



**Prize Winner**

# **Scientific Inquiry**

## **Year 3-4**

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# I 'BAG' YOU TO LISTEN! ARE YOU USING THE RIGHT BAG?

## Introduction

When people want to be more environmentally friendly, they want to separate their rubbish so that a big part of that can be thrown in the yellow bin for recycling or in the green bin for making compost. When they want to collect their organic rubbish for the green bin most people think that their choice is between three types of bags: plant base plastic, biodegradable bags or compostable bags.

The problem is that people don't know the real difference between these materials and most of time the brands that make these bags mislead the consumers with words such as "green", "plant" and "bio".

People don't know where to exactly put these bags, if the bag goes to the green, the red or even the yellow bin.

For example, the plastic-based bags such as the "Glad to be green" made by GLAD are just plastic bags with only 20% of plant-based material. They are just a bit better than standard plastic bags but not really environmentally friendly and definitely can't go in the green bin. Luckily, many people know that.

However, the biggest issue is that most people don't understand the difference between the bio-degradable and the compostable bags. In fact, they think that they are exactly the same and both can go in the green bin.

That's the biggest problem!

The difference between biodegradable and compostable bags is *what* they are made of and *how* they break down.

Biodegradable bags are made of smaller pieces of plastic with added chemicals and break down only under particular environmental conditions, such when exposed to UV rays from the sun. On the other hand, the compostable bags are made out of plant materials with no added chemicals and break down in the compost or the soil.

My research wants to demonstrate that compostable bags are not only better than biodegradable bags because they have no chemicals and they have no polluting materials but also that the bio-degradable bags should not be thrown in the green bin because it will never break down in the compost or soil.

Sources:

<https://www.eastwaste.com.au/waste-recycling/compostable-vs-biodegradable-bags/>

<https://envirochoicepackaging.com.au/faqs>

<https://glad.com.au/product/glad-to-be-green-plant-based-wavetop-tie-bag-small/>

## My Questions and hypotheses

My project is based on two main questions:

*Are all bags made of alternative materials environmentally friendly and can be thrown in the green compost bin?*

There is confusion when it comes to understanding the difference between plant-based, biodegradable and compostable bags. The word "biodegradable" is misleading as these bags don't need micro-organisms to break down (like the compostable ones) but instead they need the UV light from the sun. The plastic based are just plastic bags with a bit of plant material. Therefore, I believe that only the compostable bags should go in the green bin.

To answer this question, I have two hypotheses with two experiments:

**Hypothesis 1:** If we leave the plant-based, the biodegradable, the compostable and the traditional plastic bags outside under the sun, only the biodegradable bags will break down over time while the others won't change.

**Experiment 1:** I will leave strips of plant-based, biodegradable, compostable and plastic bags outside under the sun and check which material will break down over a few weeks.

**Hypothesis 2:** If we bury plant-based, biodegradable, compostable and traditional plastic bags under a soil/compost mix, only the compostable bags will break down over time while the others won't change.

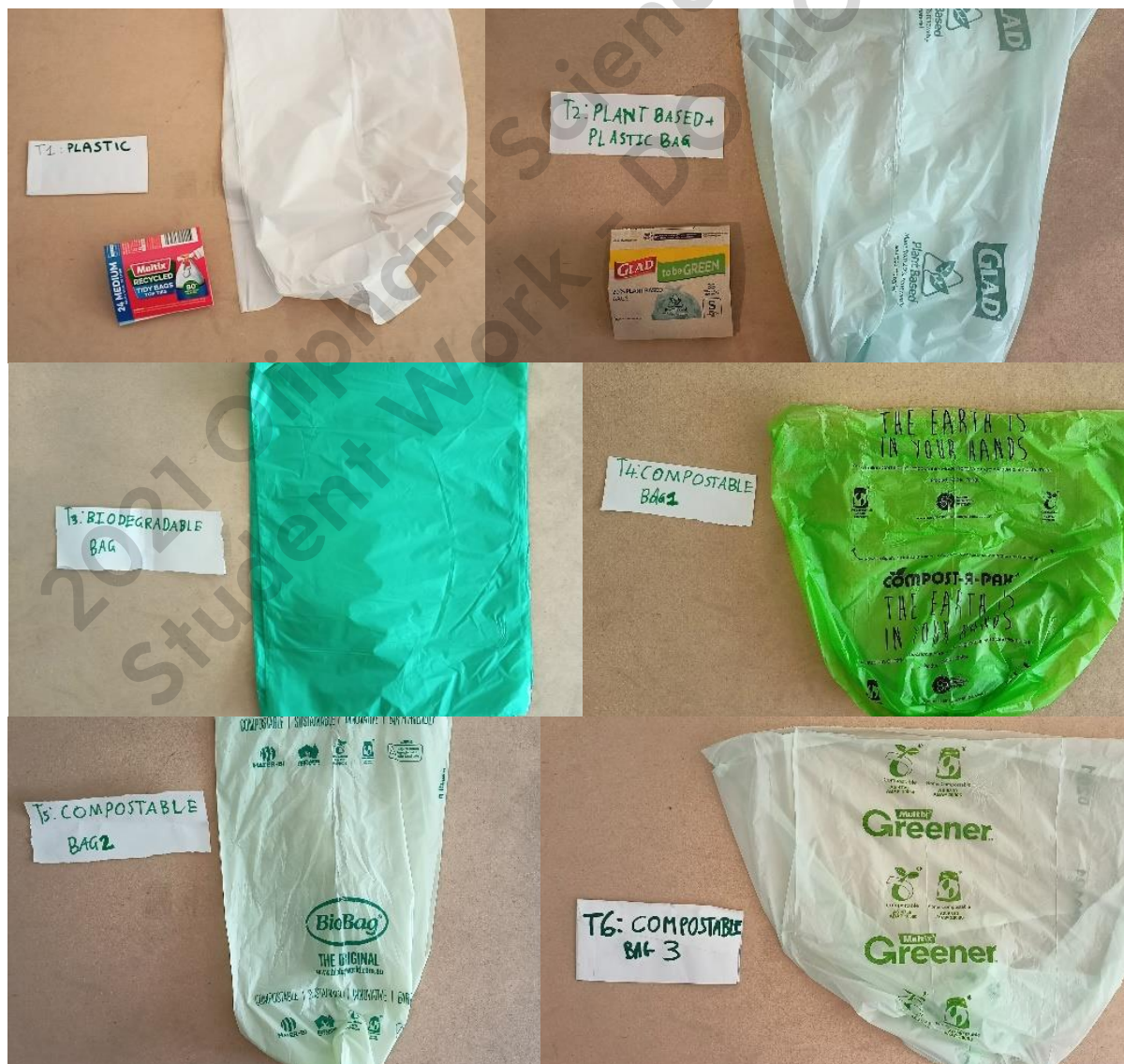
**Experiment 2:** I will bury strips of plant-based, biodegradable, compostable and plastic bags in soil/compost to check which material will break down over a few weeks

## MATERIALS AND METHODS

I have chosen 6 bags made of different materials that represent the 6 treatments of my Experiments 1 and Experiment 2.

The treatments were:

- Treatment 1 (**T1**): standard plastic bag (the control treatment). This was a recycled plastic made by *Multix*.
- Treatment 2 (**T2**): Plant-based bag made by *Glad*.
- Treatment 3 (**T3**): Bio-degradable bags made by *Glitz*.
- Treatment 4 (**T4**): compostable bag brand 1, made by *Compost-a-pack*.
- Treatment 5 (**T5**): compostable bag brand 2, made by *Biobag*.
- Treatment 6 (**T6**): compostable bag brand 3, made by *Multix*.



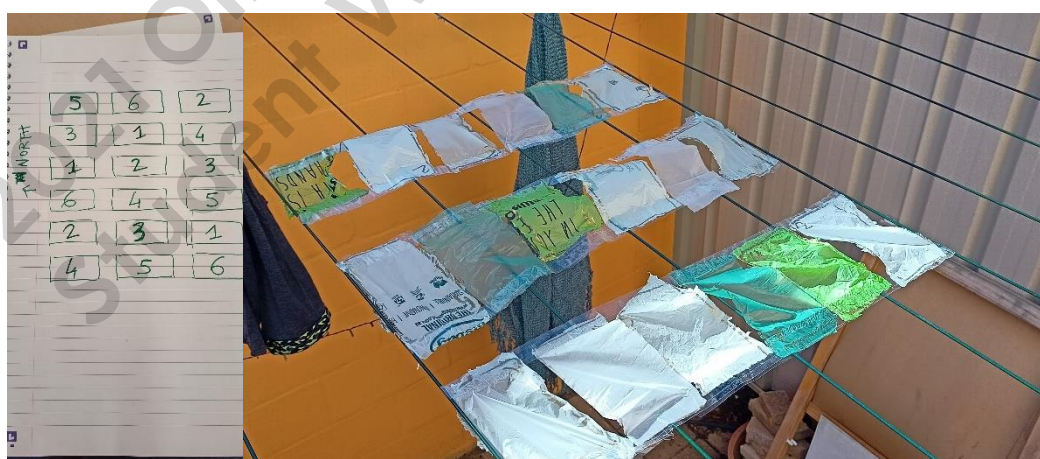


## Experiment 1 - Preparation

On June 6<sup>th</sup> 2021, I cut small square shaped pieces out of the 6 treatments (3 replicas each).

After that, I have attached these pieces together with sticky tape and put them on a drying rack in my backyard which was in the full view of the sun.

Every week I have checked if they had degraded at all and I took photos at the beginning, in the middle and at the end of the experiment on July 20<sup>th</sup> to show the results.



## Experiment 2 - preparation

Like with Experiment 1, on June 7<sup>th</sup> 2021 I cut 3 replica pieces of each treatment (that I called replica A, B and C). Each piece was buried in small pots with a mix of fresh vegetables and compost soil for plants. To speed up the composting process my father suggested to also add a liquid compost accelerator that we bought at our local Bunnings.

I made sure that the soil in the pots never dried up by regularly spraying just a bit of water and the liquid compost accelerator.

After 10 days from the beginning of the experiment I have emptied the soils from the pots of the replica A and checked if any of the treatments started to break down. I have done the same with the replica B after 20 days and with replica C after 42 days.





# RESULTS

## Experiment 1 results

After 20 days from the experiment, I couldn't see any difference between the treatments. All of the looked completely untouched.  
Surprisingly, even after more than 40 days at the end of the experiment all bags were still completely intact. Especially, all three replicas of treatment 3 (biodegradable bags) were just like new, even the colour had not changed a bit.

Bags after 20 days under the sun



Bags after 40 days under the sun



## Experiment 2 results

After 10 days from the beginning of the experiment, the results from Replica A showed that standard plastic, the plant-based and the biodegradable bags had not broken down at all and they were just like new. However, the compostable bags did look different as they started to wrinkle.



A similar observation was done after 20 days with the pieces from Replica B. Again, the treatment T1, T2 and T3 were just like new pieces of plastic while the compostable bags were continuing to get more wrinkles and started to shrink.





After 42 days (Replica C) under the soil mixture, the standard plastic, the plant-based and the biodegradable bags have not changed at all. On the other hand, the compostable bags of the treatments T4, T5 and T6 have very much changed and started to show signs of breaking down.



## DISCUSSION OF THE RESULTS AND CONCLUSIONS

The result in Experiment 1 did not confirm my initial hypothesis. The bags from the bio-degradable treatment did not break down as expected. Perhaps 40 days were not enough but I believe that the main reason is that I have conducted the experiment in Winter Time. In winter there is low UV from the sun and therefore it is not enough for the chemicals in the bio-degradable bags to break down.

The results from Experiment 2 have confirmed my initial hypothesis. Only the bags made of compostable material has started to break down when buried in soil and compost mixture. Also, the other very important result is that the bio-degradable bags did not break down at all, as I initially have predicted.

Therefore, have my experiments helped me to answer the initial question *“Are all bags made of alternative materials environmentally friendly and can be thrown in the green compost bin”*?

I believe my experiment has answered the question because it clearly shows that only the compostable bags should be used for the organic rubbish that goes in the green bin as they are the only ones that will break down.

As expected, the biodegradable bags did not break down in the compost and therefore people should stop using them in the green bin.

Also, another important result is that the bio-degradable bags did not break down when there is not enough UV ray, like for instance during winter.

That means that this could be a big problem in countries that don't have high UV all year round.

So, are YOU using the right bag?????



## Arjun Betti experiment Logbook

Date	activity
6/06/2021	Preparation of experiment 1. I cut 3 small pieces (about 4x4 cm) from the 6 types of bags representing 6 treatments (total of 18 bag pieces). Using sticky tape, I attached the pieces of bags to the drying rack in our backyard. I took note of the position of the different treatments
7/06/2021	Preparation of experiment 2. I cut 3 small pieces (about 4x4 cm) from the 6 types of bags representing the 6 treatments of the experiment (total of 18 bag pieces). I mixed potting soil bought at Bunnings with a mixture of blended carrot, lettuce and C4 onion to represent compost. I filled halfway 18 small peat pots and put the pieces of bags on top of the mixture. I have sprayed the bags with liquid compost accelerator and then I covered the bags with more soil compost mixture until the peat pots were full. I divided the 18 pots into 3 groups, called A, B and C
10/06/2021	Sprayed some water and extra liquid compost accelerator over the pots of experiment 2
13/06/2021	I checked the bags of experiment 1: no changes
15/06/2021	Sprayed some water and extra liquid compost accelerator over the pots of experiment 2
17/06/2021	I have emptied the pots from replica A of experiment 2 to check on the status of the bags. NOTE: treatments T1, T2 and T3 are like new. The compostable bags are starting to wrinkle and T4 have a couple of holes
18/06/2021	Sprayed some water and extra liquid compost accelerator over the pots of experiment 2
21/06/2021	Sprayed some water and extra liquid compost accelerator over the pots of experiment 2
26/06/2021	I checked the bags of experiment 1: no changes. All bags are still the same after 20 days. It has been raining a lot. Not much sun. I have also Sprayed some water and extra liquid compost accelerator over the pots of experiment 2
27/06/2021	I have emptied the pots from replica B of experiment 2 to check on the status of the bags. NOTE: again, treatments T1, T2 and T3 are just like new. The compostable bags look like they have even more wrinkles and some are slightly broken
1/07/2021	Sprayed some water and extra liquid compost accelerator over the pots of experiment 2
2/07/2021	I checked the bags of experiment 1: still no changes. Biodegradable bags are still intact

# Arjun Betti experiment Logbook

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