

Original Research Article

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Extraction and Stability Test of Betacyanin Pigment in Dragon Fruit Skin (*Hylocereus polyrhizus*) as an Alternative to 2% Eosin Dyes in Examination of Soil Transmitted Helminth Worm Eggs

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ABSTRACT

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Worm eggs are revealed to be colorless upon direct inspection, making them challenging to observe under a microscope. An easy technique for studying worm eggs is to utilize Eosin 2%, which is typically used in medical research and diagnostics. Eosin has some drawbacks, including a high price tag and environmentally hazardous ingredients. Consider using the skin of dragon fruits as a source of dye. The red pigment betacyanin gives dragon fruit skin its color. The intention was to determine if intestinal nematode worm egg coloration could be substituted with dragon fruit peel (*Hylocereus polyrhizus*). The red dragon fruit skin was extracted with ethanol as a solvent and 2% eosin as a reference to create the dye for this experimental study. Using ethanol solvent to dye feces preparations from dragon fruit peel extract demonstrates the possibility of doing so. Extract from the peel of dragon fruit shows promise as a coloring agent. As a result, 2% eosin can be replaced with dragon fruit peel extract (*Hylocereus polyrhizus*) when studying worm eggs.

Introduction

The class of intestinal nematodes that spread worm illnesses through soil is known as soil-transmitted helminths (STH) (Jourdan, 2018; Sutanto, 2009). *Ascaris lumbricoides*, *Necator americanus* & *Ankylostoma duodenale*, *Trichuris trichiura*, and *Strongyloides stercoralis* are the STH worm species that frequently cause worm disease in people. (Sutanto, 2009; Strunz, 2014; Djarismawati, 2008;

Pasaribu, 2019; Silva, 2003) As a result, low-middle income countries (LMIC), often known as developing countries, are typically observed to have a high prevalence of worm infections (Berqquist, 2010; Brooker, 2010).

In underdeveloped nations, schoolchildren between the ages of 5 and 15 are most frequently infected with worms (Pabalan, 2018). Stunting, undernutrition, anemia, a decline in physical health,

a decline in cognitive function, and memory loss are just a few of the negative effects of infection in children. Children may experience growth problems and a drop in their academic performance as a result of this, and they may also become more vulnerable to other infections including malaria, typhoid, and other illnesses (Pabalan, 2018; Hotez, 2008). Adults are also susceptible to infection, but this condition is occasionally asymptomatic or only manifests as minor symptoms as epigastric pain and decreased appetite. Adult infections are frequently chronic because sometimes the person is unaware of these symptoms. Obstructive ileus, gastrointestinal bleeding, excruciating diarrhea, and rectal prolapse can occur in more severe STH infections (Jourdan, 2018).

The water content of dragon fruit is about 80%, the protein content is between 0.4 and 2.2 g, the carbohydrate content is between 8.5 and 13.0 g, and the total sugar content is about 6.0 g per 100 g of weight. very rich in phenolic compounds, vitamins (B1, B2, B3, C, niacin, pyridoxine, and cobalamin), minerals (calcium, potassium, phosphorus, salt, iron, and zinc), protein, fat, carbs, sugar, fiber, and volatile chemicals, red and white dragon fruit are very nutritious (Esquivel, 2007; Halimoon, 2010). The fact that bioactive substances including polyphenols, flavonoids, and betacyanins have high antioxidant capacities and play significant roles in maintaining human health is also related to this (Ruzainah, 2009; Ibrahim, 2018; Utomo, 2012; Ruzlan, 2008; Huang, 2021).

A naturally occurring reddish-purple nitrogen pigment called betacyanin is water soluble. They contain betalains components as well as yellow betaxanthins. Red dragon fruit (*Hylocereus polyrhizus*) contains the following seven betacyanins: betanin, isobetanin, lhylocactin, isophyllocactin, betanidin, and bougainvillein-RI (Stintzing, 2002). They have also been demonstrated to have a number of pharmacological activities, including antioxidant, anti-cancer, anti-lipidemic, and antibacterial effects (20). Betacyanin has a short shelf life and low absorption, similar to curcumin (Amjadi, 2018). Additionally, under specific

environmental conditions, such as oxygen, temperature, light, pH, water activity, and enzymes, they have a tendency to become unstable (Tang, 2007; Kaimanan, 2015).

Materials and Methods

Sample and population

The dragon fruit skin (*Hylocereus polyrhizus*) population in the Padang city served as the study's population. The study used 3 kg of dragon fruit peel and feces as samples.

Testing the stability of betacyanin versus temperature

A thermometer was used to measure the temperature of the ethanol extract solution of dragon fruit peel.

Test for Betacyanin Stability against pH

Using a pH meter, the ethanol extract solution of dragon fruit peel's pH was determined.

How to Prepare STH Eggs

Using the skin extract from dragon fruits to prepare STH eggs. Drop one or two drops of dragon fruit peel solution onto a glass item, pick up some stool with a stick, mix it with the extract until it is uniform, and then look at it under a microscope.

Results and Discussion

Measuring the skin of dragon fruit resulted in a pH measurement of 6.3.

The research results show that the use of dragon fruit peel extract can help color the stool preparation as shown in the picture below:

The skin of the red dragon fruit is a common fruit in Indonesia. It is impossible to separate the utilization of red dragon fruit from the nutrients it contains. According to a number of studies, dragon fruit also contains fiber, niacin, vitamin B3 (monounsaturated

fatty acid), phenols, flavonoids, vitamin C, and betacyanin antioxidant chemicals, as well as MUFA (monounsaturated fatty acid) and PUFA (polyunsaturated fatty acid). Dragon fruit also has the potential to be used as a functional food colorant and in cytological research.

Color plays a significant role in cytology research, particularly in identifying the cells that will be examined. (Ruzainah, 2009) Due to the presence of betacyanin dye in red dragon fruit, it can be used as an alternative to eosin dye. A class of betalains known as betacyanin is a category of natural dyes that are frequently used to color red. (Ruzainah, 2009; Ibrahim, 2018; Utomo, 2012) Red dragon fruit skin and flesh are squeezed without the addition of distilled water.

According to Hidayah (2013), the fruit skin is dried in the air for 24 hours to minimize the water content before the extraction procedure is carried out. This modified maceration method is then used to extract the fruit skin.

The findings of this study on dragon fruit skin (Figure 1) demonstrate that the red or purple hue no longer emerges because the skin's betacyanin content is lower than that of the fruit's flesh. Maturity factors may also affect the skin's betacyanin content. In addition to that, the pH levels of the meat and peel of dragon fruits have an impact.

The skin of dragon fruit has a pH of 6.3. A rise in the amount of betacyanin that has been broken down can result in a drop in pH. According to Simanjuntak *et al.*, (2014), betacyanin pigments will take the form of flavilium or oxonium cations in an acidic environment, which can produce color. Additionally, the extraction procedure is possible because the vacuole cell walls will crack as the environment becomes more acidic, allowing more betacyanin pigment to escape the cells. (Maulana, 2012). The skin of a dragon fruit will change color from red to orange to yellow, according to Agne Erza Bestari Pranatik *et al.*, (2010). The hydrolysis of betacyanin in the N=C link is what causes this

color shift, which is caused by modifications at the components of betacyanin. Betacyanin will hydrolyze to yield betalamic acid and cycloDOPA 5-O-glycoside. Additionally, to obtain the best results, objects containing colors are typically crushed and soaked in a variety of solvents before being used to extract natural dyes. Anthocyanin is easily dissolved by polar solvents because both anthocyanin and betacyanin are polar molecules. (Bernad, 2012)

And Figure 2 demonstrates how using dragon fruit peel extract can enhance the color of the feces. According to Hidayah (2013), the betacyanin content of red dragon skin is 134.60 mg per 100g of dry weight. A collection of betalains called betacyanin, which contributes to the red hue, has the potential to develop into natural dyes. (Ruzainah, 2009) Red dragon fruit skin can be used as a natural dye since it includes antioxidant components that produce color in addition to betacyanin. It was the pure water that was already present in the dragon fruit peel that was employed as a coloring preparation for the red dragon fruit peel extract that was used as a natural dye in this study.

Ascaris lumbricoides egg cell walls are more readily discernible in dragon fruit peel extract (Figure 3) than in 2% eosin (Figure 2) because the color seen in 2% eosin staining is more concentrated, making the layers of the egg seem dark and more challenging to detect, identified. Masyhura (2018) claims that because dragon fruit skin also contains betacyanin, which can generate a purple tint, the color will be more strong at high quantities. As a result, at high concentrations, anthocyanin content is likewise higher, giving the substance a purple hue. It will get thicker.

Based on the results of the research that has been carried out, it was concluded that, From the research results, it can be concluded that dragon fruit peel extract has the potential to be used as a cytological stain and dragon fruit peel extract can be a substitute for 2% eosin.

Fig.1 Determination of stability to pH



Fig.2 Morphology of *Ascaris lumbricoides* eggs in children's feces using dragon fruit peel extract

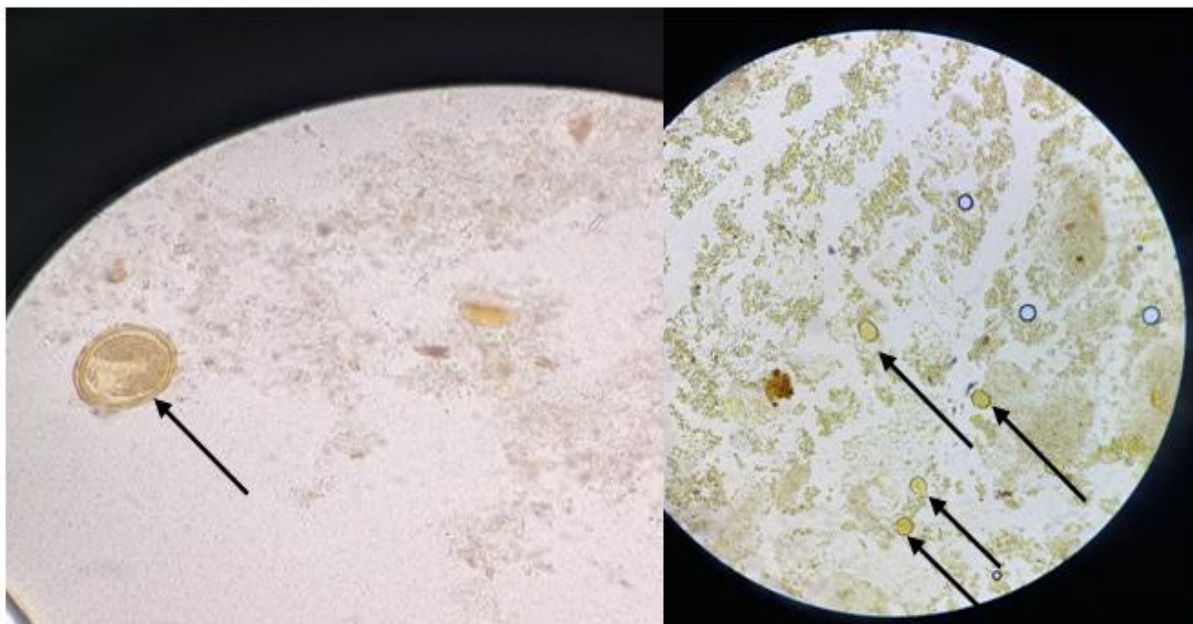
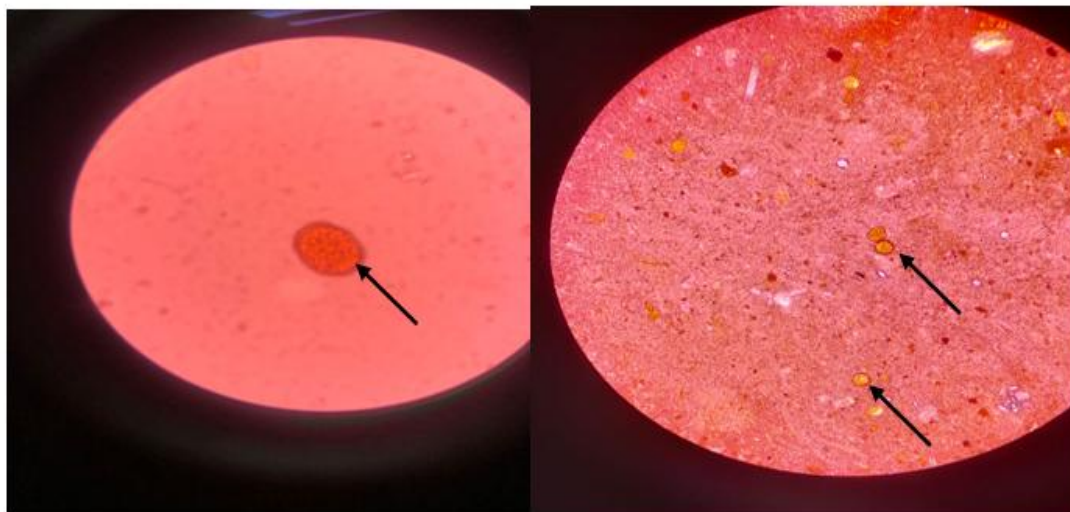


Fig.3 Morphology of *Ascaris lumbricoides* eggs in children's feces using 2% eosin reagent



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