

DEGRADABLE V/S BIODEGRADABLE – WHAT’S THE DIFFERENCE?

YEAR 5

Aim

Do Biodegradable Plastic Bags Break Down Faster Than Degradable Plastic Bags?

Background Research

Plastic items have popped up on supermarket shelves carrying the label 'degradable' or 'biodegradable'.

Biodegradable means that it can be broken down by living things like bacteria and fungi (these are microorganisms).

Degradable means they do not require living organisms to break down. Instead, chemical additives are used in the plastic to make it crumble more quickly than it would otherwise.

When buying plastics you look at the label. Biodegradable will biodegrade, but generally not as quickly as compostable plastic. So the best combination is 100% biodegradable and the disposal method is compostable. Compostable products need a controlled environment. A compostable product breaks down in a specific timeframe in a controlled moist, warm and aerobic (oxygen in the air) environment to produce compost that is non-toxic and can enhance soil and support plant life.



AS 4736 means it is compostable in a commercial compost facility and it is biodegradable. The symbol for home compostable product labels has the Australian Standard number (AS 5810-2010) on it.

The conditions that affect how quickly plastic degrades are temperature and moisture. Conditions for biodegradable also depend on the amount of living organisms to help break it down.

Degradable plastics can help reduce the amount of plastic litter that we see, but the plastic is still there, just in smaller pieces. And smaller pieces of plastic litter can actually be hazardous to wildlife. Fish, crustaceans and corals are known to eat small pieces of plastic, mistaking them for food. And as these smaller animals get eaten by larger ones, so the plastic accumulates up the food chain, affecting more and more species as it goes. Professor Tony Underwood from the University of Sydney said that biodegradable plastic may become less obvious to the naked eye over time (<http://www.theage.com.au/federal-politics/political-news/the-big-green-furphy-experts-bust-degradable-plastic-bag-myth>). He said "It simply turns it into smaller forms of plastic more quickly. It is not a solution to anything much, unless we are quite happy to shift it all into particle-sized plastics rather than plastic bag-sized plastic."

Mark Browne from the University of NSW said using the terms "degradable" and "biodegradable" plastic is confusing because people wrongly believe it would "degrade and go away". "Fully biodegradable" or "compostable" plastics are better for the environment because it is made from plant materials but only return to base organic components when processed by commercial composting facilities.

Hypothesis

Biodegradable Vs Degradable

Fully biodegradable and compostable plastic breaks down quicker degradable plastic.

Moist VS Dry

Degradable and biodegradable plastic breaks down quicker in moist environments.

Soil VS Sand

Biodegradable plastic breaks down quicker in soil versus sand. There is no difference with degradable plastic

Method

Materials

24 x 2 litre pots	Ruler
Sand	15 x Biodegradable and compostable plastic (4x4cm)
Potting Mix	15 x Degradable plastic (4x4cm)
Water	Labels
Measuring Cup	Paper

Lined each pot with paper to prevent sand and potting mix from falling out of the bottom of the pots. Cut white paper to cover the bottom and sides and stick with sticky tape.

Repeated 24 times

Potting Mix - Biodegradable

With measuring cup measured 2 cups of potting mix and placed in pot

Placed a 4x4cm green biodegradable plastic square in the middle of the pot

With measuring cup measured 2 cups of potting mix and placed on top of the plastic square in pot

Repeated 6 times

Potting Mix - Degradable

With measuring cup measured 2 cups of potting mix and placed in pot

Placed a 4x4cm white degradable plastic square in the middle of the pot

With measuring cup measured 2 cups of potting mix and placed on top of the plastic square in pot

Repeated 6 times

Sand

Sand - Biodegradable

With measuring cup measured 2 cups of sand and placed in pot

Placed a 4x4cm green biodegradable plastic square in the middle of the pot

With measuring cup measured 2 cups of sand and placed on top of the plastic square in pot

Repeated 6 times

Sand - Degradable

With measuring cup measured 2 cups of sand and placed in pot

Placed a 4x4cm white degradable plastic square in the middle of the pot



With measuring cup measured 2 cups of sand and placed on top of the plastic square in pot

Repeated 6 times

For the wet pots I watered them each day (1 cup of water per pot).

The remaining 6 plastics (3 degradable and 3 biodegradable) were not buried and this is the control group.

After 1 month and 22 days I removed the plastic from each pot. To test how much the plastic broke down; I stretched each plastic and timed how long it took to break.

	<p>Some of the materials for the experiment:</p> <ul style="list-style-type: none">Pots – same sizePaperPlastic bagsRulerScissors
	<p>Measuring the length for the biodegradable plastic bag</p>



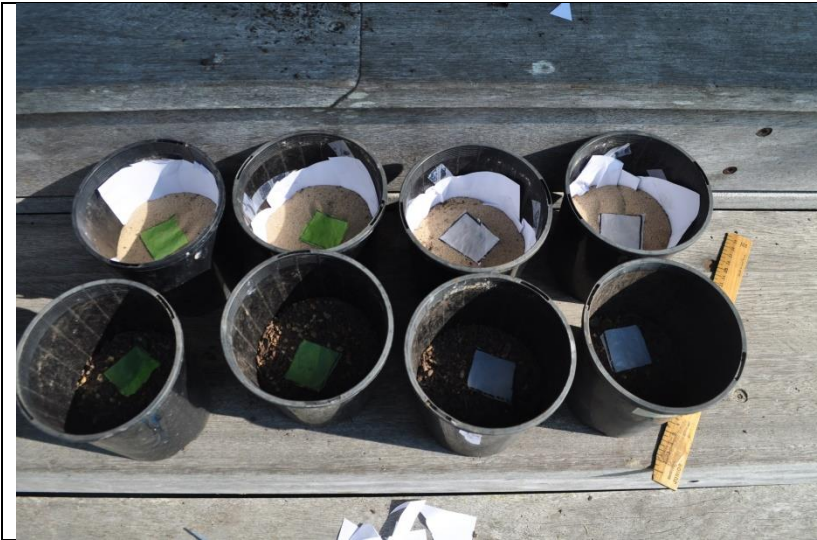
Measuring the length for the degradable plastic bag



Measuring the width



Cutting into 4x4cm squares



The 8 combinations:

biodegradable
dry sand
wet sand
dry soil
wet soil

degradable
dry sand
wet sand
dry soil
wet soil

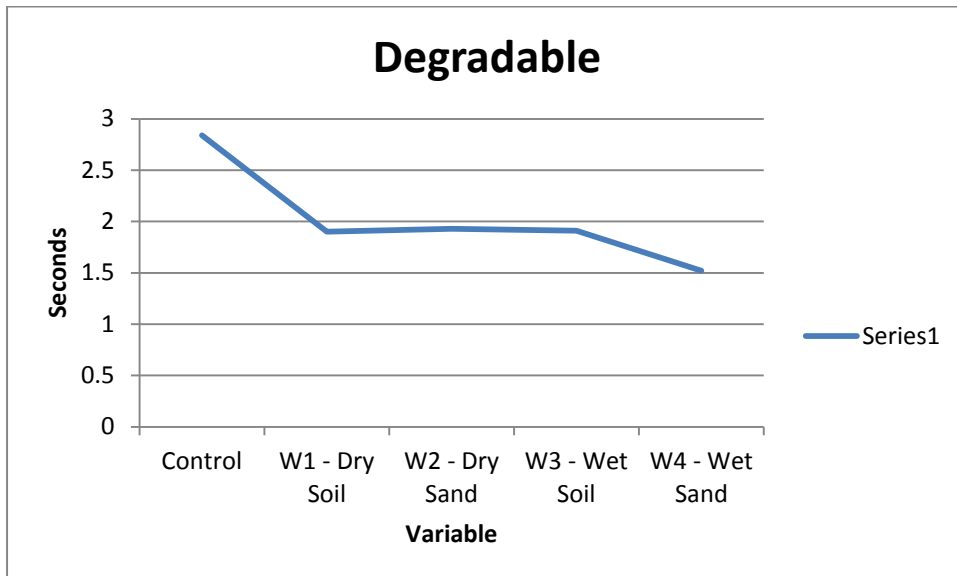
Results (Averages)

Below are the average time s (in seconds) it took for the plastic to break when stretched.

The shorter the time mean s the more the plastic had broken down

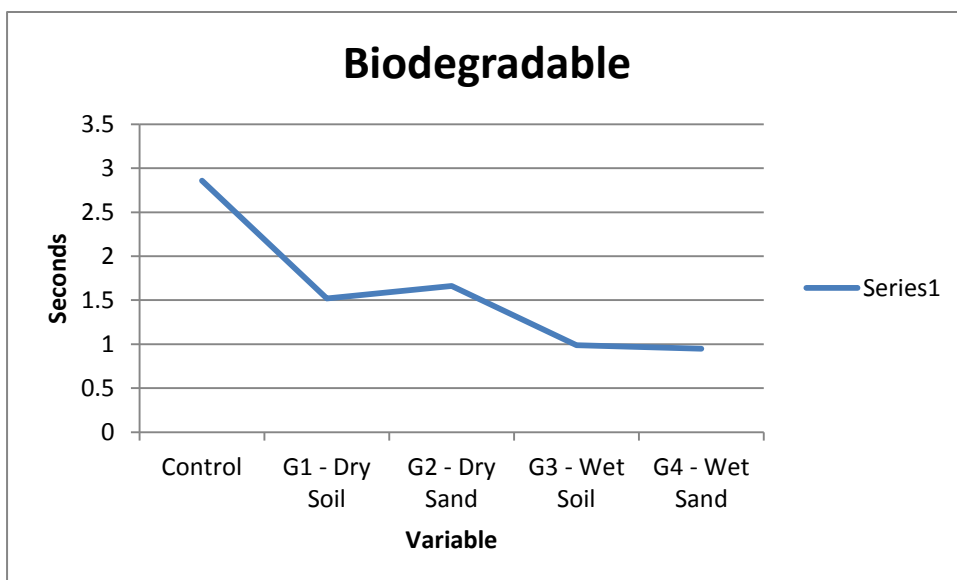
White Degradable

W1 Average:	W2 Average	W3 Average:	W4 Average	Control
1.90	1.93	1.52	1.91	2.84



Green Biodegradable

G1 Average:	G2 Average:	G3 Average:	G4 Average:	Control
1.52	1.66	0.99	0.95	2.86



Conclusion and Analysis

This experiment showed that Biodegradable plastic broke down faster than Degradable plastic. The control was the same but in soil or sand; wet or dry Biodegradable plastic broke down faster than Degradable plastic.

For Degradable plastic, the best condition to break down faster is wet (Moist) soil. For Biodegradable plastic, wet is a lot better in either soil or sand.

Soil has microorganisms so I thought that that would be a better condition for Biodegradable plastic, because living things break down the plastic. In my experiment dry soil was better than dry sand BUT wet soil was about the same as wet sand.

For Degradable plastic, the best condition was wet soil, but all the other conditions were about the same.

This experiment can be improved by increasing the sample number (I only had 3 pots for each category). Also stretching the plastic till it breaks isn't an accurate way of measuring.

Even though Biodegradable plastic breaks down faster than Degradable plastic, it's still not good for the environment. We can't see the small plastic particles but they are still there, just not plastic bag size.

LOG BOOK

31.3.16	My Teacher informed me about this science investigation.
2.4.16	I thought of testing why chilli's are spicy and told my teacher about my idea but she said that it would be too advanced for my level.
6.4.16	I thought of another idea. I was interested in testing whether biodegradable bags break down faster than degradable bags. My teacher said that that was a great idea and I should start the investigation as soon as possible.
27.4.16	I purchased the plastic bags and my Dad brought some pots and potting mix from his work.
2.5.16	Grandma and I potted 24 pots and I watered 12 of the pots (as per the method).
3.5.16- 25.6.16	I watered 12 of the pots every morning.
26.6.16	I got the biodegradable plastic pieces / degradable plastic pieces out of the pots to see if they had changed from the original plastic bag.

Individual Results

	Time Stretch (sec)
Degradable (White)	
Control	
White 1	3.52
White 2	2.15
White 3	2.84
AVERAGE=2.84	2.84
W1 - Dry Soil	
Pot 1	2.22
Pot 2	1.15
Pot 3	2.32
AVERAGE=1.90	1.90
W2 - Dry Sand	
Pot 1	1.55
Pot 2	1.91
Pot 3	2.34
AVERAGE=1.93	1.93
W3 - Wet Soil	
Pot 1	1.57
Pot 2	2.11
Pot 3	2.04
AVERAGE=1.91	1.91
W4 - Wet Sand	
Pot 1	1.35
Pot 2	1.01
Pot 3	2.19
AVERAGE=1.52	1.52

Individual Results

Biodegradable (Green)	Time Stretch (sec)
Control	
Green 1	3.09
Green 2	2.31
Green 3	3.18
AVERAGE=2.86	2.86
G1 - Dry Soil	
Pot 1	2.36
Pot 2	1.19
Pot 3	1.00
AVERAGE=1.52	1.52
G2 - Dry Sand	
Pot 1	1.41
Pot 2	2.24
Pot 3	1.33
AVERAGE=1.66	1.66
G3 - Wet Soil	
Pot 1	0.98
Pot 2	0.90
Pot 3	1.08
AVERAGE=0.99	0.99
G4 - Wet Sand	
Pot 1	1.13
Pot 2 (DISTINTEGRATED WITH HOLE)	0.45
Pot 3	1.27
AVERAGE=0.95	0.95

Acknowledgement

I would like to acknowledge my Grandma for helping set up my investigation. I would like to acknowledge my Mum for helping me with my research and helping me type up my method and my results. I would like to acknowledge my Dad for getting the materials for my investigation (Pots and Potting mix). Lastly I'd like to thank my teacher for sending me an article which helped my investigation.

References

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