

Pathogens in Organic Manure and their Effects on Health and Environment

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Abstract

*Bangladesh is a developing country. It requires plenty production of different types of crops in the country. Utilization of human excreta and cow dung in the production of organic fertilizer and bio-gas, can fulfil some percentage of requirement. Objectives of the study are: a. The general objective- is to find out the nature of pathogen present in organic manure and causes of manure not being composted properly. b. Special objectives are: (i) To see how many types of sectors are there where the organic manure is produced (ii) To make a plan for proper composting. (iii) To evaluate the present state of recycling and composting of human excreta in eco-toilet (iv) How it affect the environment and health The aims of the study are to see how the manures are composted? Maintenance of hygiene during composting, collection and sprayed in the crops fields. Laboratory test of manure from different venues, like cattle farm, eco-toilet and from village composting area. were carried out as primary data. Secondary data were collected from, different books, journals, data collection, and finally data analysis. .The samples collected from Alokdi Dhaka and under routine microscopic examination, shown the Ova of some helminth and live helminth. The samples collected from, eco-toilet of Comilla, shown the presence of Larvae of *Strongyloides stercoralis* only. But in culture all the samples (100 sample) of BARD, Rsichu and Alokdi shown the growth of *Pseudomonas spp.**

Keywords: Vulnerable community, labour migrants, remained behind family, COVID-19 pandemic, Bangladesh

Introduction

In Bangladesh 64 percent people used to use hygienic toilet in 1987 but became 84 percent in 1994 [Hoque, B A et all], In 2015 open defecation dropped at 0.10659 percent [World Bank development indicators], In Bangladesh environment friendly toilets have been made [GoB 2005] by

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the help of NGOs and Department of Public Health Engineering and Local Government. Some Eco-toilets have been made from where fecal matter and urine can be utilized as manure separately [Sears, C. L., Islam, S et al 2008; Huque, M., & Alam, M. (2005)] In last two decade back, village farmer use to agitate against the dealer for scanty supply of organic or inorganic manure at the critical time of paddy production specially in the months of July to October, because these months are important for sapling of paddy and harvest season. These became the headline of most of the daily news paper. Moreover some of the farmers use to join in the procession, there were the incidence of stick charge, use of ‘water cannon’ by the law and order enforce agencies. Even there are the history of blood shade and sacrifice few of their lives. Due to shortage of fertilizer there were less production of crops. As a result the Government could not ful-fill the requirement of crops purchase target. [Barkat, A. et al 2010,] . But for the last few years scenario has been changed due to Government policy. Fertilizer producing mills are producing different kinds of fertilizer including a group of farmer producing organic fertilizer from cattle dung and human night soil through eco-toilet. Rest of the manures are imported timely according to the demand of the state from other countries. So for the last few years those kinds of agitation are not seen in Bangladesh. Now Bangladesh is self-sufficient for her annual requirement of food. Thus maintaining the productivity needed to achieve food security and poverty reduction to uphold the sustainable development goal.

From a long time before animal dung usually used as organic manure and very few quantity for biogas production. Human feces are being collected from eco-toilet after composting for one year and spread on the crops fields [Hoque, B. A.,et al 1996] .Dairy farm has to maintain the profitability and to maintain the human health, animal health and pollution free environment. Sometimes there are the presence of pesticide, Phosphorus and nitrogen. and different types of pathogen in the field and nearby water body, leading to environmental pollution. E.coli and salmonella are frequently seen [.MacKenzie, W. R et al 1994] There may be the presence of scanty bacteria in eco-san toilet. The eco-san toilet user has less incidence of diarrhea [Pradhan,

S. K., & Heinonen-Tanski, H. (2010)] In agriculture, organic manures are needed for plant growth and .nutrition. It is dependent on main origin, elements present in the fertilizer and the process of application over the crops fields. There are every chance of remaining pathogen in organic fertilizer [MacKenzie, W. R., et al 1994] There is a guide line from WHO which has to be followed during the reuse of human excreta and other organic fertilizer. To see the risk for those people who are using organic fertilizer for increased crops in the field. [Adegoke, A. et al(2016)] The organic fertilizer has the properties of soil conditioning and nutritional status. It has also the properties of environment friendly than those of

organic manure [Besser, R. E et al 1993].The presence of pathogen in animal manure increasing the outbreak of some diseases. It is also affecting the human and animal health specially in Europe and North America. It is connected with the bringing up the animal and the number of presence of microorganism in manure from animal and human manure.

Rationale of the Study

The study has mainly concentrated on focusing the manure collected from eco-toilet, cattle farm producing biogas, cow dung slurry and the compost cow dung supplier those who sale as fertilizer. Eco-toilets were made within 2004 to 2009 in Comilla and in some areas of Bangladesh. Few decade back there were crisis of manure and every year there have been agitation, hue and cry by the farmers and carried out procession on demanding fertilizer at actual price. Many people also shade their blood in the street [Barkat, A et al 2010]. Fertilizer is important to keep our crops production specially rice. Production is also required to meet the food security and reduction of poverty to sustain the development goal. Government offering subsidy on different kinds of inorganic manure because of inadequate production of organic manure. Organic manure produced from few eco-toilets all over the country is very less, biogas projects from cow dung and locally produced manure cannot fulfill the demand but it plays some role in the production of crops. But the organic manure contains some pathogen in terms of bacteria and those of parasites, many of them are harmful to the manure users health and community as a whole. To find out the condition of eco-toilets, biogas plant sludge from cattle farm and local decomposed manure were taken into consideration. The manures were tested in laboratory to see the pathogens. Secondary information were gathered from books, journals and internet. The people use composted eco-toilet excreta as manure, some of the cattle farms produce gas and sludge as manure , local organic manure producer sale it but they have a little idea about the presence of different types of pathogen in their organic manure which are harmful to them and community as well. There are some limitation such as lack of knowledge about hygiene and sanitation, maintenance of the projects and lack of health education.

Research objectives

General objective: The general objective of this study is to find out the nature of pathogens present in organic manure and causes of not destroying the pathogens in different organic manure.

Special objectives: are

1. To see how many types of sectors are there from where the organic manure are produced.
2. To make a plan to reduce the problems where the fecal matter or cow dung not been properly composted.

3. To find out the reason and remedy where the manure is taken out before full composting.
4. To evaluate the present state of organic waste recycling and composting of human excreta in rural areas of Bangladesh.
5. Effects of contaminated manure on health and environment.

Literature Review

There are many alternative methods of treatment which can be taken to stabilize the organic fertilizers. The poultry waste is converted into single-cell protein (single cell protein) by two- stages in aerobic process. It is a *Pseudomonas fluorescens* amino acid rich in lysine. It is one of the element of poultry food.[Shuler, M. L.,et al 1989].PGPR (plant-growth-promoting rhizobacteria) decreases endogenous ethylene synthesis in the root of the plant by the helpof ACC(1-aminocyclopropane-1-carboxylate) deaminase activity which helps in the development of plant [Shaharouna, B et al 2006].Slurry is difficult to compost because of less content of bedding but manure contains large amount fecal matter and can be composted[Jones, P. W. (1980)].

The slurry handler may be contaminated by *Salmonella*, some of the animals of farm may suffer from Salmonellosis those animal passes the bacteria with dung and the slurry handler may be affected. If sewage sludge treated anaerobically then the presence of *Salmonella* and pathogenic clostridia would be low. Animal waste to be treated with the thought that many organism *Salmonella* may stay as air born and may affect the animal and human as well. Moreover there are few toxic materials like copper which may affect food of human and animal. These organism including many other bacteria and parasite are present in which may affect the community mixing with drinking house hold use water leading to diseases like Diarrhoea, typhoid and viral infection like Hepatitis A. Most of the cases *Salmonella*, *E coli* infection and Anthrax come from animal to man via food and water. *Mycobacterium paratuberculosis* may be the cause Crohn's disease which also been spread through animal excreta like many other bacteria and parasite. The bacteria, viruses and parasite may spread in environment very quickly and becomes difficult to control. Other than bacteria and virus ova of different types of helminth like *Taenia solium* and *Hymenolepis nana* and many more [Manz, W.,et al 1993] may be present. In Bangladesh, the presence of heavy metals and other contaminated materials like pesticide is within or below the WHO standard. The presence of Nitrogen , potassium and calcium in feces and urine increase the water holding capacity of the land resulting less scope water pollution [Pradhan, S. K., & Heinonen-Tanski, H. (2010)]

The use of organic fertilizer put forth in agriculture as a nutritional fertilizer and for soil conditioning. It is more environment friendly than the inorganic fertilizers [Besser, R. E et al 1993]. Organic waste may contain microorganism, a part of antibiotics and some chemical in organic waste. Wastewater can be used as an organic fertilizer. If sewage sludge treated an aerobically then the presence of Salmonella and pathogenic clostridia would be low [Pillai, S. D. et al 1996], Animal waste to be treated with the thought that many organism like Salmonella may remain as air born and may affect the animal and human as well. Moreover there are few toxic materials like copper may which affect food of human and animal [Strauch, D., &Ballarini, G. (1994)].These organism including many other bacteria and parasite are present in which may affect the community mixing with drinking house hold use water leading to diseases like Dirrhoea, typhoid and viral infection like Hepatits A.[Mawdsley, J. Let al 1995] Most of the cases Salmonella, ,E colli infection and Anthrax come from animal to man via food and water [Strauch, D. et al (1991)].

Mycobacterium paratuberculosis may be the cause Crohn's disease which also been spread through animal excreta like many other bacteria and parasite.[Utzinger, J., & Keiser, J. (2004)]. The bacteria, viruses and parasite sprayed in environment very quickly and becomes difficult to control [Monzon, R. B et al 1991] Other than bacteria and virus ova of different types of helminth like Taenia solium,Hymenolepsis nana are also present and many more [Manz, W., et al 1993]. The use of organic fertilizer exerts in agriculture as nutritional fertilizers and for soil conditioning. It has been further implied as more environment friendly than the inorganic fertilizers [Besser, R. E et al 1993] Organic waste may contain microorganism, a part of antibiotics and some chemical inorganic waste. Wastewater can be used as an organic fertilizer [Qadir, M. et 2009] The organic fertilizer is good but there are public health problem which can be eradicated. Sometime it is seen that organic fertilizers may show the presence of some microorganisms or pathogen which are antibiotic-resistant like Escherichia coli and Salmonella in fertilizers. This fertilizer can hold moisture ranged approximately from 1% to 86.4%, and the average pH was 7.77. [Miller, C. et al 2013],

Several alternative treatment methods can be employed to stabilize the organic fertilizers. Days to come when the developing countries people will suffer more from noncommunicable diseases rather than communicable diseases. The noncommunicable diseases mainly are diabetes mellitus, different kinds of heart diseases, cancer and other jeriatric diseases are replacing those customary diseases like anemia, different types of infectious diseases like diarrhea, cholera , pregnancy related anemia with premature delivery [Murray, C. J et al 1996].

Some soil spread helminthic diseases like schistosomiasis which infecting 200 million people of sub Sharan region. The resulting diseases have socio-economic impact in terms of high treatment costs per day and hospitalization costs [Utzingar, J., & Keiser, J. (2004). Billion people all over the world are suffering from parasitic infestation specially different types of helminthiasis [Ramaswamy, K et al 2003 In man, intestinal parasites are significantly associated with diarrhoea [Utzingar J, et all 1999]. The feco-oral route is the way of parasitic infestations due to poor personal hygiene [Okyay P et all 2004] Human feces may be mixed with soil and water leading to environmental pollution [Muttalib MA, et all 1983]. Night soil use as a fertilizer without conditioning, and the people those who consume raw vegetables [Mustafa U, et all 2001] may be infected and infested by bacteria and helminth.

When the soil becomes contaminated with eggs. these are transferred to vegetables then those who handle, eggs are transferred directly into the mouth with raw vegetables. [Koyabashi A: et all 1999] The risk of intestinal parasites is even higher among the inhabitants of towns of the developing countries due to poor disposal of garbage, poor health systems and overcrowding [Crompton DWT, et all 1993]. Eggs of intestinal parasites may be seen mixed in food items like green vegetable, hands and stainless part of furniture such as key knob and vessel of houses. [Kagei N: et all 1993] and with money [Crompton DWT, et all 1993]. Moreover, the parasites egg may be carried out by different kinds of flies. [Monzon RB, et all] and contaminated fingernails [Yahaya et all 1993]. There are about 23.4 million cattle, 1.86 million buffaloes, 33.5 million goats, 1.1 million sheep in Bangladesh [Rahman, M. S.et al 2011) A cow produces 29.5 kg of feces equivalent 11 metric tons in a year. One Kilogram of cattle manure can exert 12 liters of biogas [Akhter, N.,et al (2006)].

After literature review objectives may be co related as below:

- a. To see how many types of sectors are there from where the organic manure are produced: The organic manure are produced from (i) Eco-toilet (ii) Cow dung - for manure and biogas (iii) Human night soil for biogas and organic manure (iv) Sewage sludge
- b. To make a plan to reduce the problems where the fecal matter or cow dung not been properly composted: In some animal farm cattle may be infected by pathogenic bacteria or infested by parasitic agent which may affect the manure handler and community as a whole. To monitor for proper composting of cattle dung and human night soil.

- c. To find out the reason and remedy where the manure taken out before full composting:
1. The cow dung composted in some area like Alokdi - Dhaka and comilla were not composted properly and taken out before full composting.
 2. To ensure full composting and to be confirmed by laboratory test.
- d. To evaluate the present state of organic waste recycling and composting of human excreta in rural areas of Bangladesh: (i) In rural area some alternative methods to be applied for composting and stabilization of organic manure in rural areas of Bangladesh.
- e. (ii) In rural area community composting is better than small and individual composting system.
- f. In all cases laboratory test for micro-organism and detection of the parasite to be carried out.
- g. Effects of contaminated manure on health and environment: Soil contaminated with helminth may cause schistosomiasis, contamination of vegetable by eggs of some helminths and bacteria causing diarrhoea , intestinal colic and crohn's disease. Environmental pollution may have impact on socio economic status.

Conceptual Framework

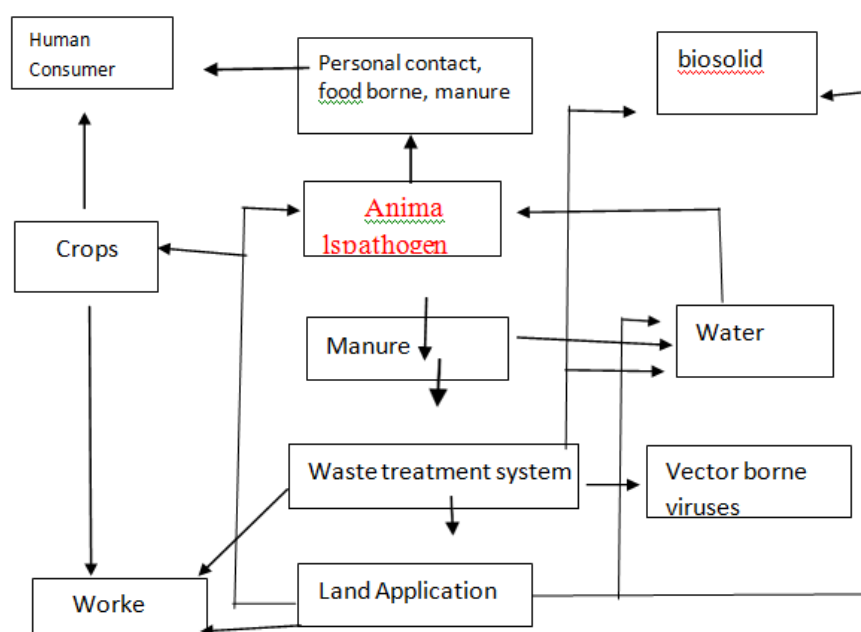


Fig 1. Source and transmission pathways of pathogens to human from animal agriculture.

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From above figure it may be explained that from animal in one side it may go to any person by contact by food or with manure.

One the other way pathogens remain in manure, from which it may be mixed with water body in one side. On the other way transmitted to waste treatment system.

From waste treatment system: one way it can remain with vector born viruses (as habitat), mixed with water body and bio-solid, in other way from the waste treatment system pathogen travel to the land with application of manure and to the worker,

From land the pathogen travels to the worker, to the crops and again to the animals as pathogen, from crops pathogen may travel to the worker in one way and to the human consumers on the other ways. Human consumer may be affected by personal contact as food born or with manure handling. Thus cycle being continued.

Research Methodology

The study was carried out in Bangladesh Academy for Rural Development (BARD) of Comilla district in Bangladesh , a village Raichu near Raichu Union porisod about 7/8 kilomter west of Bangladesh Academy for Rural Development (BARD) of Comilla district in Bangladesh, and at at Alakdi, Mirpur Dhaka from December 2019 to Jun 2020. There are a cattle farm at BARD from where 10 samples were taken for routine and microscopic examination and 10 sample for culture. There are 100 eco-toilets at Raichu, out of them 10 Eco-toilets were selected randomly then 3 samples of dried/ composted fecal matter were taken from each eco-toilet. 30 samples were taken for culture and 30 samples for routine microscopic examination. 10 samples were taken from a compost manure pile at Alokdi, Mirpur Dhaka 1216 for routine microscopic examination and 10 sample for culture. All the samples were sent to ‘Armed Forces Institute of Pathology’ laboratory, Dhaka Cantonment, Dhaka Bangladesh for routine microscopic examination and for culture at 37 degree Celsius for 48 hours. The people were very cooperative and cordial during inspection and collection of samples from their installation. All the tests were studied as a primary data, literature was reviewed and placed as secondary data. The collected information were processed and analyzed.

Results

Organic manure for routine (microscopic) examination (sample collected from compost manure of Alokdi, Dhaka . ANNEXTURE 1.

Table 1. shows: Larvae of *Strongyloides stercoralis* in 7 Slides, Ova of *Ascaris Lumbricoides* (AL) in 6 [six] slides, Ova of *Enterobius*

Vermicularis in 2 slides, Trichuris Trichura was seen only one slide (slide no-3b)

Organic manure culture and microscopic examination (sample collected from compost manure, Alokdi Dhaka) shown the growth of pseudomonas spp Report (ANNEXTURE-2).

Organic manure (Sludge): Routine (microscopic)

Cow dung was collected from cattle farm of Bangladesh Academy for rural development (BARD) Comilla from where biogas also been produced. Routine microscopic examination were done. All the slides shown the presence of Larvae of Strongyloides stercoralis

(ANNEXURE - 3).

Organic manure (Sludge): Culture

Cow dung was collected from cattle farm of Bangladesh Academy for rural development (BARD) Comilla.

10 sample were incubated at 37 degree Celsius for forty eight hours and all the slides have shown the growth of pseudomonas spp

(ANNEXURE- 4)

Routine microscopic examination. Samples were taken from Eco-toilet sludge of the village Raichu, of comillia district Bangladesh. All the 30(Thirty) slides shown the presence of larvae of Strongyloides stercoralis

(ANNEXURE 5):

Human excreta: Samples were collected from eco-toilet which have been composted for one year (six months for deposition and six months allowed for decompose) thirty samples were incubated at 37 degree Celsius for forty eight hours and all the slides have shown the growth of pseudomonas spp

(ANNEXURE 6).

RESULT and DISCUSSION

Routine microscopical examination of sample collected from Alokdi Dhaka revealed that at least one type of parasite is present in each of the specimens. Such as (Anex- 1), Table -1 Ova of Ascaris lumbricoides was present on slide 1b, 2b, 3a, 6a,8a and 10 [in six slide]. Fig 2 B and 2C. showing an adult and an egg of Ascaris lumbricoides. Table 1-. Ova of Strongyloides stercoralis was seen on slide 1a, 2a,4,5a,6b 7 and 9 [in seven slides]. Fig 2 A- showing eggs and an adult Strongyloides stercoralis. Table 1 slide number 3b showing the presence of worm Trichuris trichura. and fig 1A and B showing an egg , one male and female Trichuris trichura. Table 1

slide number 5b and 8b shown the ova of *Enterobius vermicularis*, Fig 1C and 1 D showing an egg and an adult *Enterobius vermicularis*. Though many of the ova were not found to be viable based on physical characteristics, but still some of them even in the dried specimen seemed to be capable of infestation. The samples were incubated for 48 hours at 37 degree centigrade and there were the presence of bacteria *Pseudomonas* only Fig 3.

During disaster usually surface and underground water layers does not polluted. But post latrine handling is important most of the people were not aware about their safety. But now for few years most of the Bangladeshi people have become aware about sanitization. But still few people are not so much aware about sanitization before handling of human excreta or throwing to the crops land.

In this connection Government of Bangladesh providing fund for improving hygiene and environment to the community through some agencies by the co-operation of department of public health and engineering. The executing authorities like members of the local government institutions also play an active role for this achievement.

The pathogen can remain dormant for long time and can rise up when human or animal ingest or it get a favorable condition. The presence of pathogen in livestock waste and quality of water drained for agriculture is important. Modern management and technology may reduce the presence of pathogen in human and animal waste. Sometimes, food-borne diseases are seen and some steps have been taken by the food suppliers to reduce contamination. It had been seen that number of pathogen were reduced for opposed action due to presence of some native microorganism in the soils and *E.coli* O157:H7 were inactivated very quickly.[American Society for Microbiology]

Different types of domestic animal waste, farm animal excreta or dung, household waste and human excreta collected from eco-toilets chamber are composted regularly. After one year these are applied directly in the crops field to induce increased production of different types of crops in the field and farm. These are also used in the family domestic garden, roof garden, garden on the family tub and in green houses [Freeman, T. M., & Cawthon, D. L. (1999)].

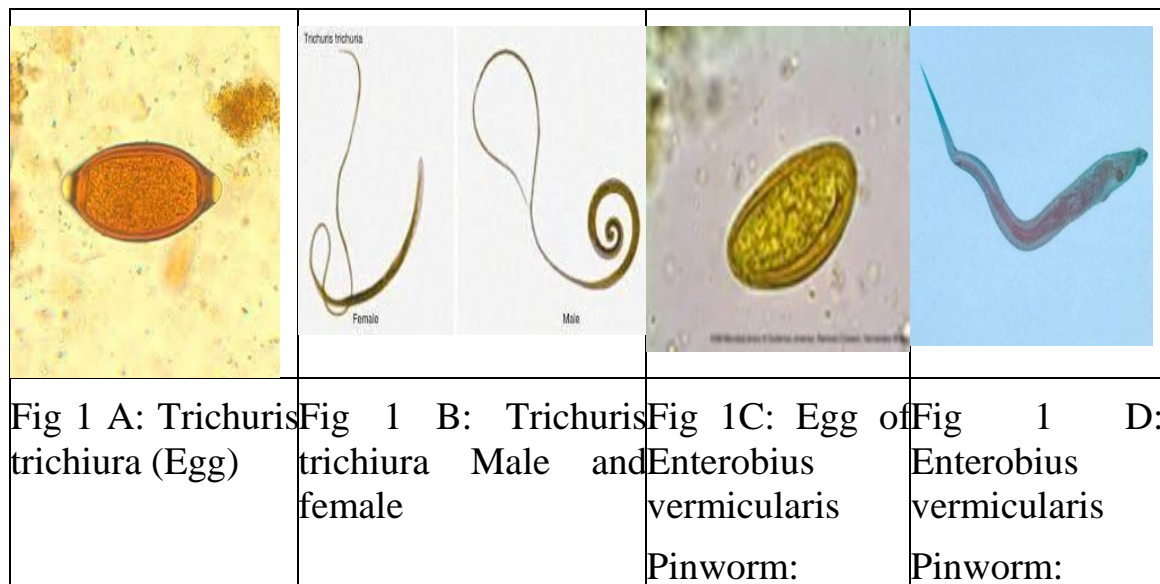
The waste are managed in different ways such as nutrients and on requirement of Nitrogen and Phosphorus of the crops fields. Sometimes may pollute water and air. The presence of pathogen like *Giardia*, *Helminth* and bacteria like, *Escherichia coli* O157: H7 and enteric pathogen *salmonella* may provoke community health problems [Pell, A. N. (1997)]. The animals which give rise food are also the reservoir of food borne pathogen like *Escherichia coli* O157:H7, *Salmonella* spp., and

Campylobacter spp [Doyle, M. P et al (1997)] Pathogens travel from organic fertilizers into crops and vegetables [Doyle, M. P et al (1997)]

Trichuris trichiura Fig 1A and 1B: This types parasite are seen in one individual within five people, 902 million people are the carriers of Trichuris trichura all over the world , with one per- cent infection rate are there in the United States. The common treatment for Trichuris trichiura are the drugs Albendazol and Pyrantal pamoate both are effective and cost efficient. Treatment can be given for increasing growth of children. [Roberts, L. S., &Janovy Jr, J. (2000)].

Enterobius vermicularis (Pin Worm): Fig 1C and 1D: The eggs of Enterobius vermicularis length is about 50—60 µm by 20—30 µm. These are clear to see, and the shapes are oval , and slightly flattened on one side [. Rawla, P., & Sharma, S. (2020)]

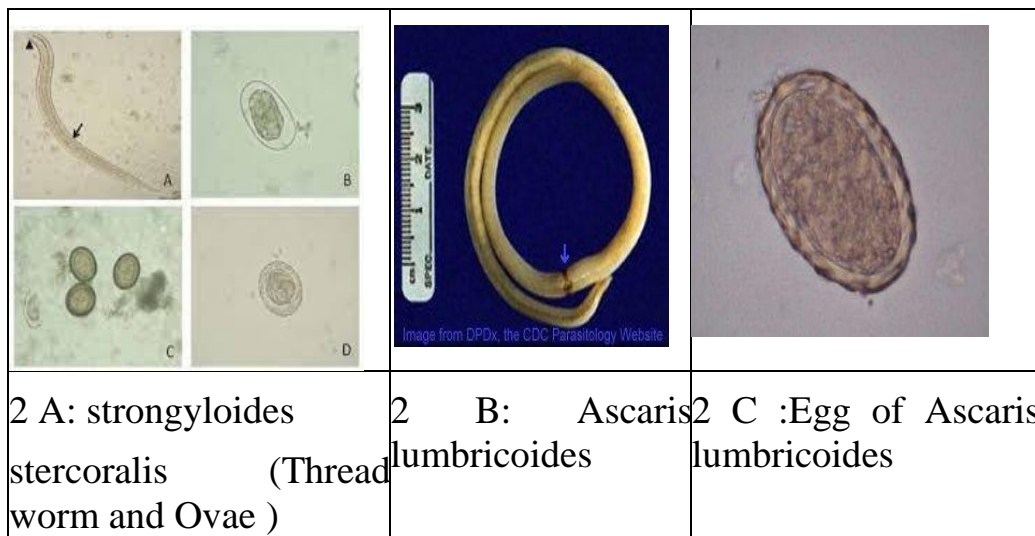
Fig: 1



Strongyloidiasis :is caused by 2 species of the intestinal nematode Strongyloides. It is distributed in human all over the worldand remain as human pathogen. as Strongyloides stercoralis. and other species, Strongyloides fuelleborni, which infest occasionally in Africa and Papua New Guinea

Strongyloides stercoralis(Fig 2A) This parasite has infested about thirty million peoples all over the world, most of the time it remains undetected and discharging of ova is also irregular. So inspite of its presence they cannot be detected. Super infection may lead to death with a quite high percentage [Ericsson, C. D et al. (2001)]

Fig 2:



Ascaris lumbricoides: Fig 2B and 2C: Its size is larger than other helminth. Males are 15 to 31 centimeter long and 2-8 millimeter in diameter. Females are 20 to 49 centimeter long, 3-6 millimeter in diameter. The female worm can accommodate approximately 27 millions of eggs in their uteri and can lay two hundred thousands of egg daily [Leles, D.,et al (2012)]



Fig 3 Pseudomonas

Pseudomonas: *Pseudomonas aeruginosa* infection had been seen for about thirty years ago or so. It may infect ear leading to otitis media, external otitis, pneumonia, meningitis and septicemia. The patient those who suffer for a long time specially those who remain in hospital they are likely to be infected by *pseudomonas*. Different types of penicillin and many other broad spectrum antibiotic acts on the *Pseudomonas*

aeruginosa infection [Bodey, G. P., et al 1983]) Different types of domestic animal waste, farm animal excreta or dung, household waste and human excreta collected at eco-toilets chamber are composted regularly. After one year these are applied directly in the crops field to induce increased production of different types of crops in the field and farm. These are also used in the family domestic garden, roof garden, garden on the family tub and in green houses [Freeman, T. M., & Cawthon, D. L. (1999)]

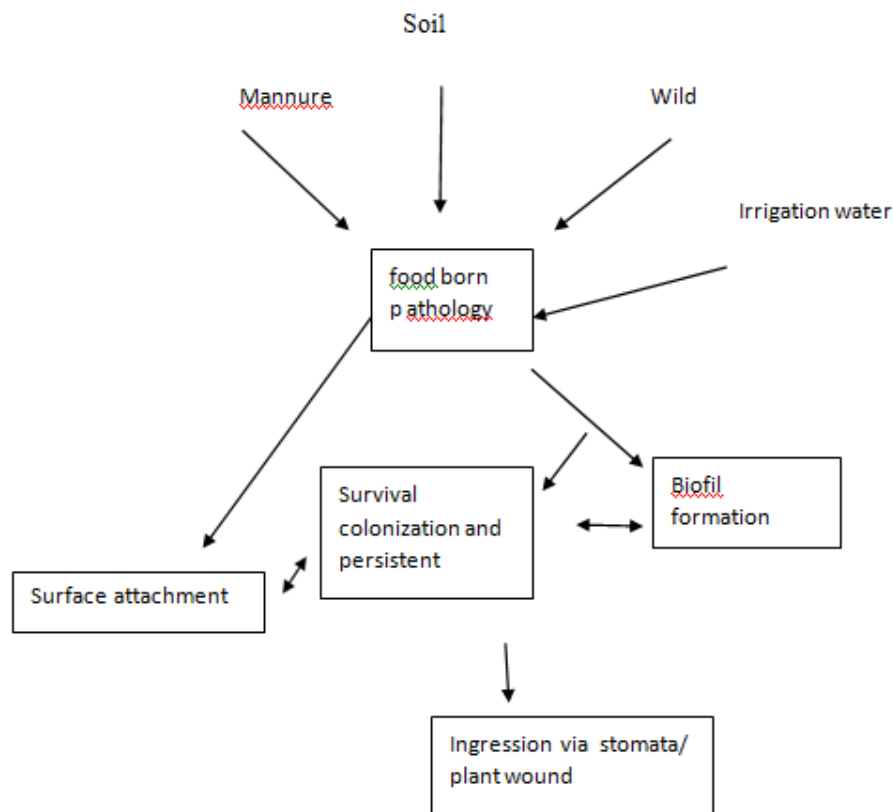
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There are about 23.4 million cattle, 1.86 million buffaloes, 33.5 million goats, 1.1 million sheeps in Bangladesh. These animal dung can be included for production of fertilizer and biogas[Rahman, M. S. et al 2011]. A cow passes 29.5 kg of feces daily or 11 metric tons approximately per year. A cow poops about 10- 12 times in a day. The body temperature of a cow is 101.5 degrees Fahrenheit (38.6 degrees Celsius) [Akhter, N. et al 2006].

Environmental and Social Effect S and Responsibilities

Organic manure increases the carbon (C) and Nitrogen (N) than the use of inorganic manure. if organic manure is used for a long time, nutrients content of soil do not reduce [Lin, Z. et all] Use of organic manure increase the production of crops leading to increase the economic growth which influences the social status [Salem, M. O., El-Shall, et al] .Contaminated food is hazardous for the population health leading to social and economic clash. There are many ways by which pathogenic bacteria may find their way to food particle and they try to survive. They may get access through watering, infected or adulterated manure, by wildlife or some sources where they take the chance to multiply and can make a dominion in a favorable condition(Alegbeleye, O. O., Singleton et al). It may happen when somehow or rather they are ingested by human and other animal following figure may give some idea about migration of bacteria which can infect population.

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In South American countries by using organic manure production of crops mainly the potatoes have grown few fold higher than the old method and they become prosperous than before [Oliveira, A. P., Santos et al] India is one of the largest crop growers in the world by using bio-fertilizer. It is cheaper, environment friendly, adverse effects are not seen in soil [Pathak, D. V., Kumar, M et al] Composted cow dung increases the permeability of soil which increases fertility. Cattle manure, molded manure, bio-char applied on cultivating land help to have long lasting land management contribute to the reduction of climate change [Hoque, M. (2018)].

Organic waste are the main source of organic fertilizer, which covers the micro and macro-nutrients. But provocations are there for heavy metals and pathogens, conversion of nutrients to the crops. Some pathogens create an instant warning. Antibiotics, other drugs and generally formed hormones if increased then increase the zoonotic diseases, which may be resistant to many antibiotics [Goss, M. J., Tubeileh, A., et al], These conditions can be overcome by taking the measure such as to keep slurry in a covered and air tight condition so that anaerobic digestion takes place where biogas can also be produced. In the same way human excreta can also be decomposed from where biogas for domestic use and sludge can be collected for spread to the agriculture fields. These are more hygienic and climate friendly [Ali, M S]. Risk to

human health for using water and food stuff. The cows dung, other cattle and poultry manure to be managed in same way to prevent the spread the pathogen from the organic manure.

Conclusions and Research Gaps

In WHO guidelines Vol 2 (Wastewater Use in Agriculture) and Vol 4 (Excreta and Greywater) there are some direction for use in Agriculture. If there are evidence of bacteria according to the risk related to pathogen, it has to be taken under treatment for alleviation of pathogen. It is required for health and environment. Organic fertilizer may be fecal sludge, urine or various types of mixture. Guide lines are prepared according to their risk or hazard to the exposure to the pathogen and their treatment. It has also been taken into consideration for Human Health Risk Management. Assessments in the land where biosolids are applied. Use of organic fertilizer and presence of pathogen depend upon the nature of pathogen , geographic distribution and socioeconomic condition WHO guideline has also to be looked into the risks and their reduction plan as per hazard or risk. Different risk comes due to different types of pathogen ,different types manure, geographical , socioeconomic and climatic condition. Crops contamination may be due to use of different types of manure, irrigation of water , after harvesting and at the time of storing process after harvest It may also happen by some other antimicrobial drugs. Lands and crops may also be contaminated by antibiotics, and by multi- drug resistance bacteriae which are dangerous in livestock, human lands and to the community.

As the government of Bangladesh is agriculture friendly and rice is a staple food in Bangladesh, for production of rice and other crops, considerable amount fertilizer is also required. Bangladesh having more than 160 million people. Now this country is self sufficient for her food. To remain in this condition she has to make an arrangement to increase the production that is why government giving subsidy in the agriculture sector including electricity, seeds and fertilizers. The use of organic fertilizer produced in the country will save foreign currency, will restore the environmental and ecological balance. But the manure produced from cattle dung and by the rural people through Eco-toilets, where Bio-gas can also be generated from compost area. According to culture report and microscopic examination, there were the presence of pseudomonas bacteria, which is a common genus of bacteria, can create infections in the body under certain circumstances. The presence of Strongyloides Stercoralis, Trichuris trichura, Enerobius vermicularis and Ascaris lumbricoides in cow dung is alarming, because it means that the cow dung has not been properly composted . If these manure is sprayed in the field it will affect the crops and the manure handlers. In same way the

presence of *Strongyloides stercoralis* and *pseudomonas* in sludge of eco-toilet indicate that this fertilizer is not composted well.

Bangladesh having 160 million population and she can produce 4480 Metric tons of organic fertilizer everyday. [Ali, M. S. (2018)] . A cow passes 29.5 kg of feces daily or 12 tons equivalent to 908 kg per year. A cow poops about 10-12 times in a day one kilogram of cow dung give rise to 12 liter of biogas [Akhter, N. et all 2006], Production of Biogas and fertilizer from human excreta and cattle waste will save foreign currency and can also be exported. Moreover hygiene and sanitation of the village people will be improved and incidence of communicable diseases will also be reduced.

Recommendation

- a) The human excreta, animal dung and other composting materials to be composted properly. To advice the people those are making the organic manure either from human waste or
- b) animal waste to advice not to pick up the manure unless it is completely composted
- c) In rural areas all sanitary latrine to be converted in to community toilet in urban areas instead of connecting the septic tank to s ewege line to allow to produce biogas in the septic tank. Gas can be collected in cylinder as C B G (Concentrated Bio-gas) for use in domestic , transport sector and at power generation installation and sludge can be used as organic manure.
- d) There should have a laboratory to test of the organic manure specially for intestinal parasite
- e) And micro-organism before applying on the crops fields as manure. Government of
- f) Bangladesh in collaboration NGO can establish Laboratory nearer to the project for
- g) examination of manure before collection, so that no harmful bacteria or parasite will remain before applying to the crops fields
- h) To follow the WHO guidelines for using human and animal waste.

ANNEXURES

Annexure 1: Organic manure for routine (microscopic) examination (sample collected from compost manure of Alokdi, Dhaka)

Table 1:

Sample		Types of examination
SL	Organic manure	routine Microscopic Result
1	compost manure	a. Larvae of strongyloides stercoralis b. Ova of Ascaris Lumbricoides
2	compost manure	a. Larvae of strongyloides stercoralis b. Ova of Ascaris Lumbricoides
3	compost manure	a. Ova of Ascaris Lumbricoides b. Worm Trichuris Trichura
4	compost manure	Larvae of Strongyloides stercoralis
5	compost manure	a. Larvae of Strongyloides stercoralis b. Ova of Enterobius Vermicularis
6	compost manure	a. Ova of Ascaris Lumbricoides b. Larvae of Strongyloides stercoralis
7	compost manure	Larvae of Strongyloides stercoralis
8	compost manure	a. Ova of Ascaris Lumbricoides b. Ova of Enterobius Vermicularis
9	compost manure	Larvae of Strongyloides stercoralis
10	compost manure	Ova of Ascaris Lumbricoides

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Annexure 2: Organic manure culture and microscopic examination (sample collected from compost manure, Alokdi Dhaka) Report.

Table 2: Manure Culture Report

Sl.	Sample / Specimen	Type of test	Result/Finding	Remarks:
1	Compost manure	Culture	Growth of pseudomonas spp	Incubated 48hrs
2	Compost manure	Culture	Growth of pseudomonas spp	
3	Compost manure	Culture	Growth of pseudomonas spp	
4	Compost manure	Culture	Growth of pseudomonas spp	
5	Compost manure	Culture	Growth of pseudomonas spp	
6	Compost manure	Culture	Growth of pseudomonas spp	
7	Compost manure	Culture	Growth of pseudomonas spp	
8	Compost manure	Culture	Growth of pseudomonas spp	
9	Compost manure	Culture	Growth of pseudomonas spp	
10	Compost manure	Culture	Growth of pseudomonas spp	

Annexure 3: Organic manure (Sludge): Routine (microscopic) examination.

Table 3:

Sl No.	Sample:Organic manure	Types of examination	Findings
1	Cow dung Sludge	Routine (microscopic)	Larvae of Strongyloides stercoralis
2	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
3	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
4	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
5	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
6	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
7	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis

8	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
9	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis
10	Cow dung Sludge	Microscopic	Larvae of Strongyloides stercoralis

Annexure 4: Organic manure (Sludge): Culture

Table 4:

Sl.	Sample: Organicmanure	Type of test: Culture	
1	Cow dung Sludge	Culture	Growth of pseudomonas spp
2	Cow dung Sludge	Culture	Growth of pseudomonas spp
3	Cow dung Sludge	Culture	Growth of pseudomonas spp
4	Cow dung Sludge	Culture	Growth of pseudomonas spp
5	Cow dung Sludge	Culture	Growth of pseudomonas spp
6	Cow dung Sludge	Culture	Growth of pseudomonas spp
7	Cow dung Sludge	Culture	Growth of pseudomonas spp
8	Cow dung Sludge	Culture	Growth of pseudomonas spp
9	Cow dung Sludge	Culture	Growth of pseudomonas spp
10	Cow dung Sludge	Culture	Growth of pseudomonas spp

Annexure-5: Routine microscopic examination. Samples were taken from Eco-toilet sludge of the village Raichu, of comillia district Bangladesh.

Table: 5

Sl No.	Sample: Organic manure of Ecoptoilet	Types of examination Routine (Microscopic)	Findings
1	Compost Human excreta	(microscopic)	Larvae of Strongyloides stercoralis
2	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
3	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
4	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
5	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
6	Compost Human	Microscopic	Larvae of Strongyloides

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	excreta		stercoralis
7	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
8	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
9	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
10	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
11	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
12	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
13	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
14	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
14	Compo st Human excreta	Microscopic	Larvae of Strongyloides sterco
16	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
17	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
18	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
19	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
20	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
21	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
22	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
23	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
24	Compost Human	Microscopic	Larvae of Strongyloides

	excreta		sterco
25	Compost Human excreta	Microscopic	Larvae of Strongyloides sterco
26	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
27	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
28	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
29	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis
30	Compost Human excreta	Microscopic	Larvae of Strongyloides stercoralis

Annexure 6: Human excreta: Samples were collected from eco-toilet which has been composted for one year (six months for deposition and six months allowed for decompose) thirty samples were incubated for forty eight hours.

Table 6:

Sl No	Sample: Organic manure	Type of test: Culture	Findings
1	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
2	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
3	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
4	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
5	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
6	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
7	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
8	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
9	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp

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10	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
11	Human feces from Eco-toilet	Culture	Gro Growth of pseudomonas
12	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
13	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
14	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
15	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
16	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
17	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
18	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
19	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
20	Human feces from Eco-toilet	Culture	Growth of pseudomonas spp
21	Compost manure	Culture	Growth of pseudomonas spp
22	Compost manure	Culture	Growth of pseudomonas spp

23	Compost manure	Culture	Growth of pseudomonas spp
24	Compost manure	Culture	Growth of pseudomonas spp
25	Compost manure	Culture	Growth of pseudomonas spp
26	Compost manure	Culture	Growth of pseudomonas spp
27	Compost manure	Culture	Growth of pseudomonas spp
28	Compost manure	Culture	Growth of pseudomonas spp
29	Compost manure	Culture	Growth of pseudomonas spp
30	Compost manure	Culture	Growth of pseudomonas spp

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