Effectiveness of Musa Paradisiaca (Banana) Peel as an Alternative to Commercial Floor Wax for Household Use in the Philippines

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Angela G. Alcaraz[1], Klara Mae R. Dimaano[2], Patricia Ann C. Feliciano[3], Kyle Andre G. Ong[4], Carlos Ignacio P. Lugay, Jr. (PhD, PIE, Asean Eng)[5]
Faculty of Engineering, Department of Industrial Engineering, University of Santo Tomas, Manila, Philippines
angelaalcaraz.04@gmail.com[1], klaradimaano@gmail.com[2] patriciafeliciano@rocketmail.com[3],ongkyleandre@gmail.com[4], cplugay@ust.edu.ph[5]

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Abstract – *The floor wax that are popularly known have side effects that are bad for the health. It also has a pungent odor that irritates most people. Studies show that constant exposure to the inhalation of the odor of cleaning products, specially floor wax, have bad respiratory effects. The purpose of this study is to create an alternative for floor wax that eliminates the bad respiratory and dermatological side effects, that can be obtained from floor wax, with the same or better quality than the floor waxes known today. The scope area of the study will focus on the households in the Philippines. The alternative that the researchers have found is to replace the toxic ingredients used for floor wax to banana peel. The methods of this study are mostly done by comparative experiments, survey and observation. The data from Brand X against the test results obtained from our experimentation was used for comparison in order to examine which is product quality is better. The researcher's experiment's goal was to obtain results which can be used as a comparison for odor, friction and shine. The result for the odor of the banana peel floor wax was not strong compared to the odor of the Brand X. The banana peel floor wax also has more friction and shine than the Brand X. It concludes that Banana peel with Carnauba wax is comparable with the commercial floor wax and can be a potential alternative in terms of cost, benefits, acceptability and effectiveness of its use in a concrete flooring material. The researchers recommend to use and help improve the Banana peel with Carnauba wax attribute qualities for better-quality effectiveness and acceptability and to further research for other factors that would increase the effectivity of the product and decrease its cost.*

Keywords – *Alternative, Toxicity, Shininess, Odor, Friction*

INTRODUCTION

In recent years, cleaning had been identified as an occupational risk because of an increased incidence of reported respiratory effects, such as asthma and asthma-like symptoms among cleaning workers. Due to the lack of systematic occupational hygiene analysis and workplace exposure data, it was not clear which cleaning-related exposures induce or aggravate asthma and other respiratory effects. Currently, there was a need for systematic evaluation of cleaning products ingredients and their exposures in the workplace. Cleaning products' ingredients of concern with respect to respiratory and skin irritation and sensitization assess the potential for inhalation and dermal exposures to these ingredients during common cleaning tasks. [1]

Floor Wax was a wax-based preparation used to finish and polish floors. It was meant to increase hardness and glossiness in flooring and create resistance against slips and scuff marks. There were some major considerations to take into account for any business owner contemplating how to coat and protect their floors, such as health effects, and durability. This kind of wax was a solution that had been used extensively since centuries for floor care. While there

were still several traditional agents available in the market, most people prefer manmade and synthetic floor waxes that were comparatively easy to apply. [2]

The benefits of the floor wax when applied properly was that it offers high shine that gives advantages for both commercial and business spaces. Commercial waxes were made of synthetic materials or a mix of artificial materials and chemical components. For decades now, there was no doubt about the effectivity and reliability that the floor had given us. We trust that floor wax will serve it function without a doubt, but what concerns industry professionals right now were the harsh chemical contents that might affect the environment around it. [3]

The most common synthetic wax ingredients used in floor wax were cresol, formaldehyde and hazardous chemicals like nitrobenzene, perchloroethylene, phenol, toluene, and xylene. Cresol was dangerous to the health when inhaled. This substance had been shown to cause kidney and liver damage in people and can cause a myriad of health issues for animals. Formaldehyde had been linked to numerous medical conditions because it was an extremely toxic substance, but it was still found in many commercial floor wax cleaners. [4] The health issues that had been linked to formaldehyde were cancer, asthma and reproductive dysfunction. It can also be lethal to many animals. Formaldehyde was a well-known irritant of the upper respiratory tract with symptoms such as eye, nose, and throat irritation commonly associated with indoor exposure to gas. [5]

Table 1. Benefits of using floor wax (USCPSC, 2013)

Advantages of using floor wax	Reasons:
Durability	The wax used in floor wax absorbs the damage caused by sharp materials, pets, foot marks and other factors that can continuously damage the floor.
Shininess	Floor wax can definitely make the floor shinier especially for the tiles and vinyl.
Safety	Waxing the floor area can provide enough grip for people to walk safely even when the floor is wet.
Longevity	Floor waxing can increase the lifespan of the floor materials by years and it can also protect the quality of the materials used on the floor.

Applying wax on the floor gives a natural appearance of the floor material and produces a relatively durable finish. It can help people to walk safely and can remove scratches caused by some factors. It can minimize the faults that can be seen on a wooden floor. Solid paste waxes can take longer to apply than liquid waxes but when it comes to quality it can last longer.

Table 2. Threshold Toxicity Values

EXPOSURE VIA INHALATION		
ppm	mg m3	SIGNS AND SYMPTOMS
0.05	0.06	Slight eye irritation
0.08-2.5	0.1-3	Throat and upper respiratory tract irritation
>5	>6	Lower airway and pulmonary irritation

On Table 2., these were the toxicity values of formaldehyde. Once the person was exposed through inhalation, there was an equivalent signs and symptoms depending on the amount of the chemical exposed to the person.

Although floor wax was suitable for almost any type of floor and had been popular for a long time, many businesses and flooring industry professionals were starting to question its harsh chemical contents and the long-term effects that it might have for anyone in an environment with floor wax.

Brand X was the most used floor wax here in the Philippines that was manufactured by the leading brand. Because of its availability in the market, it was the one commonly used in households. It was made of waxes, dyes and petroleum distillates. Due to its compositions and combustible mixture, it affected the health of children and was not allowed to be exposed in excessive heat and open flames. Brand X would be used by the researchers to compare floor wax made from banana peels.

In exchange for harmful substances such as kerosene in common floor wax, the researchers had decided that carnauba wax will be used as an alternative ingredient. Carnauba wax**,** also called ceara wax, a vegetable wax obtained from carnauba tree. [7] Many products that people use today contains carnauba wax, though people might not know that there was carnauba wax in it. Carnauba wax was an extremely significant natural chemicals and renewable resources that doesn't have a synthetic equivalent. Carnauba wax was mostly used to shine various of products and known to be used by manufacturers as a glossing agent. It has higher melting point than other waxes do, and it was also very

hard that was why it was sometimes referred to as "Queen of Waxes". It was used as durable coatings for automobiles, floors, and other products. There were no worries about its product safety in relation to consumer's concern of any product that we ingest or use on our bodies because carnauba wax was hypoallergenic and non-toxic. It was made up of fatty alcohols, fatty acid esters, hydrocarbons, and acids.

There were many alternatives that can be used instead of the synthetic materials used in commercial floor waxes. Surprisingly, banana peels contain a numerous amount of nutrients like fiber, Vitamin B6, Vitamin B12, Magnesium, and Potassium. Mineral content in a banana peel was primarily consistent of potassium (78.10mg/g) and manganese (76.20mg/g). The peel's high potassium content, if taken orally, aids in maintaining normal blood pressure.[8] Given that banana peels have high content of potassium it was commonly used ingredient in shoe polish. Banana peels were also known for its slippery effect. Dr. Kiyoshi Mabuchi and his team experimented on the slipperiness of banana peels and resulted that on wood have a CoF of only 0.07 which was twice as slippery as ice and five times slipperier than wood. Combining both idea that banana peels contain potassium and were slippery, it can be used as an alternative floor wax.

Banana (Musa paradaisica), was grown worldwide and consumed as ripe fruit or used for culinary purposes. Peels form about 18-33% of the whole fruit and were a waste product. With a view to exploiting banana peel as a source of valuable components, the nutritional composition, and antioxidant components. The fruit was protected by its peel. Bananas were packed with nutrients, and that includes their peels. Nitrogen, phosphorus and potassium were required in the highest amounts, and nutrients such as calcium, manganese, sodium and sulphur were necessary in lower amounts. [9]

Bananas can be found in all tropical and subtropical regions of Asia. Philippines was one of the countries that produces banana since the country was in tropical region. Philippines' was also known as the sixth-leading exporter of bananas in the world behind Ecuador, Costa Rica, Belgium, Colombia and Guatemala. Also, banana peels were available in populated areas where most of the people consumes or plants banana trees, and it can also be found in the vicinity of banana processing plant. Banana peels can be easily found since consumers just usually throw the peels thinking that banana peels were not usable or does not have value anymore. Moreover, there was superabundance of bananas in the Philippines which makes our research more suitable and more significance that can help the improvement of the society's welfare. Aside from its abundance, Banana peels contain potassium, a chemical element, that can be applied to leather, woods, and metals that makes a natural polishing agent and can be used to shine the mentioned materials. Also, bananas are slightly radioactive because of small amounts of the naturally occurring isotope potassium-40. But the rate of the radioactivity is so low that it's not harmful. [11] The Japanese tribologists measured the frictional co-efficient of banana peel on a linoleum surface at 0.07. The result was amazingly low. Better than metal on metal lubricated by oil. In fact, banana peel is not much worse than Teflon on Teflon, which is as about as low as you can get in the land of friction. [11]

For these reasons, the researchers would like to test if banana peels can be an alternative floor wax in the Philippine households.

OBJECTIVES OF THE STUDY

Primary Objectives:

This study aims to prove that banana peels can be recycled into good quality product and be useful to households and can prove the effectiveness of banana peel as an alternative use of floor wax and determine if Saba, kind of Banana, was effective. This research also aims to reduce the harmful chemical components found in the commercial floor waxes. The researchers wanted to help to create a product of floor wax which was cheaper and could give the same quality which the commercial one could give and compare and test the friction, odor, and shininess of the alternative floor wax from the commercial floor wax

Secondary Objectives:

The researchers wanted to find an alternative ingredient for kerosene in floor wax and test the effectivity of the banana peel as an alternative floor wax in all floor types, and identify the possible cots in making an alternative floor wax

METHODS

As for this study, the researchers used experimental research method. Experimental Research was done by isolating the research in a physical situation apart from the routine of ordinary living and by manipulating one or more independent variables under rigorously specified, operational and controlled conditions. It was considered the most conclusive research method

because it established different treatments and then studies their effects. Results of this type were likely to lead to the most clear-out interpretations.

Specifically, the research design that the researchers applied in this undertaking was Factorial design. Factorial Design was an experimental design which allows a number of groups to be considered and include in the experiment. The researchers were allowed to measure not only the main effect of each independent variable (e.g. the effects of kind, quantity of peels used, production process, ingredients used in the quality of Banana Peel floor wax) but also the interaction effects of these independent variables.

The term factorial denotes that two or more independent variables were being investigated, each variable or whether or not the effects were specific levels of the control variable.

In this research undertaking, more than two variables were considered and manipulated, interactions between them might also be present and their effects to one another cannot be ignored. The sampling technique employed in this study involved purposive random sampling. Samples of this inquiry were randomly and purposively selected in order to make the study more manageable. Due to some factors that may cause variations among the different samples of the study, the researchers randomly selected flooring by categorizing and classifying them based on their type (Scarlet Oak, Wooden tile, and Ceramic tile).

Subject and Study Site

Banana was the number one fruit commodity in the Philippines both in production and hectarage. The industry was divided into two distinct sectors namely those for the domestic market and those for the export market. Banana for the domestic market were grown throughout the country in small farms under minimal care while for the export market, large integrated farms were concentrated in Mindanao where typhoons/strong winds seldom occur and grown under intensive cultivation. Harvesting occurs throughout the year. On a regional level, the area devoted to banana varies ranging from 4,932ha in Cordillera Administrative Region (CAR) to 88,320ha in Davao Region in 2013. The yield per hectare obtained from 2008-2013 ranged from 18.22MT (2010) to 20.36MT (2011) with an average of 19.71mt/ha and an average annual growth rate of - 0.16 from 2008-2013. [10]

The researchers tried the alternative floor wax in wood block, scarlet oak and ceramic tile to differentiate the shininess, odor and friction of the product. Banana peels (Saba peel) were collected through soliciting the banana cue vendor in Espana, Manila. Survey for the odor of the two-different floor wax was given to students and janitors inside Roque Ruano Building since they were the members of the society that was most familiar with floor wax, thus, they can give a fair decision when asked about the odor.

Data Measure

Table 3. Unit of Measurement

	Unit of Measurement
Illumination	Lux
Friction	Seconds
Odor	Survey Rating
Weight	Kilogram, gram

The materials used in this study were presented and enumerated. These materials were arranged in such a way to give the prospective readers an idea of what were utilized and manipulated in producing floor wax from banana peels. These materials include banana peels (i.e. saba), and carnauba wax. The materials used were water, Carnauba wax (1/16 teaspoon), Banana peels (Saba), Canola Oil (4 teaspoons), Scarlet Oak, Ceramic Tile, and Wooden Tile.

Table 4. Comparison of Materials Used

Study 1	Study 2	Study 3	Banana peel with Carnauba wax
Paraffin wax	Carnauba wax	Janitor Fish Oil	Carnauba Wax
Polyethylene wax crystals	Water	Banana peel	Canola Oil
Kerosene	Ipil-ipil Leaves	Pandan leaves	Banana Peel (Saba)
Banana peels		Cooking oil	
		Crushed candles	

Data Gathering Procedure

The entire experimentation which included the set-up and reactions was performed at room temperature and at atmospheric pressure. It had been designed by the researchers to divide the entire experimental procedure into five parts. Particularly, starting from Part I which was the preparation of the banana peels

(i.e. saba) followed by Part II which was the production of floor wax using the banana peels in Part I, and the last three parts were for the testing of the criteria mentioned in the hypothesis.

Furthermore, no alterations or further purifications were employed to the materials used in this study except the banana peels which undergone the process of cleansing with water and chopped into tiny pieces as prescribed and designed by the researchers. The general procedure followed in this research was presented below:

Part I. Preparation of banana peels

1. Clean the banana peels with water followed by chopping them into pieces.
2. Place chopped banana peels into one bowl

Part II. Production of Floor wax

1. A double boiler using a cooking pot and an oven-safe bowl was used. Tap water was poured into the pot, the bowl on the other hand was placed on top of the pot.
2. The double boiler was then placed on the top of the stove over low flame.
3. 1/16 teaspoon of Carnauba wax scraped will be placed into the bowl.
4. The Saba banana peel was added into the bowl of the double boiler with 4 teaspoons of Canola Oil
5. The ingredients were mixed and stirred together slowly using a wooden spoon until everything was fully mixed together.
6. The bowl was then removed from the pot of water using gloves and the stove switched off.
7. Mixture was allowed to cool but not solidify. The floor wax was fluid enough to pour into a container but not too hot it cannot be handled.
8. Mixture was poured into a clean, dry, glass jar using a plastic funnel.

The finished saba banana peel floor wax was placed in a cool and dry place.

(Adopted from: Popovitch (2008) How to make floor wax @ www.eHow.com)

Part III. Testing for Friction

1. Apply the alternative floor wax and Brand X floor wax in the ceramic tiles, wooden block, and scarlet oak
2. Adjust the three (Ceramic, scarlet oak, wooden block) tiles by its respective angles
3. Test the friction by timing the slipping of a coin from start to end of the material

In terms of friction, the researchers will test it using tilted plane method where a block was placed on a plane and the tilt was increased until the object slides.

Part IV. Odor Testing

1. Conduct survey for at least 25 people to know the level of the odor
2. Solve for t test to determine the level of the odor

Part V. Testing for Shininess

1. Application and use of banana peel floor wax will be done in one area of ceramic tile, scarlet oak, and wood block to represent a wood tile that was provided by the researchers.
2. Using a wide light range meter, measure the shininess of the applied floor wax in different types of materials
3. Record the results of the shininess of the floor wax given by the device
4. Repeat steps 2 and 3 three times.

Ethical Considerations

The researchers took proper and ethical steps in carrying out this study on all accounts. The ethical considerations observed were asking for permission to different people to answer the given surveys, showing courtesy to the students and janitors who answered the survey, citing the works of the researchers used in this study such as journals, books, articles, references using American Psychological Association format or APA System, use of proper communication etiquette while interviewing and talking to the officers, staffs, and workers. The researchers kept all the gathered confidential data and all false data and misinterpretation of the study was neither entertained nor published, and there were avoided. This paper was carefully reviewed to prevent plagiarism, academic fraud, and misinterpretation. No one was harmed in the experiment, and possible benefits were maximized and minimize possible harms.

Mode of Data Analysis

T-test two sample for Means was used to determine the significant difference on the odor. ANOVA with replication was used with shininess, and friction of the floor wax derived from banana peel and the commercial floor wax.

On the other hand, t-test was also used to determine the level of significant differences between the data that were being compared. The test that was used in this study was independent samples T-test because the researchers will compare the banana peel floor wax to the Brand X floor wax.

Analysis of Variance (ANOVA) was also considered to determine the level of significant differences of friction and shininess. ANOVA was a

statistical technique that assesses potential differences in a scale-level dependent variable by a nominal-level variable having 2 or more categories. The one that the researchers chose to use was the two-way ANOVA because the researchers were using two independent variables. Two-way ANOVA can be used to examine the interaction between the two independent variables. Interactions indicate that differences were not uniform across all categories of the independent variables.

In connection to this, the researchers chose the 5 percent level of probability to determine the degree of significance of findings. A significance level of **0.05** indicates a 5% risk of concluding that a difference exists between the banana peel floor wax and the commercial floor wax in terms of odor, shininess and friction.

RESULTS AND DISCUSSION

The main purpose of giving the Banana Peel floor wax acceptability measure was to determine the effectiveness of Banana Peel floor wax when applied in a concrete material. It also aims to find out the mean difference between the Banana Peel and the commercially available floor wax, the Brand X floor wax. There were three hypotheses drawn from the Banana Peel floor wax acceptability measure data.

A mean rating of 3.0 was set as the level of odor acceptability of the Banana Peel floor wax effectiveness for the measure used as tool in the study.

A mean score of 1.12 and 11.57 was set as the level of acceptability of the Banana Peel floor wax effectiveness for the measure used as tool in the study, for the friction and shininess criteria respectively.

Below was the rating scale used by the 25 respondents of this study in rating the waxes' effectivity or acceptability in a concrete material for the odor criterion: 5 - no odor; 4 – mild; 3 – moderate; 2 - strong odor; 1 - very strong odor.

The mean rating for odor effectiveness of Banana Peel floor wax was 4 based on the survey.

The data presented shows that a mean obtained by the Banana Peel floor wax for odor statistical significance reaches the standard mean of 3.0 that was set as level of Banana Peel floor wax effectiveness or acceptability. The Banana Peel floor wax obtained a mean score of 4 for odor effectiveness or acceptability, while the Brand X floor wax obtained a mean score of 1.96.

Using t-Test: Paired Two Sample for Means, the data presented in Table 5. shows that the odor of the banana peel floor wax was not strong compared to the odor of the Brand X floor wax.

Therefore, Ho was rejected; that was, the mean score of the banana peel floor wax odor statistical significance was greater than that of the Brand X floor wax's.

Table 5. **Summary of Odor Result using T-test two paired sample for means**

	Banana peel with Carnauba wax	*Brand X*
Mean	4	1.96
Variance	0.583333333	0.956667
Observations	25	25
Pearson Correlation	-0.223105374	
Hypothesized Mean Difference	0	
df	24	
t Stat	7.452339669	
P(T<=t) one-tail	5.40746E-08	
t Critical one-tail	1.71088208	
P(T<=t) two-tail	1.08149E-07	
t Critical two-tail	2.063898562	

The respondents consist of helpers, janitors, security guards, students, and mothers. The researchers chose this mix of respondents since they were the members of the society most familiar with floor wax, thus, they can give a fair decision when asked about the odor.

Table 6. **Friction Test Results Using 1 Peso Coin (in seconds)**

	Trial	**Using Banana Peel Floor Wax**	**Using Brand X Floor wax**
Ceramic Tile (13 deg.)	**1**	1.07	1.00
	2	1.46	1.31
	3	0.89	0.94
Wood Parquet (25 deg.)	**1**	0	1.58
	2	0	1.39
	3	0	1.84
Scarlet Oak (19 deg.)	**1**	1.06	1.72
	2	0.60	0.59
	3	0.85	0.52
	Mean	0.988	1.21

The data in Table 6 shows that the banana peel floor wax has greater friction than the Brand X floor wax when applied to a ceramic tile inclined at 13 degrees.

The table above also shows that the Brand X floor wax has much lesser friction than the banana peel floor wax since the one-peso coin did not slide down the material when the wood parquet was inclined at 25 degrees. The one-peso coin only slides down the inclined wood parquet at an angle of 45 degrees.

Furthermore, the banana peel floor wax also has greater friction than the Brand X floor wax when applied to scarlet oak inclined at 19 degrees.

This result show that a mean score obtained by the Banana Peel floor wax reached the standard mean set as level of Banana Peel floor wax statistical significance which was 1.12. The Banana Peel floor wax obtained a mean of 0.988 which reaches the standard level. Meanwhile, the mean score obtained by the Brand X floor wax was 1.21 which exceeded the standard level.

Table 7. **Summary of friction result using ANOVA two-way with replication**

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*
Sample (Flooring)	1.366	1	1.366	12.02	0.004
Columns (Floor wax)	0.306	2	0.153	1.346	0.296
Interaction	2.511	2	1.255	11.04	0.001
Within	1.364	12	0.113		
Total	**5.548**	**17**			

Kinds of Flooring

1. Ho = u1 = u2 = u3
2. H1 = At least 2 were not equal

Ho = The mean time using different flooring were equal

H1 = At least 2 of the mean time using different flooring were not equal

Ho = The kind of flooring has no effect on the friction

H1 = The kind of flooring affects friction

3. Alpha = 0.05
4. Reject Ho

Type of floor wax

1. Ho = uX = uB
2. H1 = uX ≠ uB

Ho = The mean time using different floor wax were equal

H1 = The mean time using different floor wax were not equal

Ho = The type of floor wax has no effect on the friction

H1 = The type of floor wax affects friction

3. Accept Ho

Interaction

1. Ho = (u1*uX) = (u1*uB)
2. H1 = (u1*uX) ≠ (u1*uB)

Ho = The combinations of the mean of the different flooring and floor wax were equal

H1 = The mean time using different flooring and floor wax were equal

Ho = The combinations of flooring and floor wax do not affect time

H1 = The combinations of flooring and floor wax affect time

3. Reject Ho

The data presented in Table 7 suggests that the Banana Peel floor wax was indeed generally acceptable to be used in a concrete material. Furthermore, the data also shows that the Banana Peel obtained a mean score of 0.6589, which was quite significantly greater than the Brand X floor waxes with a mean score of 1.21.

Based from the set standard level of friction effectiveness/acceptability (1.12), results show that somehow, the Brand X floor wax was also generally acceptable to use in concrete materials with a friction mean score of 1.21

The researchers used ANOVA to determine the difference on the friction and general statistical significance of the banana peel floor wax and Brand X floor wax.

Table 8. **Shininess using Wide Light Range meter**

	Trial	**Using Banana Peel Floor wax**	**Using Brand X Floor Wax**
Ceramic Tile	**1**	16.6	16.3
	2	16.1	15.1
	3	16.1	15.2
Wood Parquet	**1**	12.4	11.1
	2	13.2	11.6
	3	12.1	11.3
Scarlet Oak	**1**	6.8	6.3
	2	7.4	6.6
	3	7.5	6.6
	Mean	12.02	11.12

Results in Table 8 also supports the first Hypothesis (H1); that was, the friction of Banana Peel floor wax was greater than that of Brand X's.

Further analysis of the data also shows that there was an insignificant difference in using different types of floor wax. Both the Banana Peel and Brand X floor waxes were generally acceptable to be applied in a concrete material.

As for different kinds of flooring, results show that different types of flooring affect friction. This also goes for using combinations of different kinds of flooring and different types of floor wax.

The best combination to obtain the greatest friction was for one to use the Banana Peel floor wax in a wood surface.

Table 9. Summary of shininess result using ANOVA two-way with replication

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Sample (Flooring)	3.64	1	3.64	20.1	0.00	4.74
Columns (Floor wax)	246.	2	123.	679.	4.5E-13	3.88
Interaction	0.25	2	0.12	0.69	0.52	3.88
Within	2.17	12	0.18			
Total	**252.**	**17**				

As shown in Table 9., the shininess of the Banana Peel Floor wax was better than the Brand X floor wax when applied to different types of material used.

The data presented shows that the shininess level of the Banana Peel floor wax reached and exceeded the statistical significance for shininess, which was 11.57. The Banana Peel floor wax obtained a mean score of 12.02. It was greater than the Brand X floor wax's mean score of 11.12.

It was fair to conclude that both the Banana Peel and Brand X floor waxes were acceptable due to the negligible mean difference derived from the criteria.

Kinds of Flooring

1. Ho = u1 = u2 = u3
2. H1 = At least 2 were not equal

Ho = The mean lux using different flooring were equal

H1= The mean lux using different flooring were not equal

Ho = The kind of flooring has no effect on the shininess

H1 = The kinds of flooring affect the shininess

3. Reject Ho

Type of floor wax

1. Ho = uX = uB
2. H1 = uX ≠ uB

Ho = The mean lux using different floor wax were equal

H1 = The mean lux using different floor wax were not equal

Ho = The type of floor wax has no effect on the shininess

H1 = The type of floor wax affects shininess

3. Reject Ho

Interaction

1. Ho = (u1*uX) = (u1*uB)
2. H1 = (u1*uX) ≠ (u1*uB)

Ho = The combination of the mean lux of the different flooring and floor wax were equal

H1 = The mean lux of the different flooring and floor wax were not equal

Ho = The combinations of flooring and floor wax do not affect shininess

H1 = The combinations of flooring and floor wax affect shininess

3. Accept Ho

Table 10. Product comparison for Shininess

Product Comparison for Shininess					
Ceramic Tile		**Scarlet Oak**		**Wooden Tile**	
Brand X	Banana Peel Floor wax	Brand X	Banana Peel Floor wax	Brand X	Banana Peel Floor wax
					

The results presented in Table 10. show if using different kinds of flooring and floor wax affects shininess.

It was hypothesized that there was no significant difference between the mean shininess of the banana peel floor wax and Brand X floor wax when applied to ceramic, wood, and scarlet oak.

The researchers used ANOVA to determine the significant difference on the shininess and general statistical significance of the banana peel floor wax and Brand X floor wax.

As shown in the table, the banana peel floor wax and Brand X floor wax obtained a mean lux of 12.02 and 11.12, respectively. With a statistical significant

level of 11.57 for shininess, one was justified to conclude that banana peel was shinier than the Brand X floor wax.

Therefore, Ho was rejected; that was, the shininess of the banana peel was greater than the shininess of the commercial floor wax.

Further analysis also shows that although combinations of different kinds of flooring and different types of floor wax has no effect on shininess, using different kinds of flooring and different types of floor wax affects shininess.

Table 11. Statistical Tests Results Summary

Criteria	Type Of Test Used	Alpha	P-Value	Conclusion	Interpretation
Odor	T-test two paired sample for means	0.05	5.41 x 10^-8	Reject Ho	Brand X floor wax has stronger smell than the Banana Peel floor wax
Friction	ANOVA two-way with replication	0.05	0.0019	Reject Ho	Using different kinds of flooring and different types of floorwax affect friction
Shininess	ANOVA two-way with replication	0.05	0.52	Accept Ho	Using different kinds of flooring and different types of floor wax has no effect on shininess

Table 12. Summary of Results

	Type of Floor wax	
Criteria	**Banana peel with Carnauba**	**Brand X (Commercial Floor wax)**
Odor	No odor, Generally acceptable	Strong odor
Friction	Same quality	Same quality
Shininess	Exceed acceptability, greater	Below acceptability
Cost	Economical	Expensive

CONCLUSION AND RECOMMENDATION

Banana peels can be recycled and used to lessen the waste in our environment. There were many ways to lessen such waste to maintain cleanliness in our surroundings and also to prevent harmful effects to humans due to pollution. One of the ways to lessen the waste in our surroundings was to recycle scraps came from fruits, one of which was the Banana peel. Banana peel can be used as an alternative ingredient in making floor wax. Using this kind of scrap can reduce the harmful chemicals components found in the commercial floor wax. Also, Carnauba wax can help the Banana peel to produce good quality floor wax as a substitute to kerosene. Banana peels can be easily found around the trash bins, especially in side streets. Households in the Philippines can use this kind of alternative since all the materials that can be used on this product can be easily found. The cost of this alternative was cheaper compared to the floor wax that was commercially available. The quality of the Banana peel with Carnauba wax floor wax was just the same or greater than the commercially available, Brand X floor wax.

Type of Floor wax and its Criteria:

Shininess:

- Using different kinds of flooring and different types of floor wax affects shininess
- The shininess level of the Banana Peel floor wax is better compared to Brand X because of its ingredients.

Odor:

- The Banana Peel floor wax for odor statistical significance reaches the standard mean of 3.0 which means that the odor of the Banana Peel Floor wax is acceptable
- Banana peel with Carnauba wax floor wax was not that strong compared to Brand X floor wax because of its content and less chemical substance

Friction:

- Both kind of floor waxes were generally acceptable to be applied in a concrete material

Kind of Flooring and its criteria

Shininess:

- There was no significant difference between the mean shininess of the banana peel floor wax and Brand X floor wax when applied to ceramic, wood, and scarlet oak

Friction:

- There was an insignificant difference in using different types of floor wax since the outcome of the

Banana peel with Carnauba wax floor wax was just the same with Brand X floor wax.

The results further verify that the Banana peel with Carnauba wax was comparable with the commercial floor wax and can be a potential alternative in terms of benefits, acceptability and effectiveness of its use in a concrete flooring material.

In order to achieve the positive outcome that comes with the alternative floor wax, the foregoing recommendations to use and help improve the Banana peel with Carnauba wax attribute qualities for better-quality effectiveness and acceptability were presented to the following:

Students, Janitors, Parents and Household Cleaners

Those who were practicing the use of floor wax can use Banana peel with Carnauba wax instead for polishing their cemented floors or tiles inside the classroom and observe such practice. Parents and Household cleaners can use Banana peel with Carnauba wax as an alternative to commercial floor wax for waxing and polishing cemented floors and tiles.

Commercial Industries and Agricultural Sectors

Upon proving the effectiveness, acceptability, and comparability of Banana peel with Carnauba wax with the commercial floor wax, it was hereby recommended for the commercial industries involved in floor wax production to try to undertake on using Banana peel as an alternative ingredient for floor wax production. It was expected that farmers and those people involve in agriculture will continue planting and culturing the Banana tree.

Future Researchers

It was further recommended for other researchers to improve the existing procedure in making Banana peel with Carnauba wax floor wax for improved effectiveness/acceptability in different kinds of flooring.

Area/s for Further Study

The study was only focused on the Saba peel with Carnauba wax as the alternative floor wax for household use in the Philippines. It was limited to the substitute components and characteristics of floor wax. For further examination, the following problems were suggested:

1. The effectiveness or acceptability of Banana peel with Carnauba wax floor wax in other kinds of flooring
2. The effectiveness or acceptability of different types of Banana peels (e.g Lakatan, Latundan)
3. A cheaper means or way of producing Banana peel with Carnauba wax floor wax
4. Determining of the toxicity level of the Banana Peel with Carnauba wax
5. Effectiveness of over-ripe banana peel as the alternative ingredient for floor wax
6. Analyzing if Kerosene would be a better component than Carnauba wax

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