DEDICATION

First and foremost, this study is dedicated to **Almighty God** who helped the researchers accomplish their research papers and made everything possible.

Also, to their Research teacher, **Ms. Lourdes Medrano** who helped them in accomplishing the study.

This is also dedicated to their families and friends who gave them support in completing the research papers.

Last but not the least, this is dedicated to the people who loves art.

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ABSTRACT

This study aimed to produce a watercolor using the following fruits and vegetables: 1) Mango; 2) Lemon; 3) Pineapple; 4) Carrots; 5) Orange; 6) Squash. The level of acceptability in terms of color vividness, application, and time to dry were determined.

The materials used were bought at nearest hypermarkets. The fruits and vegetables were extracted through the process of blending and were added to the watercolor solution of 56mL vinegar, 56g baking soda and 112g cornstarch by mixing. Three (3) samples were made for each fruit: In the Sample A of each fruit, 75mL of extract was added. In the Sample B, 150mL of extract was added and in Sample C, 225mL of extract was added. The three (3) samples of each fruit were assessed through its acceptability in terms of color vividness and application wherein the researchers conducted a survey with forty-three (43) respondents from 8-Darwin and Pasteur of Urdaneta City National High School. The time to dry was assessed when the respondents drew different shapes in a piece of coupon bond then they colored the drawings using the watercolor and timed upon application.

Results show that Sample C of squash, which has 225mL extract that showed the highest mean of 2.68 among the samples in terms of color vividness. The Sample C of carrot had the highest mean of 2.86 which shows that it is the easiest to apply. Sample A dried the fastest upon application using a timer with ten (10) seconds increment. The cost of the watercolor per every 15mL of Sample A is P21.00; Sample B, P23.00; and Sample C, P25.00.

Chapter 2

REVIEW ON RELATED LITERATURE AND STUDIES

This chapter presents the review of related literature of the study.

RELATED LITERATURE

Sources of Orange Color

There many sources of orange color**.** The orange color of carrots, pumpkins, sweet potatoes, oranges, and many other fruits and vegetables comes from carotenes, a type of photosynthetic pigment. These pigments convert the light energy that the plants absorb from the sun into chemical energy for the plants' growth. Orange pigments and dyes, synthetic or natural, are added to many orange sodas and juices, cheeses (particularly cheddar cheese, Gloucester cheese, and American cheese); snack foods, butter and margarine, breakfast cereals, ice cream, yoghurt, jam and candy. It is also often added to children's medicine, and to chicken feed to make the egg yolks more orange (C.E.S., 2007).

Carotene is a pigment that absorbs blue and indigo light, and that provides rich yellows and oranges. The distinctive colors of mango, carrots, fall leaves, and yams are due to various forms of carotene, as is the yellow of butter and other animal fats (Web Exhibit, 2016).

Sources of Yellow color

Flavonoids are the yellow plant pigments seen most notably in lemons, oranges, and grapefruit. The name stems from the Latin word "flavus," which means yellow (Web

Exhibit, 2016). Along with carotenoids, they are responsible for the vivid colors in fruits and vegetables (Szalay, 2015).

This nutrient group is most famous for its antioxidant and anti-inflammatory health benefits, as well as its contribution of vibrant color to the foods we eat (World Health Foods, 2017)

Discoloration of Fruits and Vegetables

Fruits turn brown due to exposure to oxygen. This causes the oxidation of phenolic compounds that are naturally present in fruit tissue. This reaction takes place in the chloroplasts by means of an enzyme called polyphenol oxidase (The Plant List, 2007). Discoloration in fruits and vegetables is reviewed in relation to the chemical and biochemical causes of black, brown, red, yellow, and green discolorations. Browning in citrus fruits has been associated with the degradation of ascorbic acid and sugars. The browning of Lemon and Orange is a major problem during processing and storage in the presence of air (Clegg and Morton, 1965). Browning of fruit and vegetables is a chemical reaction which involves non-enzymatic and enzymatic oxidation of phenolic compounds. The quality of the fruits and vegetables are negatively affected because of the changes in color, flavor and softening (Whitaker, 1995). For fresh or processed fruits and vegetables, the enzymatic browning produces undesirable colors and off-flavors. In addition to the loss of aesthetic quality of fruits and vegetables, enzymatic browning also reduces nutritional quality through the destruction of nutrients such as ascorbic acid (Arslan, 2009).

Table 1.3 Color Vividness of Watercolor made from Fruits and Vegetables Extracts of Sample C

Fruits/Vegetables	Average Weighted Mean	Descriptive Equivalence
Pineapple	2.56	Highly Vivid
Lemon	2.45	Moderately Vivid
Mango	2.76	Highly Vivid
Carrot	2.57	Highly Vivid
Squash	2.68	Highly Vivid
Orange	2.53	Highly Vivid

Table 1.3 reveals that in terms of color vividness, only lemon got an average weighed mean of 2.45 which means "Moderately Vivid". While pineapple, mango, carrot, squash and orange had 2.56, 2.76, 2.57, 2.68 and 2.53 which is "Highly Vivid". Sample C obtained the highest means among the three.

implies that the differences in terms of application were significant thus, rejecting the null hypothesis.

Table 3.10. Significant difference among the three (3) set-ups of Squash as fruit in Fruits and Vegetables extract as watercolor in terms of application

Source of Variation	dF	Sums of Squares	Mean of Squares	Tabular f at .05	Computed f-test	Ho
Between Groups	2	2	1	3.09	5.88	Rejected
Within Groups	126	26	0			
Total	128	28	1			

Table 3.10 shows that there are significant differences among the three (3) samples in terms of Application since the computed F-value is 5.88 while the critical f-value of the Samples in Squash is 3.09. Since the computed F-value is greater than the critical F-value, this rejects the null hypothesis.

Table 3.11. Significant difference among the three (3) set-ups of Orange as fruit in Fruits and Vegetables extract as watercolor in terms of color vividness

Source of Variation	dF	Sums of Squares	Mean of Squares	Tabular f at .05	Computed f-test	Ho
Between Groups	2	12	6	3.09	16.56	Rejected
Within Groups	126	46	0			
Total	128	58	6			

Table 3.11 shows that in the three (3) samples, they had a computed f-value of 16.56. Since the computed F-value is greater than the critical value of 3.09, the null

Conclusions

Based on the findings, the following conclusions were drawn:

1. In terms of color vividness and difficulty of application, Sample C had the best results.

2. Sample A took the shortest time to dry.

3. There were significant differences among the three (3) samples in terms of color vividness and difficulty of application but there is no significant difference in drying time.

4. It is found out that the study produced cheaper product compared to the commercial Faber Castell watercolor.

Recommendations

For this study, it is recommended that:

1. The watercolor made with 225mL of fruit and vegetable extract should be
2. For fast drying, more proportion of fruits and vegetables should be conducted to improve the drying time of the watercolor.
3. More fruits and vegetables should be used to produce a harmless watercolor with less toxic and chemicals.

APPENDIX A

QUESTIONNAIRE

Name (Optional):_____

Grade and Section _____

directions: Write the corresponding value according to their Color Vividness and Difficulty to Apply. Use a timer to time how fast it will dry every ten (10) seconds. Check the column to its corresponding time

Sample		Color Vividness	Difficulty to Apply	Time to Dry (secs)			
				10	20	30	40
Pineapple	A						
	B						
	C						
Lemon	A						
	B						
	C						
Mango	A						
	B						
	C						
Carrots	A						
	B						
	C						
Squash	A						
	B						
	C						
Orange	A						
	B						
	C						

Color Vividness:
3- Highly vivid
2- Moderately Vivid
1- Least vivid

Difficulty of application:
3- Easily Applied
2- Moderately Difficult to Apply
1- Difficult to apply

Table 11. f-test computation for Carrot Color Vividness

	X_1	X_1^2		X_2	X_2^2		X_3	X_3^2
	1	1		2	4		3	9
	1	1		2	4		2	4
	1	1		2	4		3	9
	2	4		2	4		2	4
	2	4		3	9		3	9
	2	4		3	9		2	4
	2	4		3	9		2	4
	3	9		3	9		3	9
	3	9		3	9		3	9
	2	4		2	4		3	9
	2	4		3	9		3	9
	2	4		3	9		3	4
	3	9		2	4		2	4
	3	9		3	9		2	4
	3	9		3	4		3	9
	2	4		2	4		3	9
	2	4		1	1		2	4
	3	9		2	4		3	9
	2	4		2	4		2	4
Sample A	1	1	**Sample B**	3	9	**Sample C**	3	9
	3	9		3	9		2	4
	2	4		2	4		3	9
	2	4		2	4		3	9
	1	1		2	4		3	9
	2	4		2	4		3	9
	3	9		3	9		3	9
	2	4		3	9		3	9
	1	1		2	4		3	9
	2	4		3	9		2	4
	3	9		2	4		2	4
	2	4		3	9		3	9
	3	9		2	4		3	9
	3	9		2	4		3	9
	2	4		3	9		2	4
	2	4		3	9		3	9
	3	9		3	9		3	9
	3	9		3	9		2	4
	2	4		3	9		3	9
	2	4		2	4		2	4
	1	1		3	9		3	9
	2	4		2	4		3	9

MSb = SSb/ dfb

= 1.74/2

= 0.87

MSw = SSw / dfw

= 25.30/126

= 0.20

F = MSb / MSw

= 0.87/0.20

= 4.32

Filling the container half-way

Mixing the extract and the Watercolor solution

Finished Products