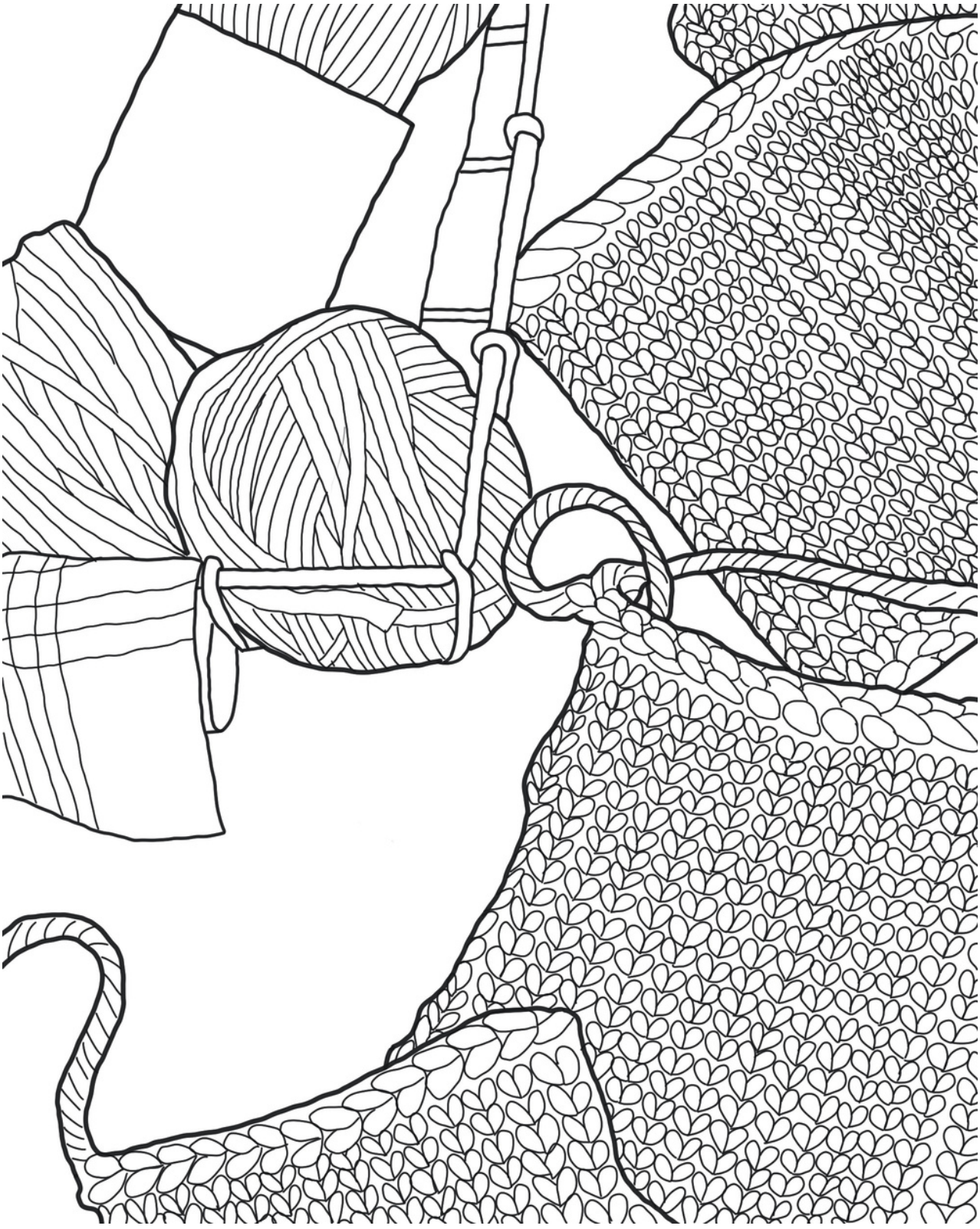
Yarn Bleeding Experiment

TECHNICAL DOCUMENT



Overview

THE CONCEPT

HYPOTHESES

1: Increasing the temperature of the water used when wet blocking increases the amount of dye bleeding.
2: Adding (wool wash, washing up liquid, white vinegar) to the blocking bath leads to a reduction in dye bleeding.
3: Adding a colour catcher to the blocking bath prevents any dye bleed from adhering to lighter coloured yarn.

APPROACH

Each hypothesis will be tested individually.

Round One will test the effect of temperature; the results will inform the temperature at which Round Two will be performed.

Round Two will test the effect of additives in reducing bleeding whilst controlling for temperature.

Round Three will test the effect of using a colour catcher in four conditions: those with the most and least bleeding in each of Round One and Round Two.

ABOUT THE ADDITIVES

Two different types of wool wash will be tested: Soak, and Eucalan. This is because Eucalan claims to be "pH neutral", and it is known that the pH of the water is highly relevant to dyeing yarn with acid dye. Soak does not make this claim.

Washing up liquid is another commonly used and readily available additive, and so will also be tested.

Many make the claim that white vinegar will prevent bleeding. This will also be tested.

ABOUT COLOUR CATCHERS

Colour catchers are effective in normal laundry at capturing any dye bleed and preventing it from attaching where it isn't wanted. This will also be tested.

The swatches used for this round will be a combination of dyed and undyed yarn. As well as observing dye in the blocking bath, the undyed yarn will be checked for a change in colour.

Round One

TEMPERATURE

VARIABLES

Independent variable: water temperature
Dependent variable: amount of bleed observed
Extraneous variables: water hardness
Confounding variables: volume of water, soak duration, soak vessel, dye colour, swatch size / shape, chemical content of water

TREATMENTS

1: tap water at 10C
2: tap water at 30C
3: tap water at 50C

CONTROLLING CONFOUNDING VARIABLES

- Volume of water: each treatment will consist of 500ml water per swatch blocked.
- Soak duration: each swatch will be photographed after exactly 30 minutes of soaking.
- Soak vessel: each treatment's soaking vessels will be identical.
- Dye colour: each treatment will be applied to 5 different dye colours.
    - All dye colours will be from the same dyer and on the same yarn base.
    - All swatches will be the same pattern, knit on the same needles.
    - Swatches will not be reused; there will be 3 separate swatches of each colour.
- Swatch size / shape: each swatch will be 20 stitches x 26 rows of stockinette stitch knit on 5.5mm needles with a long tail cast on and standard bind off.

EXTRANEOUS VARIABLES

- Each treatment's water hardness (TDS) will be measured. This is not expected to vary significantly between treatments.

Round Two

ADDITIVES

VARIABLES

Independent variable: the chemical content of the water used for blocking
Dependent variable: amount of bleed observed
Extraneous variables: water hardness
Confounding variables: water temperature, volume of water, soak duration, soak vessel, dye colour, swatch size / shape

TREATMENTS

1: tap water + wool wash 1 (Soak)
2: tap water + wool wash 2 (Eucalan)
3: tap water + white vinegar
4: tap water + washing up liquid

Note: all treatments mixed at 5ml additive per 3L water

CONTROLLING CONFOUNDING VARIABLES

- Water temperature: each treatment's water temperature will be controlled at the temperature from Round One which caused the most bleeding.
- Volume of water: each treatment will consist of 500ml water per swatch blocked.
- Soak duration: each swatch will be photographed after exactly 30 minutes of soaking.
- Soak vessel: each treatment's soaking vessels will be identical.
- Dye colour: each treatment will be applied to 5 different dye colours.
    - All dye colours will be from the same dyer and on the same yarn base.
    - All swatches will be the same pattern, knit on the same needles.
    - Swatches will not be reused; there will be 5 separate swatches of each colour.
- Swatch size / shape: each swatch will be 20 stitches x 26 rows of stockinette stitch knit on 5.5mm needles with a long tail cast on and standard bind off.

Further:

- Each treatment's water and additive will be mixed in one large jug, then measured and distributed between soaking vessels, in order to ensure identical dilutions.
    - The dilution in the large jug will be 5ml additive per 3L water.
- Each treatment's water pH will be measured. While pH is not a specific variable in this experiment, pH is critical to the acid dyeing process, and measuring this may give further insight to interpreting the results seen.

EXTRANEOUS VARIABLES

- Each treatment's water hardness (TDS) will be measured. This is not expected to vary significantly between treatments.

Round Three

COLOUR CATCHER

VARIABLES

Independent variable: the inclusion of a colour catcher in the blocking bath
Dependent variable: amount of bleed observed
Extraneous variables: water hardness
Confounding variables: water temperature, volume of water, soak duration, soak vessel, dye colour, swatch size / shape, chemical content of water

TREATMENTS

1: Least Bleed, Round One
2: Most Bleed, Round One
3: Least Bleed, Round Two
4: Most Bleed, Round Two

Note: any treatments from Round One or Round Two with no bleed will be ineligible for Round Three.

CONTROLLING CONFOUNDING VARIABLES

- Water temperature: each treatment's water temperature will be controlled at the temperature from its previous iteration.
- Volume of water: each treatment will consist of 500ml water per swatch blocked.
- Soak duration: each swatch will be photographed after exactly 30 minutes of soaking.
- Soak vessel: each treatment's soaking vessels will be identical.
- Dye colour: each treatment will be applied to 5 different dye colours.
    - All dye colours will be from the same dyer and on the same yarn base.
    - All swatches will be the same pattern, with the same ratio of dyed to undyed yarn, knit on the same needles.
    - Swatches will not be reused; there will be 5 separate swatches of each colour.
- Swatch size / shape: each swatch will be 20 stitches x 26 rows of stockinette stitch knit on 5.5mm needles with a long tail cast on and standard bind off.

Further:

- An equal size piece of colour catcher will be added to each vessel.
- Each treatment's water pH will be measured. While pH is not a specific variable in this experiment, pH is critical to the acid dyeing process, and measuring this may give further insight to interpreting the results seen.

EXTRANEOUS VARIABLES

- Each treatment's water hardness (TDS) will be measured. This is not expected to vary significantly between treatments.

The Experiment

HOW IT'S DONE

SUBJECTS

Each treatment group will be applied to 5 different subjects - in this case, dye colours. This will allow me to see whether the treatments affect dye colours differently.

The colours are:

- Litha: a deep golden yellow
- Blackcurrant Jam: a berry purple
- Storm: a dark teal
- OOAK Navy: a dark navy blue
- Ruby Slippers: a slightly pinkish red

Round 1 will require 3 swatches in each colour.
Round 2 will require 4 swatches in each colour.
Round 3 will require 4 swatches, each in a mix of dyed and undyed yarn.

MEASURING THE OUTCOME

Measurements will be taken at two key points:

1. When the mixture has been prepared, before portioning it;
2. After 30 minutes of soaking, untouched;
3. After 30 minutes of soaking, with the swatch removed and squeezed out.

Temperature will be measured using a food thermometer.
Water hardness will be measured using a TDS meter.
Water pH will be measured using a pH meter.

The outcome in terms of bleeding will be recorded via photography and assessed visually.

Whilst this is an imperfect method, using white vessels will provide a clean and consistent background, and configuring the appropriate white balance on the camera each time will help to ensure consistent colour representation.

Results will be recorded on a scale of 0-2.

0: no observable bleeding
1: some observable bleeding
2: significant observable bleeding

Do Your Own Experiment

HOW TO REPEAT THE TEST YOURSELF

DECIDE YOUR OBJECTIVE

To recreate this test, or to test the effect of a different variable, follow the instructions below. For example, you could repeat the Part 1 temperature test using your usual wool wash to identify the optimum blocking temperature for you.

Depending on what you are testing, you may not need all of the equipment below.

EQUIPMENT LIST

- 3L jug (plastic)
- 500ml jug (glass)
- 5 identical white bowls (china)
- wool wash (Soak) (5ml)
- wool wash (Eucalan) (5ml)
- white vinegar (5ml)
- washing up liquid (Fairy) (5ml)
- colour catcher
- swatches (see right)
- water (3L per treatment, total 15L)
- waterproof thermometer
- TDS meter
- pH meter
- camera

SWATCH PATTERN

Yarn: Giddy Aunt Yarns Chunky, 100% superwash merino

Instructions

Cast on 20 stitches using the long tail cast on.

Work 26 rows in stockinette stitch.

Bind off.

I used 5.5mm needles. You can use any size needles, but be consistent!

STEP BY STEP

1. Take 1 swatch in each colour. Place each swatch in a white bowl.
2. Measure out 3L tap water into a jug, using a mix of hot and cold water to ensure the correct temperature.
    a. For Part 1, the temperature is the variable being tested.
    b. For Part 2, the temperature is controlled.
3. Part 2 only: add 5ml of the additive being tested to the jug and mix.
4. Record the temperature, hardness, and pH of the water in the jug.
5. Measure out 500ml water for each swatch and pour over.
    a. For Part 3, add the piece of colour catcher to each bowl now.
6. Set a timer for 30 minutes. Wait.
7. When the timer has finished, photograph the bowls to capture any bleed.
8. Lift each swatch out of the bowl, gently squeeze it out, and set aside. Photograph the blocking bath.
9. Pat dry and block the swatches as usual, or allow to dry.

About the Author

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