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Research Paper

Effects of bio-fertilizer in agriculture sector

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Abstract
The application of agriculture fertilizer could potentially enhance the growth of crops as well as to reduce the economic cost of the farmer. Present study endeavored to emphasize the microbiological aspect of the use of organic fertilizer and its impact on the shelf life of the vegetables collected from the different area of the Dhaka City, Bangladesh. Total 30 samples (15 treated with organic fertilizer and 15 fresh vegetable) were microbiologically examined through several common, traditional, and replicable cultural and biochemical tests. Both samples were found to be contaminated with total viable bacteria and fungi. The elevated range of contamination was found in fresh vegetable up to 10^8cfu/g for total viable bacteria and 10^7cfu/g for fungi while the contamination range was comparatively lower in organic fertilizer treated vegetable (e.g Total viable bacteria 10^5cfu/g and fungi 10^4 cfu/g). The existence of specific pathogens such as Staphylococcus spp., Pseudomonas spp., and Bacillus spp. was found to be harbored in both categories of samples.However, the elevated range of pathogenic contamination was noticed in case of fresh vegetable samples up to 10^6cfu/g while the load was found in organic fertilizer treated vegetable within a range of 10^2 -10^4cfu/g.

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I. Introduction

Increased trash production from incorrect disposal is a major global challenge at various population levels (Woulters*et al*., 2005). One of the greenest ways to turn this enormous volume of waste into a useful resource is by composting (Gajdos, 1992). Since 'rotting' or degradation of organic waste by microbes occurs naturally during composting under regulated settings (Taiwo&Oso, 2004; Peters *et al*., 2000). Compost is organic matter that has decomposed and can be added to soil or used as a growing medium for plants. Composition and succession of microbial communities during the composting process determine the compost's quality (Taiwo&Oso, 2004; Peters *et al*., 2000). As a microbiological process, composting involves a variety of mesophilic, thermotolerant, and thermophilic aerobic microorganisms (such as bacteria, actinomycetes, yeasts, and fungus) (Beffa*et al*., 1996).

Compost has been used for millennia to provide the essential nutrients for crop growth, making it a crucial biofertilizer for any farming enterprise. In addition to providing a wealth of nutrients for crop production, compost also boosts soil organic matter, increases the ability of fine-textured clay soils to drain properly, increases the water-holding capacity of coarse-textured sandy soils, acts as a source of slow-release nutrients, prevents water erosion, and encourages the growth of earthworms and other beneficial soil organisms. Studies have shown that, *Azospirillum*promotes plant growth (Cohen *et al*., 2007). Organic manures can be used as alternative to mineral fertilizers for improving soil structure (Dauda*et al*., 2008). The earthworms used in vermicomposting provide biological control against various plant pathogens (Hoitink and Grebus, 1994).

However, several studies have shown that several food born outbreaks of bacterial infections were associated with the consumption of raw fruits & vegetables contaminated by manure (Cieslak, 1993; Chapman, 1997; Itoh, 1998; Little, 1999). Therefore, the use of compost for agricultural or residential purposes may potentially raise the risk of disease transmission through direct human contact with the material, microbial

contamination of food crops, or environmental contamination that may sustain diseases in the animal population's diet(Jones and Martin, 2003).

Along these lines, current investigation attempted to ponder the propagation of microbial contamination in fresh and organic fertilizer treated vegetable as well as the drug resistance pattern of the isolates.

II. Materials and Methods

Study area, sampling and sample processing

Thirty samples of two different categories i.g., organic fertilizer treated vegetable and fresh vegetable were randomly collected from different market during January 2014-March 2014 following standard protocol (APHA, 1998).

Isolation and enumeration of microorganisms

Estimation of total viable bacteria and fungi.

The enumeration was performed by using 0.1 ml of each sample onto nutrient agar (NA) and Sabouraud Dextrose Agar (SDA) for total viable bacteria (TVB) and total fungal load respectively followed by spread plate technique. The plates were incubated at 37 ºC for 24 hours and at 25 ºC for 48 hours for total viable bacteria (TVB) and total fungal respectively. According to the standard guideline (Cappuccino and Sherman, 1996).

Estimation of coliform count and fecal coliform count (FCC)

An aliquot of 0.1 ml of each sample was spread on to MacConkey agar, and membrane fecal coliform agar plates for the estimation of coliform (*E. coli* and *Klebsiella* spp.) and fecal coliform (FCC), respectively. For coliform count, all plates were incubated at 37 °C for 24 hours while for estimating the fecal coliforms, incubation at 44.5 °C for 24 hours was carried out. Eosin methylene blue agar media were further used for the observation of production of green metallic sheen (if any) characteristic of *E. coli* strains.

Estimation of Staphylococcus* spp.*, and Pseudomonas spp.

An aliquot of 0.1 ml of each sample was spread on to mannitol salt agar and cetrimide agar for the isolation of *S. aureus* and*Pseudomonas* spp.,respectively. Afterwards, plates were incubated at 37 °C for 24 hours. For the isolation of clostridium 1 ml of eachsampleblendsweremixed in sterilenormalsaline in a ratio of 1:8 followed by heatingat 80°C for 15 minutes in order to killvegetativecells of themicroorganisms. Fromhere, one ml of eachsampleswereincubatedfor 4 hours at 37 °C with 9 ml of fluid thioglycolatebroth.

III. Results and Discussion

Since the country's independence, the agricultural sector has been essential to Bangladesh's overall socioeconomic development. The industry makes a significant contribution to the creation of jobs, GDP expansion, and the expansion of other industries. The current section of this essay addresses the contribution of the agricultural sector to Bangladesh's economy (Cohen et al., 2007; Rahmman 2020). To ensure the better production of crops, reduce the health and environmental risk and soil degradation scientists suggested that the use of organic fertilizer (bio-fertilizer) is more effective than the chemical fertilizer (Mahanty et al 2017). Present study showed that the bothsamples were found to be highly contaminated with total viable bacteria and fungi up to the range 10^8& 10^7cfu/g respectively (Table 1).

Table 1. Comparativemicrobialload (cfu/g) withintheorganicfertilizertreatedvegetables and freshvegetablesboughtfrommarket

Microorganism	**Organicfertilizertreatedvegetables n=15**	**Freshvegetables n=15**
TVBC	6.3×10^5	2.6×10^8
Fungi	6.6×10^4	1.3×10^7
Coliform	0	0
Fecal coliform	0	0
*Staphylococcus*spp.	1.0×10^4	1.5×10^6
Bacillus spp.	3.3×10^2	2.7×10^4
Pseudomonas spp.	1.4×10^3	2.1×10^5

All the experiments have been done three times and the results were reproducible. One representative data have been shown.

TVBC: Total viable bacterial count

The existences of pathogenic flora such as *Staphylococcus* spp., *Bacillus* spp., *Pseudomonas* spp., were also found in all the samples within the range of 10^2 to 10^6cfu/g. Among them *Staphylococcus* spp. was the most

predominant organism. All the tested samples were revealed no growth of coliform, fecal coliform, *Vibrio* spp., *Salmonella* spp., *Shigella* spp., *Listeria* spp., *Clostridium* spp., (Table 1). All the isolates found in the tested samples were biochemically confirmed through several test (Table 2)

Table 2. Biochemical identification of the pathogenic isolates.

Assumed pathogenic microorganisms	TSI			H_2S reaction	Indole test	MR test	VP test	Citrate Test	Motility	Oxidase test
	Slant	Butt	Gas							
Bacillus spp.	Y	R	+	+	-	+	-	+	-	-
Staphylococcus spp.	Y	R	+	+	-	+	-	+	+	-
Pseudomonas spp.	R	R	-	-	-	-	-	+	+	+

TSI Triple Sugar Iron Test
Y Yellow (Acid)
R Red (Alkaline)
MR Methyl red
VP Voges-Proskauer

IV. Conclusion

Overall, the present study revealed that biocompost or biofertilizer imparted no added effect in context of microbiological quality on the vegetables on which they were applied. In this point of view, it can be concluded that biocompost can easily be applied to the field instead of chemical fertilizer considering its economic benefit together with environmental sustainability as might be posed by the chemical fertilizers.Finally, current investigation reveals that the presence of drug resistant bacteria might responsible for serious obstacle in proper medication of the diseases which could potentially become a public health threat.

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