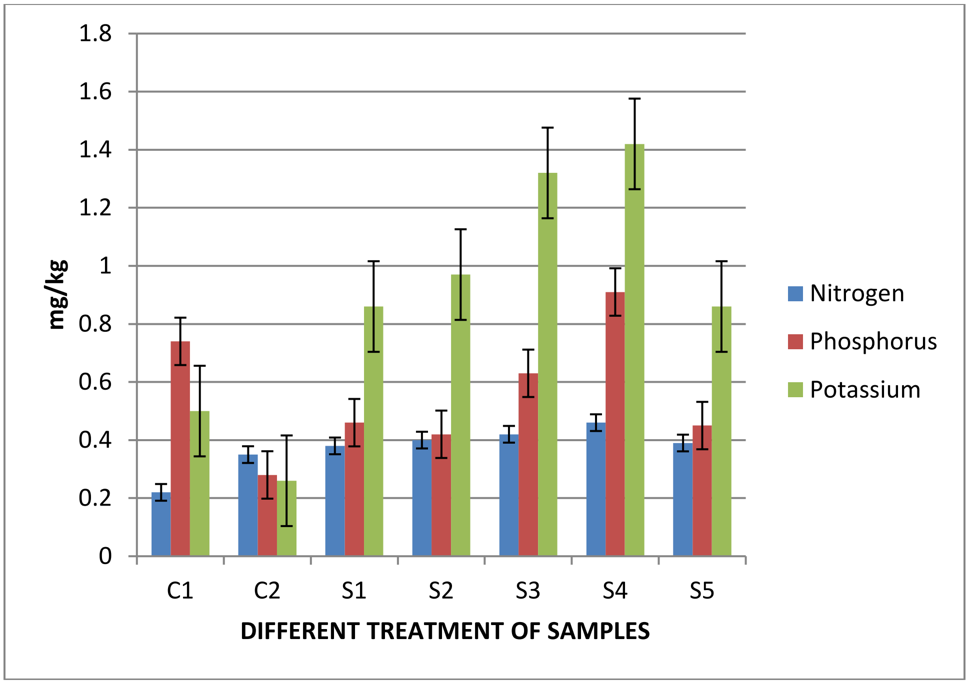

Coconut husk has a rich content of carbon and chicken manure has a high content nitrogen and induce quicker coconut husk degradation leads to heat production by mixing of poultry manure. The effective breakdown of the complex plant constituents by high temperature is leads to their breakdown and reduction of pathogenic microbes.

The growth of green gram plants indicated that the maturity of compost used as an organic inducer in crop manufacturing. The analysis of poultry and fresh coconut husk by mixing with potting mixture showed the maturity of composted coconut husk to help growth characteristics and nodulation of green gram. The plant growth parameters of No of leaves, length of shoot and root, and plant dry weight were significantly more in green gram plants grown in with composted manures. The maximum growth in terms of height was observed in S_4 treated plants and moderate growth was found in equal proportion of coconut husk and poultry excreta. This was due to limited supply of NPK which support the growth of green gram plants (Fig 2).

Figure 2: Effect of co-composting manure on growth of pea plants

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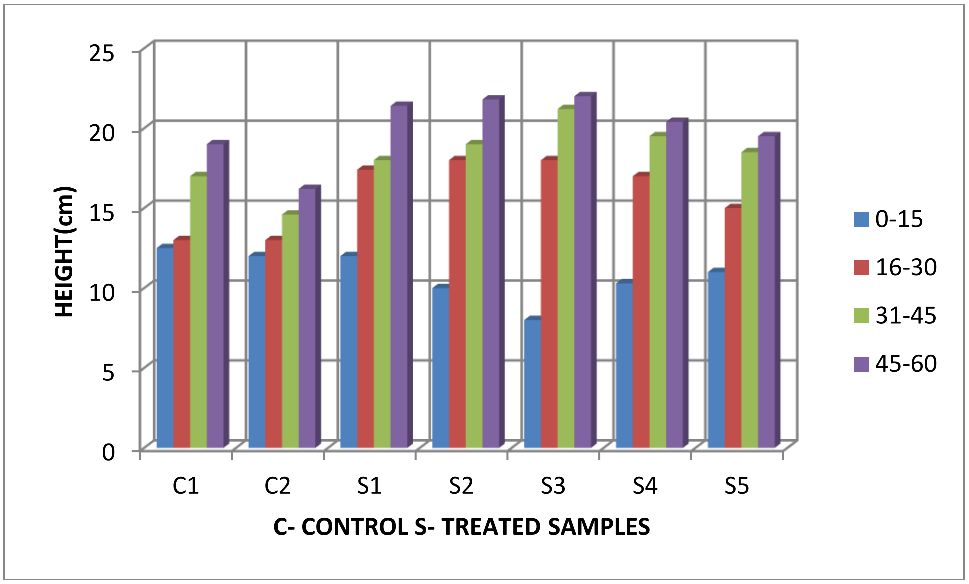

Figure 3:GC–MS spectra of Phytochemicals in root nodule of green gram treated with coconut husk manure

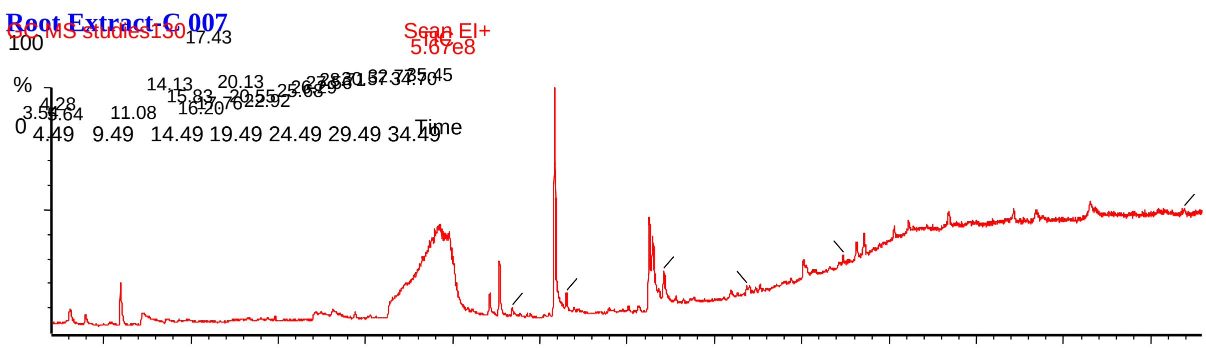

Table2: GC-MS analysis of phytochemials identified from toot nodules of green gram treated with coconut husk manure

No	RT	Name of the compound	Molecular Formula	Peak Area %

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1	3.54	Butane, 1,1-diethoxy-3-methyl-	$C_9H_{20}O_2$	5.03
2	3.97	Hexanoic acid, ethyl ester	$C_8H_{16}O_2$	1.05
3	4.98	Propane, 1,1,3-triethoxy-	$C_9H_{20}O_3$	6.01
4	5.64	Octanoic acid	$C_8H_{16}O_2$	2.20
4	9.49	Decanoic acid, ethyl ester	$C_{12}H_{24}O_2$	0.65
9	16.20	Ethanol, 2-(9-octadecenyloxy)-,(Z)-	$C_{20}H_{40}O_2$	3.91
10	17.43	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	33.29
11	17.76	Hexadecanoic acid, ethyl ester	$C_{18}H_{36}O_2$	2.42
12	20.13	9,12-Octadecadienoic acid (Z,Z)-	$C_{18}H_{32}O_2$	14.79
13	20.55	Oleic Acid	$C_{18}H_{34}O_2$	7.03

Figure:4 GC-MS analysis of phytochemials identified from root nodules of green gram treated with poultry-coconut husk treated manure

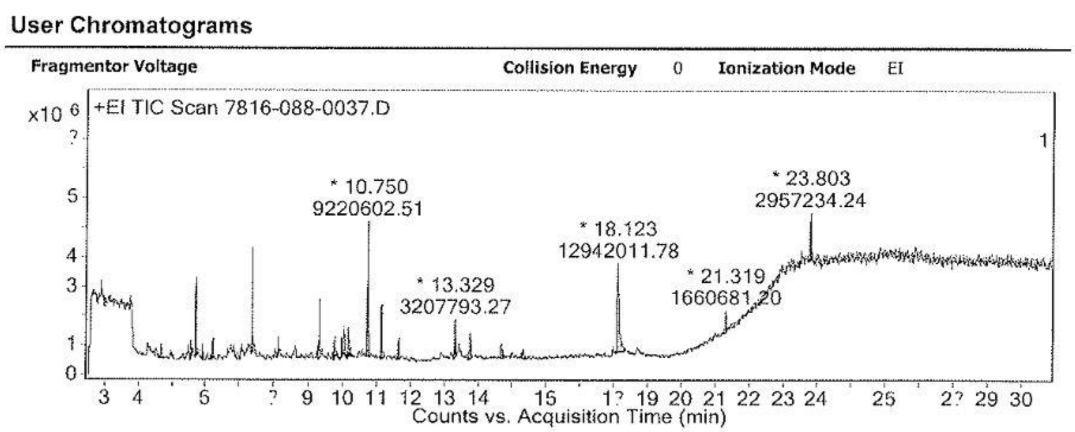

Table:3 GC-MS analysis of phytochemials identified from root nodules of green gram treated with poultry-coconut husk treated manure

No	RT	Name of the compound	Molecular Formula	Peak Area %
1	2.88	Tetra acetyl-d-xylonic nitrile	$C_{14}H_{17}NO_9$	2.02

2	3.76	9-Octadecenoic acid	$C_{28}H_{44}O_4$	2.11
3	5.57	7-Methyl-Z-tetradecan-1- acetate	$C_{17}H_{32}O_2$	2.05
4	5.64	Octanoic acid	$C_8H_{16}O_2$	3.53
4	10.75	Hexadecanoic acid, methyl ester	$C_{17}H_{34}O_2$	4.92
5	18.12	9-Octadecenamide	$C1_8H_{35}$ NO	3.20
6	20.55	Oleic Acid	$C_{18}H_{34}O_2$	3.91
7	21.31	Phen-1,4 diol,2,3 dimethyl 5-trifluoromethyl-	$C_9H_9F_3O_2$	2.62
8	23.80	Ethy l iso-allocholate	$C_{26}H_{44}O_5$	4.02

Phytochemical screening-GC MS study

3-TrifluoroacetoxypentadecaneButane,1,1-diethoxy-3-methyl-Propane, 1,1,3-triethoxy-Phthalic acid, butyl undecyl ester, Octanoic acid Hexadecanoic acid, ethyl ester ,sugars and and their derivatives were observed only in coconut husk treated samples. Oleic acid was found in both samples.9,12- Octadecadienoic acid (Z,Z)- was found to be maximum (14.79) in coconut husk treated sample. and similar results were observed in coir waste samples (Anbuselvi et.al,2012) The amount of n-Hexadecanoic acid was observed as an rapid arc of 33.29 in coconut husk treated samples. n-Tetra acetyl-d-xylonic nitrile,Octa decenoic acid, 7-Methyl-Z-tetradecan-1- acetate aximum peak of Phthalic acid, butyl undecyl ester Phen -1,4 diol,2,3 dimethyl 5-trifluorometh y and l Ethy l iso-allocholate were observed in poultry excreta treated sample.

CONCLUSION

Poultry manure has been used in the stabilization of organic wastes of coconut husk having lignin and cellulose, rich inwood wastes. There are many findings from this study on the use of coconut husk as a bedderl in poultry farms, The poultry droppings can induce coconut husk on composting. The reuse of poultry litter as a valuable NPK and good conditioner of soil. It based on latest developing technologies to produce biproducts which supports the farmers, industrialist, and design of tools for waste recycling into valuable application at local levels.

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