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Utilizing Dried Orange Peels Eco-Friendly Paper Bags on Reducing Plastic Dependency

[1] Ardiente Eccie D, [2] Alcantara Genesis O, [3] Cabataña C-Jay S, [4] Lasola Jaynielle S, [5] Mendoza Christ Nazarene D, [6] Optana Jezekiel Pascual C, [7] Suarez Janvier P, [8] Ton-Ogan Shan Marnie L

[1, 2, 3, 4, 5, 6, 7, 8] Grade 12 STEM Student, Young Achievers' School of Caloocan Inc., #7 Ramos Compound, Bagumbong, Caloocan City 171, Philippines

Corresponding Author: **Ardiente Eccie D**

Abstract

Plastic has been a convenient material for packaging and carrying items, but the problem is that plastic is non-biodegradable, which harms the environment, wildlife, and contributes to soil and water contamination. This study highlights the environmental impact of plastic and explores an alternative solution to plastic dependency. The study, Utilizing Dried Orange Peels Eco-Friendly Paper Bags on Reducing Plastic Dependency, investigated orange peels, a common household waste, as a source for eco-friendly paper bags. Orange peels contain cellulose, making them suitable as an alternative material. A quantitative experimental design was used with pre-test and post-test surveys on 20 Grade 11 STEM 1 and 2 students. The bags were evaluated based on quality, aroma, and biodegradability. Findings revealed that orange peel-based paper bags are durable, biodegradable, and have a pleasant aroma, making them safe and sustainable alternatives to plastic.

Keywords: Aroma, Biodegradability, Eco-Friendly, Orange Peels, Plastic Dependency

Introduction

Plastics are the most essential and used item for hand carry and carrying multiple items in one bag. Plastic is cost-effective or inexpensive, meaning it is super budget-friendly and that everyone can afford and use it. The use of plastic bags is a big problem for the environment. The floods, animals, water contamination are the influences of plastics. Waste can be generally declared as useless by-products/unwanted substances that are generated mainly during reduction, but the carbon-intensive manufacturing process and long-life cycle of plastic mean we cannot rely on the material for as many purposes as it serves now. Plastic waste has become a universal problem, as most plastic waste is difficult to degrade naturally. In particular, most developing countries have no advanced technological facilities and no proper rules and regulations on plastic production, use, and waste management (Eze, 2021). Though with this advancement, one major factor to be taken into consideration is climate change and the impacts of the usage of conventional petroleum-based plastics which are non-biodegradable, negatively affecting nature (Sharma, 2023). Plastic is not biodegradable and it takes 20 to 500 years to decompose, polluting soil and water in the process. It could also harm wildlife animals and may mistake plastic for food which could lead to the death of animals. Plastic pollution poses a significant threat to the environment. Plastic waste management is also discussed offering practical insights and real-world scenarios. Solutions and challenges in effective plastic waste management guide the creation of a more sustainable and environmentally responsible approach. It highlights the importance of using alternative by using dried orange peels to overcome the plastic dependency. Creating an alternative to reduce the independence of using plastics can help to reduce the harm and potential risk that can be caused by plastic. Orange peel, a common waste product, contains insoluble fibers (cellulose, hemicellulose, and lignin), and soluble fibers (pectin). Orange peels are the outer protective layer of the orange fruit, which is a valuable byproduct generated in the orange processing industry. Orange peel contains the natural substance limonene, the oxidation and connection with carbon dioxide led to the production of biobased plastic The orange peel consists of hemicelluloses, starch, cellulose, lignin, pectin, soluble sugars, fat, ash, protein, and flavonoids. Additionally, the components in orange peel have several health benefits being a noteworthy source of bioactive components, antioxidants and dietary fiber (Tahir, 2023). Dried orange peels are economically friendly and help the environment lessen the harm in the way that dried orange peels decompose after a few months, meaning at the same time it can help improve soil and waste

reduction. These paper bags are a better option because they can be reused and are more environmentally friendly. Eco-friendly paper bags provide a clean, safe, and eco-friendly alternative. Paper bags reduce their long-term environmental impact because they naturally decompose in a few months or years unlike plastic bags. Regarding environmental friendliness, paper bags offer incredible benefits for some reason, they strive to make the environment more sustainable (Pratiwi, 2024). If we truly want to help the environment, we must use sustainable manufacturing practices, renewable energy sources, and ethical material sourcing to minimize damage and ensure a more comprehensive approach. Plastic is one of the most commonly used materials in the world. It has a lot of purposes such as making containers, bags, and packaging materials. The advantages of using plastic that encourage people to rely on it include its lightweight, which makes it easier to handle, and its durability, which allows it to last for years without breaking. However, this same durability is also the same reason why it has become a problem for our environment. Plastic has become a major problem to the environment, as it takes long to decompose, meaning most of it ends up in oceans and on land, where it causes pollution and harms the wildlife. Creating a way to reduce our dependency on plastic to help prevent problems in our environment is to develop eco-friendly paper bags made from dried orange peels which can decompose naturally by microorganisms over time and prevent waste from polluting the environment. Although there is still the use of eco bags, the bio-bag has better materials in altering paper bags and reusing fruit peelings into a product. This study explores the advantages and limitations, as well as the distinguishing characteristics, of the proposed bio-bag that may help it become a new option for the solutions of pollution through a clear set of objectives and problems. The researchers aim to expound on the potential of the orange (Citrus sinensis) peelings as a Citro Bag and the characteristics it has to contribute to reusing and recycling wastes in the environment. It is also taken into consideration what the amount of time or duration the bio bag has before it decomposes or degrades is, as well as to what extent of strain or weight the bio bag is able to carry. Orange is one of the known members of fruit belonging to Citrus sinensis that is widely produced in Brazil, United States, Mexico, and China (Tutem, 2020). According to (Igolima, M., 2023) world range production is over 60 million tons annually, while orange peel waste is about 32 million tons. Orange peels contain a high cellulose content and a rich pectin that can be made into bioplastic (Zhang, 2023). Utilization of fruit wastes, especially, orange peels to produce bioplastic has several advantages, it is biodegradable, sustainable, and can be an alternative for common plastics. This study aims to reduce the dependency on plastic use, where it discusses the alternative eco-friendly bag that uses dried orange peels that decompose after a period of time, preventing it from making a potential risk or harm to the environment and wildlife. This study is important and necessary to conduct for us to lessen or eliminate factors of risk because of plastics. In order for us to protect and keep our environment healthy, we have to prevent and make alternatives to lessen or stop the risk of harm that can make humanity suffer if not resolved.

Materials and Methods

"Utilizing Dried Orange Peels Eco-Friendly Paper Bags on Reducing Plastic Dependency" by using recyclable natural materials such as orange peels, egg cartons, crushed paper, and water can make an alternative eco-friendly paper bag. These natural materials were selected for their biodegradability and likely to reduce the use of plastic. A blender, large container, screen, and drying surface were employed as tools for processing and shaping into paper sheets. The procedure began by placing orange peels, egg cartons, crushed paper, and water into the blender. The mixture was blended thoroughly until it reached a uniformly pulpy consistency. Once blended, transfer it into a large container and fill up the container with water. Using a screen, ready the mixture and shape it into sheets. The made sheets needed to be dried in the direct sunlight for 2-3 days until it was completely firm and hardened. Once the drying process was complete, the sheets needed to fold like a regular paper bag to the product itself were evaluated based on their quality, aroma, and biodegradability as eco-friendly alternatives to plastic bags. Gratifies and investigates the experience of reducing plastic dependency using dried orange peels to make an alternative eco-friendly paper bag. Experimental quantitative research design utilizes the scientific approach. It establishes procedures that allow the researcher to test a hypothesis and to systematically and scientifically study causal relationships among variables. A research design will be employed to measure the quality, aroma and biodegradability. The respondents of the study were the Grade 11 STEM 1 and STEM 2 students of Young Achievers School of Caloocan. From the total population of 86 students, a total of 20 respondents were selected using simple random sampling—10 from STEM 1 and 10 from STEM 2. They were chosen as participants because they represent the younger generation who are expected to adopt sustainable practices. The instrument used in the study was a survey consist of 5-point Quality Likert Scale. The survey is measured the respondent’s evaluation of the eco-friendly paper bags in terms of quality, aroma, biodegradability, and overall preference compared to plastic bags. To gather data, the procedure began by introducing the students to two different types of bags which is the traditional plastic and the eco-friendly paper bags made from dried orange peels. After a short explanation of the purpose and features of each bag type, the students were asked to use both bags. Once they had experienced using each type, they were instructed to answer the survey rating their experience. The collected data were analyzed using a paired t-test. Statistical test was applied to determine whether there was a significant difference between the student’s ratings before and after using the eco-friendly paper bags made from orange peels.

Results and Discussion

Results and discussion of the gathered data being analyzed and solved from the conducted study. The study titled "Utilizing Dried Orange Peels as Eco-Friendly Paper Bags on Reducing Plastic Dependency" presents and interprets the findings of the study based on the data gathered from Grade 11 STEM 1 and STEM 2 students at Young Achievers' School of Caloocan, Inc. This section will discuss if the alternative hypothesis is effective or not through the results of the test score data. Also, this study utilized statistical

tools which are the paired t-test. Use of pretest and posttest to collect the data and determine the effectiveness of using dried orange peels in making eco-friendly paper bags as an alternative to plastic.

Pre- Test score

Table 1: Descriptive Statistics of Pre- Test Score

Test	n	Mean	Standard Deviation
Pre-Test	10	52	4.5
Post-Test	10	79.5	5.5

Note: Pre- Test = Plastic use before trying the eco-friendly paper bag; Post- test = After using the dried orange peel eco-friendly paper bag

Table 2: Summary of Pre- Test and Post Test Scores

Pre- Test	Post- Test
61	91
58	76
52	78
53	71
48	81
51	81
51	77
49	75
51	81
46	84

The pre-test focused on the regular use of plastic bags. Students from grade 11 stem 1 and 2 pre-test scores (61, 58, 52, 53, 48, 51, 51, 49, 51, 46) generate a **mean= 52.00** and **standard deviation (SD)= 4.50**. It suggests that plastic bags stay the most accessible and convenient option for students in their everyday routines.

Post-Test

For the post-test, where participants tried the dried orange peel eco-friendly paper bags, the mean score increased to **m= 79.50** with a standard deviation of **SD=5.50.** This shows a higher level of acceptance and usage of the eco-friendly paper bags compared to plastic. The higher mean shows that the orange-peel paper bags were accepted by the students and found useful in daily use.

Paired T- test Result

Table 3: Paired t-test Analysis of Pre-test amd Post-test Scores

Test Pair	Mean Difference	Standard Error	t	table t
Pre- Test and Post-Test	27. 50	1.96	-14.01529776	2.626

Note: The difference between pre-test and post-test scores was statistically significant at probability value **p < .001**

The paired t-test result showed **t = -14.02**, with **p < .001**, which is higher than the **table t = 2.262**. The null hypothesis was rejected and the alternative hypothesis was accepted. This means that the **H_1 (Alternative Hypothesis)** paper bags made from orange peels are effective, biodegradable, and have an acceptable aroma when compared to conventional alternatives.

These findings are backed by some recent studies. Lopez and Martinez (2021) studied that giving schools and communities eco-friendly materials can actually encourage young people to behave more environmentally, since they start noticing environmental issues more. Kumar and Singh (2022) discovered that biodegradable packaging gets accepted easily when it is practical and durable, showing that people care about both usefulness and sustainability. Using natural materials or waste like fruit peels can help make products that are cheaper, eco-friendly, and also reduce plastic dependency and pollution (Chen, 2023). The study of aroma is important when making biodegradable packaging, since it can affect people's satisfaction and comfort. Zhao (2023) said that making it smell fresh and appealing when it has citrus peels or orange peels. The study about orange peel-based aroma needs to be balanced to make eco-friendly alternatives and user-friendly paper bags.

Overall, using dried orange peels in making eco-friendly paper bags led to a large, statistically significant improvement from pretest to posttest scores. **Pre- test mean= 52 SD= 4.5** and **Post-test mean= 79.5 SD= 5.5 (mean gain= 27.50, t = -14.015, table t 2.626, p < .001,)**, Therefore, the null hypothesis **(Ho) is rejected**, and the alternative hypothesis **(H_1) is accepted**. Orange-peel paper bags are effective, biodegradable, and acceptable (including aroma considerations) compared to conventional plastic-based options.

Conclusion

This study is aimed to reduce plastics and food waste in the environment by using orange peel from food waste. By recycling an orange peel, orange peels can be recycled as paper bags and reduce the usage of plastics, it helps to decrease the plastic usage and it helps to reduce food waste. Orange peels come from natural resources, which can be used as a fertilizer. The researchers aim to accomplish this study that can help our environment and to lessen or eliminate factors of risk because of plastics. These paper bags can assure the safety of your food, because it is environmentally friendly and durable. This research is focused on how to reduce the usage of plastics by using natural resources and making them more eco-friendly. The respondents of the study are a total of 20 students from

grade 11 STEM students from STEM 1 and STEM 2 at Young Achievers' School of Caloocan, Inc. This study is experimental which highlights pre-test and post-test through data gathering. According to the results of pre-test and post-test that were gathered by researchers. The null hypothesis was rejected and the alternative hypothesis was accepted. This means that the H^1 (Alternative Hypothesis) paper bags made from orange peels are effective, making them more eco-friendly in our environment. The effectiveness of eco-friendly paper bags is that by recycling an orange peel and turning it to a paper bag it reduces the usage of plastics and food waste. It helps our environment by recycling it using dried orange peels, it can make a natural source that decomposes after a period of time to prevent the waste in our environment. In conclusion, the result of the study paired t- test led to a large, statistically significant improvement from pre-test to post-test scores. **Pre- test mean= 52 SD= 4.5** and **Post-test mean= 79.5 SD= 5.5 (mean gain= 27.50, t = -14.015, table t 2.626, p < .001,)**, Therefore, the null hypothesis **(Ho) is rejected**, and the alternative hypothesis **(H_1) is accepted**.

Recommendations

For students, in the classroom, it is suggested that they begin implementing environmentally friendly alternatives such as paper bags made from orange peel into their daily routines. By doing this, students not only lessen their reliance on plastics but also develop a sense of responsibility for cutting down on environmental waste. Apart from inspiring their peers to adopt eco-friendly practices, they are also encouraged to participate in awareness-raising activities and research more biodegradable materials that could be recycled or used to create useful products.

For researchers, to make orange peel paper bags more useful for everyday use, it is advised that this study be expanded by enhancing their quality and durability. Researchers are also urged to look at consumer acceptability production, scalability and cost-effectiveness in order to assess whether large-scale application is feasible. To provide a more comprehensive understanding of the environmental benefits of using biodegradable materials, long-term research on biodegradability under various conditions is also recommended.

Teachers can include topics about environmental protection and plastic alternatives in their lessons. Educators should motivate students to try new ways in making paper from dried orange peels as a fun and educational proposed project. Teachers may also guide students in starting eco-friendly clubs to promote the use of recycled materials in school zones.

School administrators should spread and support every program that motivates people to reduce plastic use by using paper bags made from natural waste. With this support, they can lessen the influence of plastic by limiting the idea of using plastic bags in the canteen. They should also provide the needed resources for students proposed eco-friendly activities that will help bring these projects to be utilized around the school.

Future researchers should look for new ideas to turn orange peels into strong, durable, and usable paper. They can also test how well orange peels paper breaks down naturally compared to plastic. Future researchers can broaden and improve the existing research regarding the use of biodegradable waste in producing a new product.

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