



THAT'S SO DEGRADING!

Which bioplastic degrades the fastest?

Purpose

The purpose of this project is to test different kinds of homemade bioplastics to inform others which ones will degrade and how to make them so that the environment is safer.

Hypothesis

“I believe that gelatin plastic will break down the fastest because it is the softest. I think that milk plastic will take the longest because it is the most rigid. I don't think the purchased bioplastic will degrade at all because it requires a commercial compost facility.”

Preliminary Preparation

First: Research different recipes for making bioplastic.

Second: Experiment with making different types of bioplastic:

- Cornstarch

- Arrowroot starch

- Orange Peel

- Banana Peel

- Algae

- Gelatin

- Milk (Casein)

Third: Decide which bioplastics to use for the experiment.

The Experiment (Summarized)

1. Prepare the 3 types of bioplastics chosen: Milk (Casein), Orange Peel, Gelatin.
2. Cut all of them including the control (commercial) bioplastic into ten 12cm x 15cm rectangles weighing .350g each.
3. Fill 10 plastic cups with ordinary garden soil.
4. Place one of each type of bioplastic into each cup soil.
5. Every 2 days, remove the bioplastics from the soil, carefully brush the dirt off, and weigh them to see how much mass (if any) they have lost.
6. After 10 days, add 10ml of water to the soil to simulate 'rain'.
7. Continue this process for 30 days, recording the data as you go.

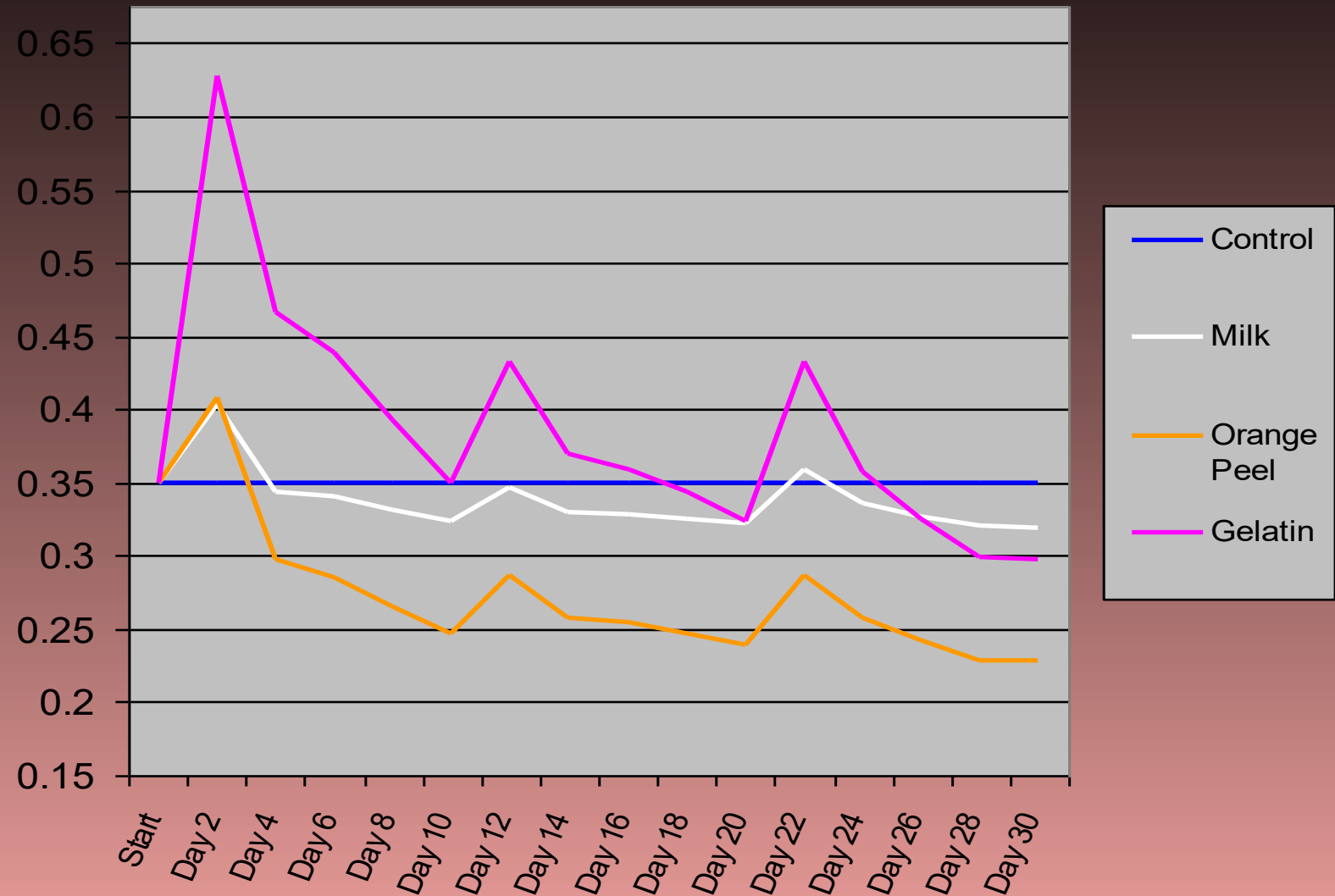
Results

According to the data, the orange peel plastic lost the most mass after 30 days. However, due to the gelatin plastic “absorbing” the soil, it was not possible to get an accurate measurement of exactly how much of the gelatin had broken down. In the end, the commercial bioplastic had not lost any mass, the milk lost .031g, the gelatin lost .053g, and the orange peel lost .122g.

TOTAL LOSS OF MASS IN GRAMS

	Control	Milk	Orange Peel	Gelatin
Cup 1	.000	.034	.120	.042
Cup 2	.000	.031	.129	.034
Cup 3	.000	.034	.132	.079
Cup 4	.000	.029	.136	.048
Cup 5	.000	.040	.108	.041
Cup 6	.000	.022	.118	.082
Cup 7	.000	.029	.122	.070
Cup 8	.000	.034	.119	.056
Cup 9	.000	.026	.117	.013
Cup 10	.000	.035	.122	.055
Average	.000	.031	.122	.052

Average Mass of Each Type of Bioplastic by Day in Grams



*Spikes represent an increase in mass due to moisture that was absorbed after the addition of water.

Conclusions

Commercially produced bioplastics which require a specific composting facility to process either do not degrade or degrade very slowly. Casein bioplastic is the most durable, but breaks down the slowest of the three tested. Orange peel plastic is more flexible and breaks down faster than the milk (casein) plastic. The gelatin is the least durable of the three, however, it quickly was 'incorporated' into the soil to the point that it became inseparable within just a few days.

Future Improvements

This experiment was just one small step in discovering what types of bioplastic could one day be useful. In the future, it would be helpful to do a lot more testing over a longer period of time. It would also be good to use some of the other experimental types of bioplastic and to test other properties like strength and behavior in other environments like air and water. In the end, deciding which bioplastic to use will depend on what it is going to be used for.



Thank You!