How different Types of foods affect the productivity of Bio-Digester.

Brennen Michel.

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Abstract

This study is related to bacteria, food waste, fuel production and composting. This study is important because it will help us use a type of energy production that isn't commonly used that can help us create cleaner energy and it will help us reduce food waste in the future. Previous studies have shown how useful Bio-Digesters have been to third world countries and creating clean and useful gas that can be used to power generators, stoves and stove tops.
The objective of this study is to find out how different food groups function in a Bio-Digester. This Research was done by creating 5 bio-digester by using 5 gallons of buckets.
The data I collected suggest that the different food groups might not work too well in a bio-digester apart. This is because all the digester showed under two pounds of pressure which means that there was a very little reaction between the food and the bacteria in the cow manure. Therefore this man suggests that all the food's groups will work better together.

Introduction:

Food waste in the United States is a major problem, if fact according to the USDA Around 30-40%. of all food in the US was wasted, according to the organization Feeding America more than $218 billion worth of food is wasted each year with dairy products being wasted the most. The USDA says that food is wasted at all stages of production from harvesting, milling, transport, and drying. (USDA, 2010) Other reasons such as damage from birds, rodents, and bacteria are also major causes of food waste.

The USDA also says food waste stretches to non-edible foods by humans such as banana peels, egg shells, and bones. Some other things include hair, horns, and feet according to Public Goods. The EPA (Environmental Protection Agency, 2022) says that "When food is wasted, the land, water, energy, and other inputs that are used in producing, processing, transporting, preparing, storing, and disposing the food are wasted as well." The USDA says we waste anywhere from 30-40% of food in The US is wasted every year (USDA) . Save on energy say about 10.11 quadrillion Btu is "consumed" in the US every year. If 30-40% of all of that food is wasted this is equivalent to 3.1999844e+18 - 4.2666459e+18 joules of energy wasted per year in the US. According to shrink that footprint the average US household consumes 10,715 kWh of electricity annually. That can power about 82957028 to 110609371 homes in the US.

As you can see this is a major problem because you're not only wasting food you're wasting energy too. The USDA and the EPA list many ways to reduce food waste like creating better storage and buying less food or feeding People in need or animals. And non-human edible foods can be composted or even made into clothing. But one thing they didn't cover was a

bio-digester.According to the Green Business Bureau a bio-digester “is a system that biologically digests organic material, either anaerobic (without oxygen) or aerobically (with oxygen)”. Bio-digesters are a Clean way to produce fuel and cut down on food waste. Think of a bio-digester as a stomach, you put food wasted in and that food waste is turned into biofuel which can be burned like natural gas or turned into electricity by a generator.

But all kinds of foods break down, differently some break down faster than others and some things can even be bad for a bio digester. Some food will affect the pH of the bio-digester and how much biofuel it makes.That can greatly reduce how efficient the digester produces fuel.

This will lead me to my hypothesis : If foods with higher nutritional value are given to a bio digester then the bio digester will produce more biofuel than bio digesters that are given foods with less nutritional value.

Methods

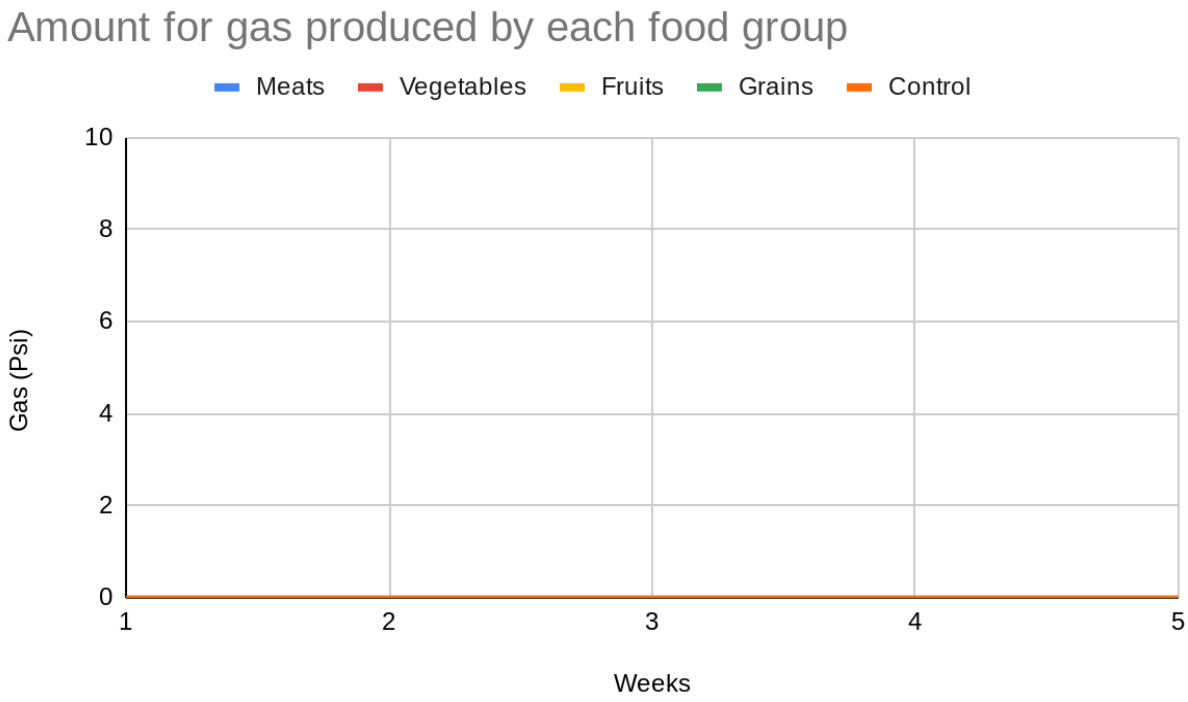
I will use five 5 gal food grade buckets that can turn them into bio-digesters. I will do this by drilling three holes into them, one for fuel to come out of, one to feed it, and one for waste. PVC pipe and small tubing will be put into the holes to make sure that all the gas doesn't come out and, the small tubing will be used for an exit for gas and. An 8 by 12 inner tube of tire will be used to capture the fuel and a pressure gauge to check the tire pressure. Then I will put cow manure and water into each bucket.

The cow manure is how I will get the bacteria that will produce methane/biofuel. I will put 3 different vegetables, 3 different fruits, 3 different grains, 3 different types of meat, and one digester with only manure in it for a control I will evenly split 170 grams of corn, potatoes, and broccoli into one digesters, 170 grams of bananas, oranges, and apples, 170 grams of rice, oats, and wheat, 170 grams of ham, ground beef, and chicken.

Amount for gas produced by each food group

Weeks	Meats	Vegetables	Fruits	Grains	Control
1	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)
2	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)
3	Under 2 (PSI)	Under 2 (PSI)	Under 2 PSI)	Under 2 (PSI)	Under 2 (PSI)
4	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)

Weeks	Meats	Vegetables	Fruits	Grains	Control
1	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)
2	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)	Under 2 (PSI)
3	Under 2 (PSI)	Under 2 (PSI)	Under 2 PSI)	Under 2 (PSI)	Under 2 (PSI)



Discussion

As this graph and table shows nothing happened. I observed that the buckets that the gas was being produced in became filled with gas just by looking at it yet the pressure gauge still showed zero Psi although each gauges only went to two to fifty Psi which is why I put under two

psi on the table. I believe I got these results because there was only one food group in each digester.

Limitations

The main limitation was to heat the shop that we keep the digesters in. The shop was at the same temperature the majority of the time but whenever the shop door was open the temperature dropped. Another imitation was finding the right food for the digesters.

Future Studies

There are many things that you could do differently in this project, you could use a different type of manure or other food. I could use cornmeal, pears, turkey, and lettuce for different foods and chicken or pig manure.

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