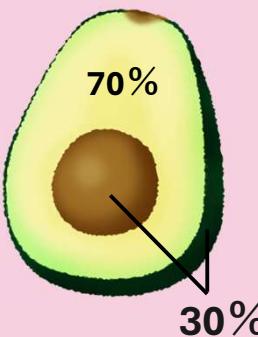
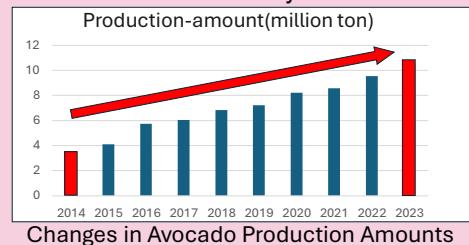


The New Potential of Food Waste

~Exploring the Function of Food Waste-Based Dyes~

Background

Avocado production
→Doubled over 10 years



Avocado

Seeds and peel account for 30%.
→30% of each avocado is discarded

Discover a method to use food waste as dye
↓
Research whether avocado dye has **additional functions** beyond simply dyeing fabric
↓
Expect to enhance the value of avocado waste as a dye

Research question

Does the dye made from avocados have additional functions beyond just dyeing fabric?

Research methods & results

【Materials】

- Avocado
- Alum
- Coffee
- Black Tea
- Onion
- Green Tea

【Method】

- ① Boiled materials in water for 30 minutes
- ② Soaked the cloth in alum solution for 30 minutes
- ③ Washed the fabrics and dried them



Dyeing process

Dyed fabric

Insect-repellent Experiment I

Purpose

Confirm that insects dislike dyed fabric

Method

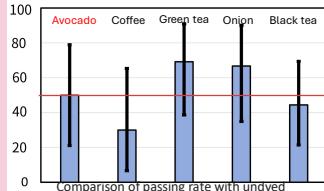
1. Placed dyed and undyed fabric on opposite ends of an cage.
2. Placed mealworm feed on top of both fabrics.
3. Released 10 mealworms between the two fabrics.
4. Counted how many mealworms gather on each fabric, and calculate the selection rate for the dyed fabric.
5. Analyzed the results using a binomial test with Holm method.



experimental apparatus

Results

Selection rate (%)



None of the dyed fabrics can be said to repel insects, indicating they have no insect-repellent effect.

Insect-repellent Experiment II

Purpose

Confirm that insects dislike dyed fabric

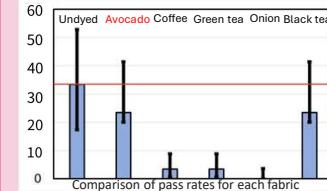
Method

1. Made a tunnel and put a piece of fabric between the food and the mealworms.
2. Counted how many mealworms got to the food and figured out the passing rate.
3. Compared the results with the untreated fabric using Fisher's exact test (one-tailed) and corrected them with Holm method.



Results

Passage rate (%)



Coffee, green tea and onion had an effect. Avocado and black tea showed no effect.

UV Protection Test

Purpose

Verify how much ultraviolet radiation the dyed fabric blocks

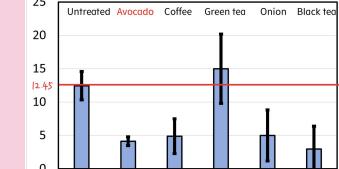
Method

1. Covered the UV beads with fabric and exposed them to UV light.
2. Quantified color variation through image analysis.
3. Conducted a two-tailed t-test and evaluated the results after applying Holm method.



Results

Blocking rate



The fabric that was significantly blocked had a darker color.

Does the darkness of the fabric affect UV blocking more than the dye used?

Smell Test

Purpose

Determine if dyed fabric smells better than undyed fabric

Method

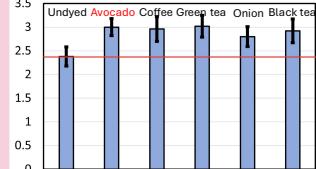
1. Had a total of 50 people smell the dyed fabric and undyed fabric.
2. People rated them on a five-point scale.

5-point rating

- 1→bad smell
- 2→a bit of a bad smell
- 3→normal (no smell)
- 4→a bit of a good smell
- 5→good smell

Results

Rating



The avocado and the other fabrics smelled better than the undyed fabrics.

Did the original scent fade away during the dyeing process?

Analysis

- The fabric was dyed beautifully, so it has value as a dye.
- Additional functions could not be confirmed through these experiments.

Future Steps

- Check other functions that were not tested, such as antibacterial and deodorizing effects.
- If good ways to use the dye are found, create an efficient system to collect avocado seeds and peels.