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Production of biocompost by cellulosic waste

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Abstract
Annually, grate amount of cellulose wastes, which could not be measured in many billion of tones, are produced worldwide as residues from agricultural activities and industrial food processing. Consequently the use of microorganism in order to remove, ameliorate these potential polluting material is a real environmental challenge, which could be solved by a focused research concerning efficiency method applied in biological degradation processes. In this respect we were concern the biological degradation of cellulosic waste from different part of society which include garden waste, paper waste and fruit waste, vegetable waste. This whole processes of the biodegradation is carried out by the enzymatic activity. For this operation cellulosic waste were allowed to degrade for four month with natural conditions.
Present investigation bacterial species *Brucella* and *Pseudomonas* and fungal species *Aspergillus, Fusarium, Trichoderma, Monospora* were isolated from cellulose bio-compost.

Keywords: Cellulytic microflora and Biocompost.

1. Introduction
Cellulose is an organic component with the formula (C6H10O5)n, a polysaccharide consisting of linear chain of several hundred to many thousand of B(1 → 4 linked D-glucose unit).
It is a most important structural component of the primary cell wall of green plants, and algae. It is testless and odourless contain of the cell wall and also insoluble in water cotton fiber represent the purest natural form of cellulose, containing more than 90% of this polysaccharide.
Cellulose waste is a biodegradable material generated in large quantities from various source like, domestic industries, municipalities and market. Disposal of such waste in society is creating serious problem of the pollution which is hazardous to the environmental. To avoid such a hazard it is necessary to the dispose manner in short proper degradation of the waste containing the cellulose should be decompose in proper manner with the help of cellulose degrades and this degraded cellulosic waste (bio-compost) we can used as biofertilizer to enhance to fertility of soil. The purpose of this work was to degrade the cellulosic waste and to check its efficiency as a biofertilizer on other hand to isolate the cellulose degrader.
The purpose was achieved through different steps, biodegradation of cellulosic waste, isolation of cellulose degraders and application of biodegraded cellulosic compost to crop as a biofertilizer to boost up the soil fertility.

2. Material and Methods
- **Container:** Plastic bags, white metal and steel container with hole at bottom.
- **Culture media:** Nutrient agar medium, with enrichment medium (g/lit) NaCl 6.0; $(NH_4)_2$ SO_4, 1.0; KH_2 PO4, 0.5; $MgSO_4$ 0.1; $CaCl_2$ 0.1 and supplemented with 0.1% carboxymethyl cellulose (CMC) as cellulose source, selective media *Pseudomonas* isolation agar, Brucella agar base and Potato dextrose agar for fungal isolation were used.
- **Sample Collection:** Sample was collected directly from society, garden, institute and temple and allowed to degrade for 3 to 4 month in different container with natural condition.

- **Isolation of cellulose degrader:** Streaking plate method on enrichment media and selective media were used to isolate the cellulose degrader.
- **Chemical analysis of bio-compost:** For the chemical analysis of freshly degraded cellulosic waste (Biocompost) were sent to soil testing department of Akola, to analyze their Nitrogen (N), Phosphoures (P), Potassium (K) content.
- **Cellulytic activity of isolated bacteria and fungi:** In this test isolated bacteria and fungi were spot inoculated on nutrient agar and potato dextrose agar containing cellulose powder and are incubated at 37 °C for 48 hours. To check zone of cellulose degradation plate were treated with 1% Congo red and 1 m NaCl.
- **Potency test on plant:** Potency test was done on the plant to see how effectively it work on plant. The test was done on spinach plant.

Observation and Results

Table 1: Chemical analysis

Sr. No.	Test	Paper	Grass	Banana
1	pH	7.3	7.3	8.4
2	Salinity (E.C.)	0.32	0.33	0.44
3	Organic carbon	0.18	0.25	0.39
4	P_2O_5	31	3	29
5	K_2O and Na	1075	457	511

Table 2: Cellulose activity of Bacteria

Sr. No.	Isolate	Grass	Maize	Banana	Paper
1	*Pseudomonas aeurginosa*	21 mm	-ve	15 mm	14mm
2	*Brucella*	10 mm	-ve	0.9 mm	13mm

Table 3: Cellulolytic activity of fungi

Sr. No.	Fungi	Cellulolytic activity
1	*Aspergillus niger*	3 cm
2	*Fusarium oxysporum*	4 cm
3	*Trichoderma harzianum*	2 cm
4	*Forsecaea pedrosi/monospara*	2.5 cm

3. Discussion

Cellulosic waste is a most dangerous problem is increasing in the society, proper degradation of the cellulosic waste and utilization as a biofertilizer help to overcome the problem of pollution caused by cellulosic waste.

The first table shows the cultural characteristic by the organism, isolated from the four biocompost which were inoculated on Nutrient agar with enrichment of carboxymethyl cellulose and then isolated colonies were again inoculated on selective medium, incubated at 37 °C for 24 hours at pH 7. (Oyeleke, S.B. and Okusanmi T.A., 2008; Bashir Ahmed, Sahar Niger *et al*., 2013; Fagude O.E. and Bamigboye O.O., 2012; Behera B.C., S. Parida *et al*., 2014; Sumit kumar Dubey, Rakesh kumar Meena *et al*., 2014; [18, 3, 6, 2, 26]

Table number two indicate the biochemical nature of the isolated bacteria from 4-Biocompost that are Indole –ve, MR –ve, Vogas prouskar –ve, but citrate +ve. (Sumit kumar Dubey, Rakesh kumar Meena *et al*., 2014) [26]

In third table Sugar test were performed Pseudomonas isolated from four sample shows acid and gas production in glucose and lactose, but not shows any fermentation sign in mannitol. Fermentation of lactose in supported by the Sumit kumar Dubey and co-worker in 2014.

Fourth table enzyme test result are given. Pseudomonas shows catalase, oxidase and gelatinase positive. On other hand Brucells shows negative result for catalase and positive result for oxidase and gelatinase enzyme test. On other hand study of Sumit kumar Dubey and co-worker shows the –ve result for gelatinase test in Pseudomonas.

Cellulolytic activity of the isolated Pseudomonas from grass biocompost is highest shows 21 mm zone, Pseudomonas isolated from Maize biocompost show –ve cellulolytic activity and on other hand it gives 15 mm zone when it isolated from Banana biocompost and 14 mm isolated from paper biocompost.

Brucella isolated from grass biocompost gives highest cellulolytic activity 10mm, maize biocompost shows negative cellulolytic activity but Brucella from Banana and paper biocompost gives cellulolytic zone about 0.9 mm and 13 mm. (Table No. 4).

From the four biocompost made up of garden waste, paper waste, Banana waste and maize waste. Four fungal species are isolated that are *Aspergillus niger, Fusarium oxysporum, Trichoderma harzianum* and *Faresecea Pedrosi / Monospora* out of this all fungi *Fusarium oxysporum* show's highest cellulolytic activity with 4mm cellulolytic zone and *Aspergillus niger* gives the 3 mm zone. The highest cellulose production by this fungus is supported by the Sanjogita Sharma and Geeta Sumbali, 2014, in their study. On the other hand cellulolytic zone given by the Trichoderma harzianum is 2 mm and it's cellulolytic activity is agreed by matching result with research of study by M. Rubeena, Kannan Neethu *et al*., 2013. Lastly Monospora fungal species gives the cellulolytic zone of 2.5 mm. (Table No. 6).

In chemical analysis table No. 7 pH, Salinity (E.C.), Organic carbon, P_2O_5, K_2O and Na were tested. From the obtained result, pH, Salinity, Organic carbon and P_2O5 value of the bio-compost made up of Banana waste is highest, but amongst of K_2O and Na in the biocompost made up of paper is highest.

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