

RESEARCH ON SAFE DRAWING PRODUCTS FOR CHILDREN FROM FRUITS AND VEGETABLES

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Abstract

Nowadays, parents' needs are increasing to choose toys, especially painting colors that are both beautiful, ensure their children's health, and are also environmentally friendly. In the production of industrial colors, waste from steps in the watercolor production line, if not treated to meet environmental standards according to regulations, will become a huge hazard to the environment and human health. Human. Including causing skin, eye, digestive, and respiratory allergies. It causes poisoning, disease, cancer... Destroys the aquatic environment and trees, pollutes rivers and lakes. When building an industrial painting colors production line and putting it into use, if you do not think about solutions to treat wastewater from the production process, it will not be able to operate long-term. Wastewater from color factories is mainly heavy metals contained in painting colors, such as lead carbonate, oxide, and metal salts containing cadmium chromate. These substances cause mass death of organisms in the water, and polluted water cannot be used for agriculture. This research uses two main methods: experimental research to create products; combined with the questionnaire survey method to get customer opinions after using the painting colors test. Research results show that painting colors products made from fruits and vegetables combined with beeswax and coconut oil are very eye-catching and receive positive feedback from customers. With the aim of protecting children in the future and responding to the green environmental message in the world, we hope that safe painted colors of products from vegetables and fruits will be popularized in the community in the future.

Keywords: beeswax, environmental protection, painting colors, safe products, safe wax crayons

1. Introduction

Since ancient times, people have used natural pigments such as ocher, charcoal and stone to paint colors in caves tens of thousands of years ago. In ancient times, the Egyptian, Greek and Roman civilizations developed more advanced techniques for producing and using painting colors. They used pigments extracted from plants, minerals and animals, combined with binders such as resin and beeswax to create painted colors. In the Middle Ages, watercolor painting colors techniques were developed in China and spread to Europe. Temperature painting colors were also commonly used during this period. The Renaissance saw an explosion in the art of using painting colors. Artists such as Leonardo da Vinci and Michelangelo used sophisticated color mixing techniques to create vibrant and realistic, modern works of art. During the 19th and 20th centuries, many new painting colors were invented, including acrylics, oils, and pastels. These types of colors give artists more options for colors and effects.

Painting colors has been discovered and used for more than 2000 years. Throughout history, different civilizations have experimented and learned a lot about painting colors. To this day, we still have to learn and research about the effects of painting colors on people and the importance of painting colors in life. Nowadays, painting colors is used in many different fields besides art, in design, architecture, printing, cosmetics... With the development of science and technology, more and more paintings are being created, Because of many superior features to suit all fields, meeting all user needs.

For painting colors from vegetables and fruits:

Gum Arabic contains the main ingredient, which is a polysaccharide belonging to the acid group, including uronic acid; 3-4% inorganic substances and enzymes such as oxidase emulsin. It exists as white or yellowish white granules, powder or dry spray powder, odorless and with a light taste, soluble in glycerin, glycol, water. Gum Arabic is used in foods as a stabilizer. It is edible and has the E number E414. Used in confectionery processing, chocolate scraping, chewing gum as an emulsifier, creating hardness and flexibility. It is used to produce orange and lemon flavored beverages, candies, coats, emulsion products, roller tablets, microencapsulated products... Gum Arabic is also an agent that increases thickness, creates gel, creates foam, and creates. The solution that has a smooth viscosity, retains odor, retains moisture, prevents sugar crystallization, emulsifies fats and distributes the emulsion evenly in the product. Thickener E414 used for nut milk - use rate: Users and content according to regulations in Circular 24/2019/TT-BYT regulating the management and use of food additives: milk fermented (pure), with post-fermentation heat treatment. Sterilized cream, high temperature treatment (UHT), egg cream and egg whipping cream, skimmed cream (pure). Spreads, milky spreads and mixed spreads. Vegetables (including mushrooms, roots, tubers and rhizomes, beans, legumes, aloe vera) and seaweed soaked in vinegar, oil, salt water or soy sauce. Smoked, dried, fermented or salted fish and aquatic products, including mollusks, crustaceans and echinoderms. Products similar to salt.

Potassium sorbate anti-mold powder is used in both food and cosmetics. Potassium sorbate is a food preservative. This substance inhibits the growth of mold in many foods such as cheese, wine, dried meat, yogurt, soft drinks and baked goods...

In the food industry, potassium sorbate is used in the range of 0.025-0.10%.

- In cosmetics, the usage rate is 0.1-0.5%.
- Vegetables (including mushrooms, roots, tubers and rhizomes, beans, legumes, aloe vera), seaweed, nuts and seeds, ground seeds and spreads (e.g. peanut butter): Scale usage rate should not exceed 1000mg/kg.

Beeswax contains many nutrients such as fatty acids, esters, caffeine, acid phenethyl ester (CAPE) and bioflavonoids. Flavonoids have up to 20-30 different types, the most important of which are chrysin, pinocembrin and galangin. Besides, beeswax also contains monosaccharides, cellulose, amino acids, vitamin groups B1, B2, pro-vitamins A, E, and D, nicotinic acid, folic acid, minerals such as calcium, magnesium, iron, copper, zinc. Currently, a wax candy is very popular on the market with the main ingredient made from beeswax. In addition, beeswax is also used in polishing wood to brighten objects and surfaces, renewing wooden items such as tables, chairs, etc. Beeswax also has the effect of removing scratches on wooden surfaces (Nguyen Loan Minh Trang, 2021).

Coconut oil is an edible oil obtained from mature coconut seeds harvested from coconut trees. In recent years, this oil has become a superstar in the healthy food world. Celebrities are using it, nutritionists are endorsing it, and patients are praising its many virtues. Various health benefits have been attributed to this oil. These include benefits in skin care, hair care, stress reduction, weight loss and maintenance of cholesterol levels, immunomodulatory effects, cardiovascular uses, and more recently Alzheimer's disease (Duong Ngoc Van, 2022).

The research team will make their own vegetable and fruit pigments by slicing them thinly and drying them under the hot sun for 4 days. When dry enough, the team will then grind them into powder, and the final step is to sift them again, Again to filter out the vegetables that have not been finely ground.

Most studies only point out the harmful ingredients in the painting colors, but don't really point out which colors are truly safe or suggest methods for making painting colors that can be made with environmentally friendly ingredients. For example, Rebelo et al. (2015) pointed out the types of coloring that are very commonly used in preschools. Not only does it affect the skin, but it is also poisoned through use when ingested. This study also evaluated the content of heavy metals in paints.

Similarly, Njati et al. (2019) reported high lead levels recorded in countries such as China, South Africa, Thailand, Brazil... Cases of lead poisoning in children due to the use of watercolors were reported in some countries such as France, South Africa, and the United States.

According to author Niral Kumar Singh and his colleagues, the butterfly pea flower has many good medicinal properties: antioxidants, anti-cancer, diabetes prevention...

Research by authors Kamkean, Wilkinson also shows that the extract of butterfly pea flowers contains antioxidants and can be applied in the production of pharmaceutical and cosmetic products. In Thailand, extracts from butterfly pea flowers have been used to produce anti-wrinkle eye gel.

According to Azwanida and colleagues, research in 2014 research using Betalain from red-fleshed dragon fruit as a natural colorant for lipstick. Because the lipstick is prepared with natural ingredients such as dragon fruit, olive oil and vegetable fats, harmful health effects are minimized and can be used safely (Azwanida et al., 2014).

According to Tran Thi Duyen (2022), because our country cannot produce food coloring, everything will have to be imported from abroad. In some cases, using unqualified colorants causes adverse effects on users' health. Therefore, research on food coloring plants and colorants from plants is important to the country's socio-economy. Anthocyanins, belonging to the flavonoid group, are water-soluble plant vacuolar pigments responsible for the bright red, purple or blue colors of flowers, peels, seeds, fruits and leaves. The main sources of anthocyanin in edible fruits are grapes, cherries, plums, raspberries, strawberries, apples, peaches, blueberries... Vegetable groups containing anthocyanin pigments are eggplant, purple cabbage, perilla, butterfly pea flowers... Anthocyanin color intensity and fastness depend on many factors such as structural composition, colorant concentration, pH, temperature, light, presence of other colorants, metal ion species, enzymes, oxygen, vitamin C and sugar, etc. Besides their color properties, anthocyanins have recently attracted more attention because they are also compounds with many valuable biological activities for health, Such as anti-oxidant, anti-allergic, anti-radiation, anti-inflammatory, anti-bacterial, anti-coagulant properties that cause coronary artery disease and have cardiovascular protective and coronary vasodilator effects. Anthocyanins are non-toxic and do not have any maximum limits for applications in food. They are widely used in industrial production activities. Anthocyanin colorants can be studied for their beneficial effects on human health and their applications as potential alternatives to natural colorants in foods. Therefore, research on using anthocyanins as food colorants is necessary and meaningful work to exploit and further develop organic compounds of natural origin (Tran Thi Duyen, 2022).

According to Nguyen and colleagues, 2016 dragon fruit powder was made by spray drying method. UV-vis measurement results show that the red-flesh dragon fruit (*Hylocereus polyrhizus*) fruit pulp contains 2.5 times higher betacyanin content than the red-flesh dragon fruit peel and the white-flesh dragon fruit peel (*Hylocereus undatus*) is 3.5 times. This lipstick is made entirely from green compounds. Survey results based on 12 indicators show that users highly appreciate lipstick made from spray-dried dragon fruit powder, especially in the field of safety (Huyen and et al., 2016).

2. Material and methods

2.1. The method of data collection

Proceed to collect and research documents through books, newspapers and previous research articles available on the Internet... articles with content related to color products made from nature. The methods and processes of making the product as well as the advantages and disadvantages of the

product. The biggest advantage of researching water colors from vegetables and fruits is to reduce the negative impact of the color when discharged into the environment and ensure Safe for children's health when used.

2.2. Experimental method

To make painting color products from fruits and vegetables, you need the following materials:

Materials:

To make a set of colors using fruits and vegetables, the materials used are specifically listed as follows:

TABLE 1. Materials statistics (Source: we implementation)

NUMBER	MATERIAL	QUANTITY	UNIT
1	Vegetables and fruits (bamboo charcoal powder, white beans, butterfly pea flowers, pandan leaves, gac, turmeric, beetroot)	20	Kilogram
2	Gum arabic	2	Kilogram
3	Anti-mold powder	500	Gram
4	Beeswax	2	Kilogram
5	Water	1	Liter
6	Brass	2	Piece
7	Whisk eggs	1	Piece
8	Mold	4	Piece
9	Box	5	Piece
10	Packaging	5	Piece
11	Glove	1	Box
12	Face mask	1	Box
13	Vegetable peeler	3	Piece
14	Compressor	1	Piece
15	Coconut oil	200	Gram

The process of making wax color from vegetable and fruit pigments

The ingredients are collected from wholesale fruit and vegetable markets.

Implementation time: 5 hours/ 1 set of colors (not including time to buy fruits and vegetables)

Team members proceed to make products according to the following processes and materials:

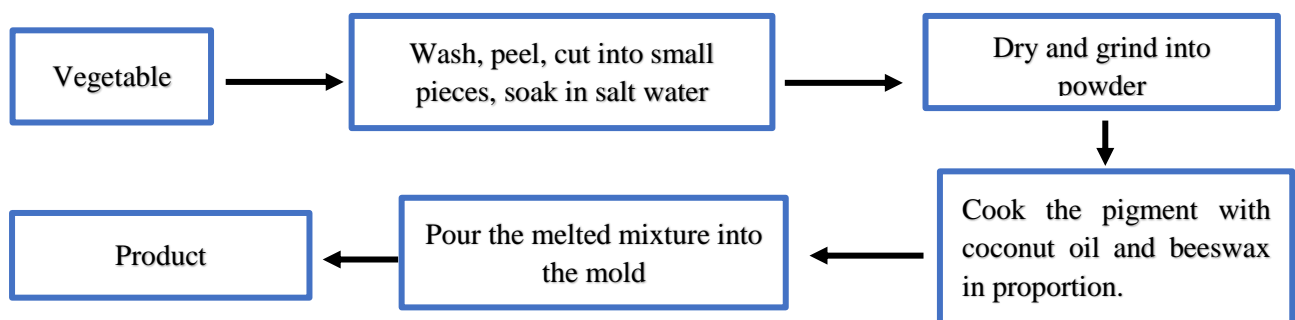


Diagram 1. Process of making wax colors from fruit and vegetable pigment

Product implementation process: 6 steps

Time to collect raw materials: 7 days

Step 1: Collect ingredients

We collect vegetables, fruits, and food preservatives at markets. We buy fruits and vegetables with corresponding colors (bamboo charcoal powder, white beans, butterfly pea flowers, pandan leaves, gac, turmeric, beetroot). Vegetables and fruits must be fresh and not bruised or rotten to ensure they are not contaminated with microorganisms.

Step 2: Wash, peel, cut into small pieces, soak in salt water

We collect ingredients to an agreed location, wash and remove soil and sand from fruits and vegetables, peel and pick up withered leaves to keep the juice mixture free of sand. Filtering to remove peels, crushed surfaces, etc. is very time-consuming to create a uniform paint composition without impurities.

Step 3: Dry and grind into powder

After the vegetables and fruits are cut thinly, they are dried in the hot sun for 4 hours to become dry and crispy. Then grind it into a fine powder.

Step 4: Distill the ground color powder with coconut oil and beeswax in proportion

Mix ground vegetable juice with additives, melted beeswax and coconut oil in proportion (16g beeswax + 4ml color powder + 2ml coconut oil, anti-mold powder for food) and heat on the stove for 10 degrees. minutes for the mixture to dissolve.

Step 5: Pour the melted mixture into the mold

After the wax has been completely melted, we pour it into the mold to shape the wax color.

Step 6: Products

After about 30 to 40 minutes, the color tree is completely dry. We proceed to separate the color from the mold and paste the packaging for the color. The research team's color set has 7 basic colors, such as: red, purple, moss green, white, orange, black, blue.

The shape of the crayons has an oblong shape with three triangular sides to help prevent the crayons from rolling when placed on the table, and pointed at both ends for easy painting.

2.3. Method of surveying user opinions on painting color quality experience

2.3.1. Survey questions

Part 1: Product appearance, color and quality

Do you feel the smell is too strong or difficult to smell when using the product?

Do you find the shape of the colored tree easy to hold?

Do you find the colors of the trees eye-catching?

Does the color have all the basic colors (red, yellow, green, blue, purple, black, white) for use?

After experiencing the product, do you feel the color adhesion on paper is good?

Part 2: Personal opinion after using painting color

Do you feel safe with painting color made from this friendly material?

If you have children or grandchildren in the house, would you choose this product?

With a price of 50,000 VND for a box of colors made from fruits and vegetables, do you find them too expensive compared to wax colors on the market? (Information: the above industrial wax colors range in price from 15,000 VND to 35,000 VND)

During use, does the color get on your hands?

Part 3: Contributions to improve the product.

2.3.2. Objects and objects of research

Research subjects: We are studying pedagogy at Thu Dau Mot University

Although this is a research article on safe painting color products for children, taking surveys from children is not feasible because firstly, they are children, so the perception of safe or unsafe colors is unknown. Yes, children just need beautiful colors to paint color, not knowing if it's safe or not. Second, children cannot write or read surveys to evaluate. Therefore, choosing preschool pedagogy we the survey that both meets professional needs and has the most impartial view of the product.

The preschool pedagogy sector is the sector that has the most contact with young people and will also be aware of what children want and clearly understand what will attract and be good for the youngest children.

Research object: we satisfaction with painting color quality.

3. Results and discussion

3.1. Color is made from fruit and vegetable powder

The group dried vegetables and fruits and ground them into powder, then carried out the process of making colored wax. And this method has overcome the phenomenon of bad smell in making watercolor and the color change when using the temperature to melt the ingredients in making wax with vegetable powder.



Figure 1. Finished color product



Figure 2. Finished color product



Figure 3. Color tested

3.2. Analyze data

The research team conducted a survey at a third-year preschool pedagogy class at Thu Dau Mot University.

The number of ballots distributed is 42, the number of valid ballots is 25.

For part 1: shape, color, product quality

TABLE 3. Statistical table of votes on product shape, color, and quality

Question	The answer is yes	The answer is no	Total number of we participating in the survey
1	0	25	25
2	20	5	25
3	19	6	25
4	24	1	25
5	13	12	25

Comment: out of 25 votes given out, 25 answered no to question number 1; 5 votes answered no for question number 2; 6 votes answered no for question number 3 and only 1 vote answered no for question number 4; 12 votes answered no for question number 5.

Part 2: Personal opinion after using painting color

TABLE 4. Statistics table of votes on personal opinions after using drawings

Question	The answer is yes	The answer is no	Total number of we participating in the survey
1	24	1	25
2	20	5	25
3	9	16	25
4	2	23	25

Comment: Of the 25 survey questionnaires sent out, 24 answered yes to question 1. There were 20 answered yes to question 2. 9 answered yes to question 3 and only 2 answered yes to verse 4.

The survey results in the two charts above show that users highly appreciate the shape, color and quality of paint on vegetables and fruits. With natural ingredients that are not harmful to users, especially children, it creates a feeling of trust and enjoyment for users. However, there is still some feedback that needs to be paid attention to improve product quality, such as and the price is still quite high and some users want to have more unique colors.

Part 3: Contributions

Most of us gave good opinions about the product and showed interest in products made from plant materials. However, there are also a few people who have suggested improving the adhesion of painting color.

3.3. Statistical chart of answers

Part 1: Product shape, color, quality

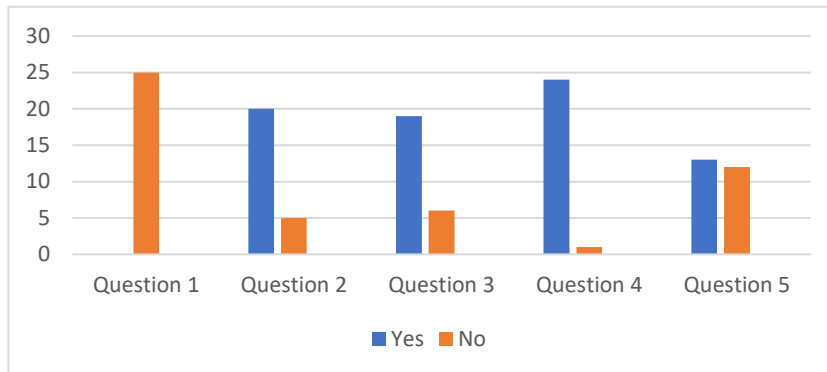


Chart 1. Survey results on product shape, color and quality

Comment: Regarding the survey results listed in the chart of product shape, color, and quality, the research team found that 100% of consumers feel that the smell is pleasant and not too strong or unpleasant Use. And 60% to 80% of customers find it easy to hold and use, with eye-catching colors. However, in terms of color adhesion, the team needs to improve because nearly 50%, or nearly half of the customers surveyed, were not satisfied with color adhesion.

Part 2: Personal opinion after using painting color

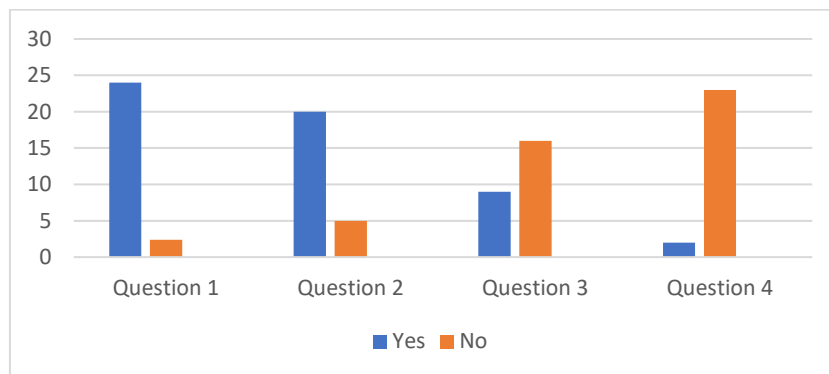


Chart 2. Customer opinions after experiencing the product

Comment: Regarding the survey results listed in the chart about customer opinions after experiencing the product, the team recorded that up to 99% of customers always feel secure about the safety of the product, because the ingredients used in the research process are all fruits and vegetables and ingredients allowed to be used in food, and they are willing to choose products for their children to use. A small portion of customers feel that the price is still high, and some colors are slightly sticky on their hands and need to be improved.

4. Conclusion and recommendations

After the process of researching and creating products, our team has researched and successfully created safe painted colors for children from fruits and vegetables. During the testing process, the group did the coloring in three ways: the first way was to make a water color from fruit and vegetable juice; The second way is to make a wax color from fruit and vegetable juice; The third and also

successful way was to use fruit and vegetable powder as a wax color. All of the above ingredients are easy to find, low cost but produce painting colors products that are safe for children and environmentally friendly. The process is easy, no need for complicated machinery. The products are easy to use and also ensure health if accidentally swallowed because they are made from edible materials, and the waste is completely harmless to the environment. Best of all, the price is affordable because it is produced and handmade. In addition, the group tested and surveyed opinions directly with preschool education us of the Pedagogy Department of Thu Dau Mot University and found that the majority of us were satisfied with the quality of the painting's colors, saw the advantages of the color and also agreed to buy them for their relatives to use. Safe painted products of fruits and vegetables are very environmentally friendly, do not pollute the environment or cause illness to users. The survey results in the two charts above show that users highly appreciate the shape, color and quality of paint on vegetables and fruits. With natural ingredients that are not harmful to users, especially children, it creates a feeling of trust and enjoyment for users. However, there is still some feedback that needs to be paid attention to improve product quality, such as because the price is still quite high, some users want to have more unique colors.

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