MARTINA MURONI

Wool & Flow

LE TEXTILE LAB
FABRICADEMY
textile and technology academy

Booklet

Credit: Marie Tregoat,
Le Textile Lab

Material and context

Lyon Lab is a key partner of the EU project Woolshed, which aims to revitalize Alpine wool value chain through design, innovation and small-scale technologies.

The material used is **Thônes et Marthod wool**, a rustic French fiber with a strong territorial and cultural identity, yet limited applications in fashion.

Its coarse texture, combined with the high water demand of conventional treatments, often leads to it being undervalued.

Each year 8 tons are discarded, with only 350 kg are recovered by the wool association Defrise ton mouton. This project uses part of the recovered wool.


Thônes et Marthod
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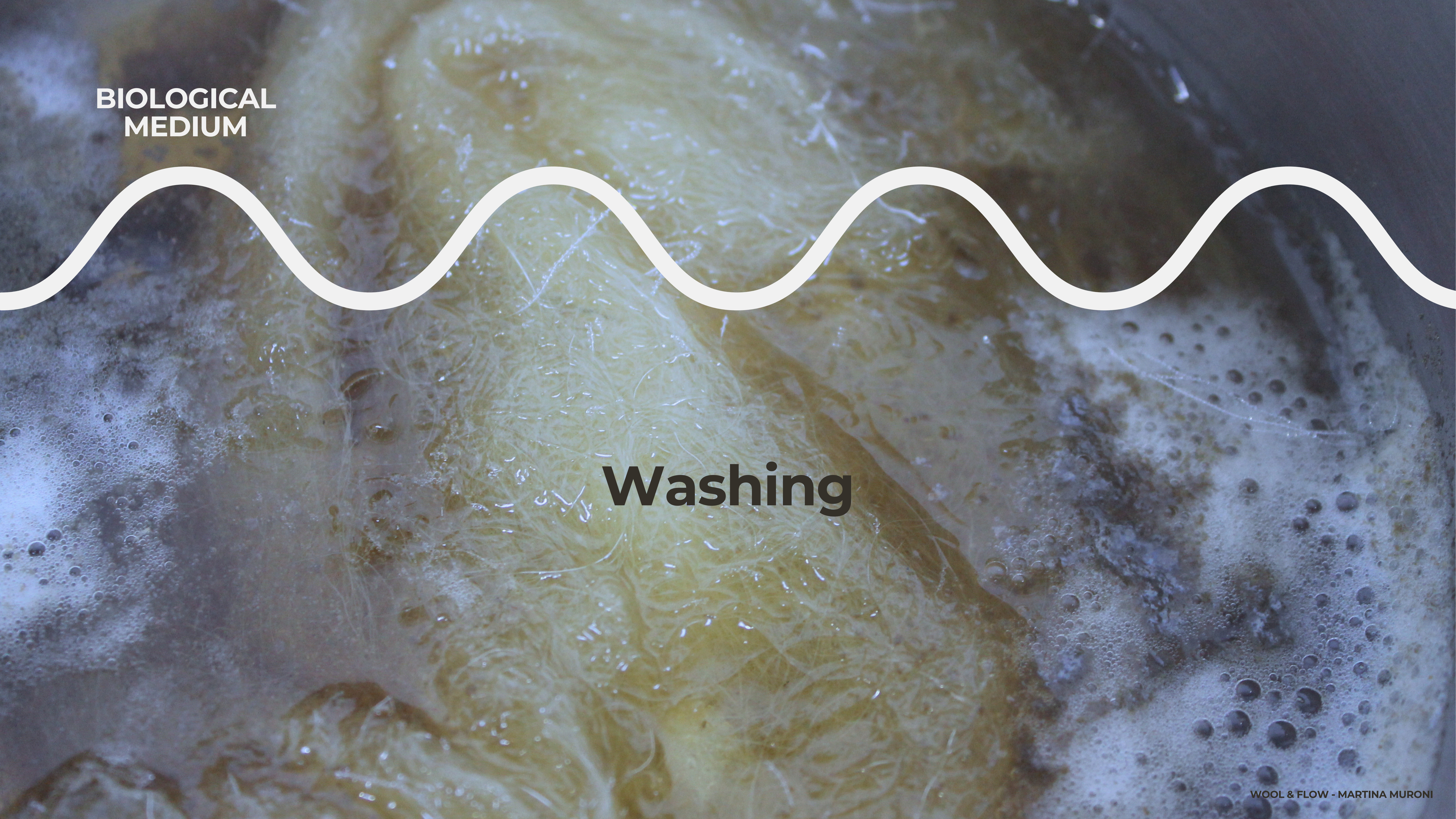
Project focus

Traditional wool processing requires a considerable amount of resources, especially water. For rustic wool, which has a low market value, the investment is often economically unsustainable.

In this project, water is rethought within the processing of rustic wool.

Initially seen as a resource to be reduced, it gradually becomes a transformative element, shaping texture, color and structure.
Like a river and its tributaries, this shift unfolds through multiple paths, all contributing to the same flow.


BIOLOGICAL
MEDIUM
Washing
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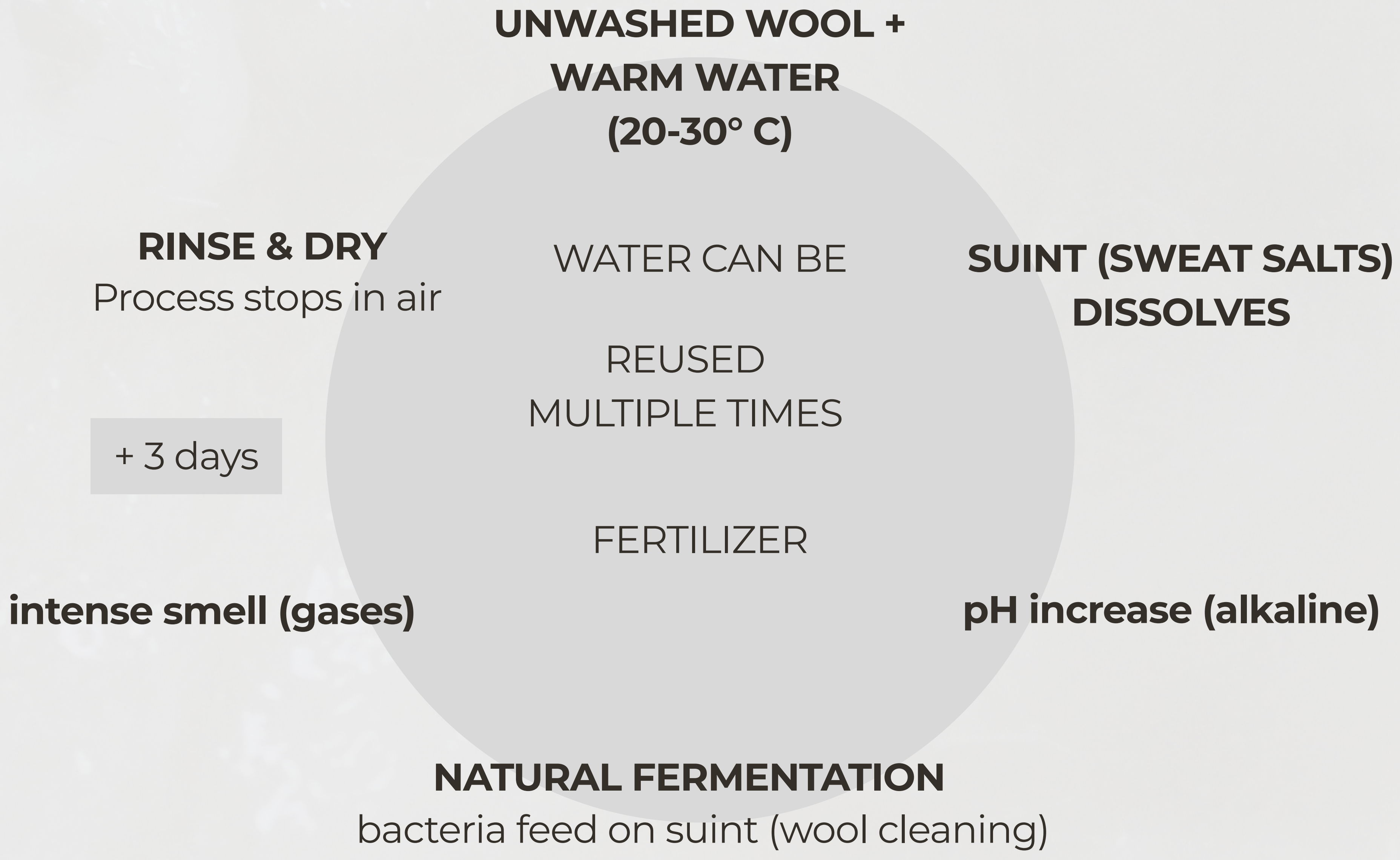
Suint Fermentation

It is a pre-industrial wool scouring method that relies solely on rainwater and the natural suint contained in raw wool. Suint, composed of water-soluble salts from sheep sweat, gradually dissolves in warm water, creating a naturally alkaline bath without the need for added soap

At temperatures between 20–30°C, a biological fermentation process begins: naturally occurring bacteria feed on the suint, breaking it down and effectively cleaning the wool.

Because it depends on stable warm temperatures, suint fermentation is traditionally carried out in spring and summer.



My goal was to create a laboratory setup to run the process even in winter and all year round.

Below you can find the system now available in Le Textile Lab to wash up to 10 kg of wool

System from inside

5 kg of Thônes et Marthod wool washed through the system.
Once dried, the wool completely lost its strong smell. The fiber became soft and was ready for the next stages of the transformation process.

Washing systems comparison

Compared to conventional washing methods, suint fermentation enables reductions across several environmental indicators.

Indicator	Fermentation	Industrial*	Micro-Scouring**
Water Use (L/kg)	**10 L/Kg**	15 L/kg	50 L/kg
Temperature	**20-30°C**	60–70°C	50–80°C
Synthetic Chemicals	**None**	Yes (alkali + detergents)	Soap / detergent
Effluent Outcome	**Regenerative water (reused)**	Industrial wastewater	Sewage system
Energy level required	**Low**	High	Medium

*Industrial scouring, as described in textile processing literature (e.g., multi-bowl washing systems).
**Micro-scouring plant from "Laver la Laine", Atelier Laine d'Europe.

CHROMATIC CARRIER

Dyeing

Natural Dyeing

Alternative to chemical colors

The work is structured around three main directions:

Local resources

Territorial water and plant dyes

Focus on Alpine dye plants, typical of the countries participating in the Woolshed project, and on local water sources, comparing rainwater (pH:5) and tap water (pH:8).

While pH variations do not always produce significant differences, in some cases they influence tone and colour development, contributing to context-specific results.

Process simplification

No scouring and separate mordanting

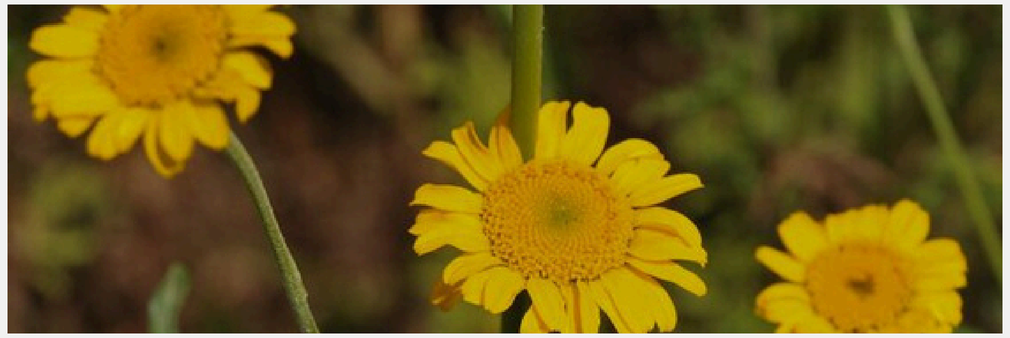
Tannin colours are observed without a mordanting step, alongside simultaneous mordanting during dyeing, reducing the number of steps while maintaining effective results.

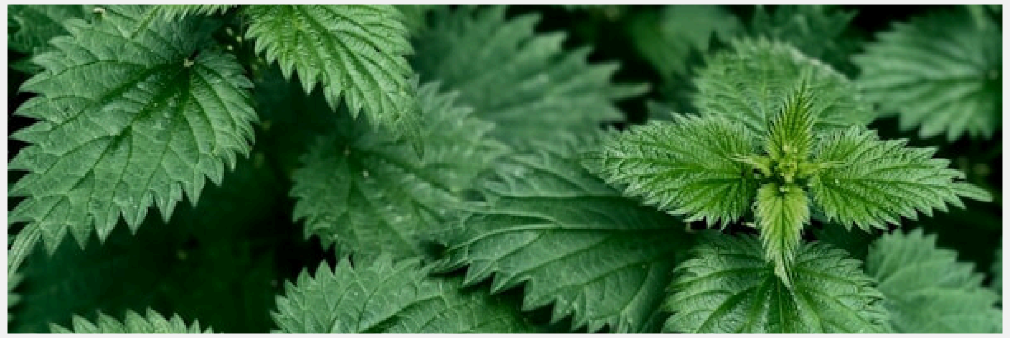
Circular Colour

Dye bath reuse and pigment extraction

Extension of dye material life through reuse and transformation. Dye baths are reused across multiple cycles, producing softer tonal variations, while pigment extraction enables further applications, such as on paper or for additional dyeing processes.

Local dyeing material





credits

NAME	COLOUR	COUNTRY
Chamomile (Anthemis spp.)	Yellow	**Slovenia**
Madder (Rubia tinctorum)	Red	**Italy**
Nettle (Urtica dioica)	Beige	**Switzerland**
Oak galls (Quercus spp.)	Beige/Pink	**Austria**
Walnut husks (Juglans regia)	Brown	**France**

Dyeing tests

Tap water (TAP) ph: 8 - Rain water (RAIN) ph: 5.

Low-concentration iron, tested with a lower-impact method.

Chamomile (Anthemis spp.)

MORDANT IN DYE BATH

TAP - No scouring	RAIN - No scouring	TAP + iron	RAIN + iron	mixed bath (+ nettle and iron)

Nettle (Urtica dioica)

MORDANT IN DYE BATH

TAP - No scouring	TAP - Scouring	RAIN - No scouring	RAIN - Scouring	TAP + iron

Madder (Rubia tinctorum)

MORDANT IN DYE BATH

TAP - No scouring	TAP - Scouring	RAIN - No scouring	RAIN - Scouring	TAP + iron	Pigment dyeing

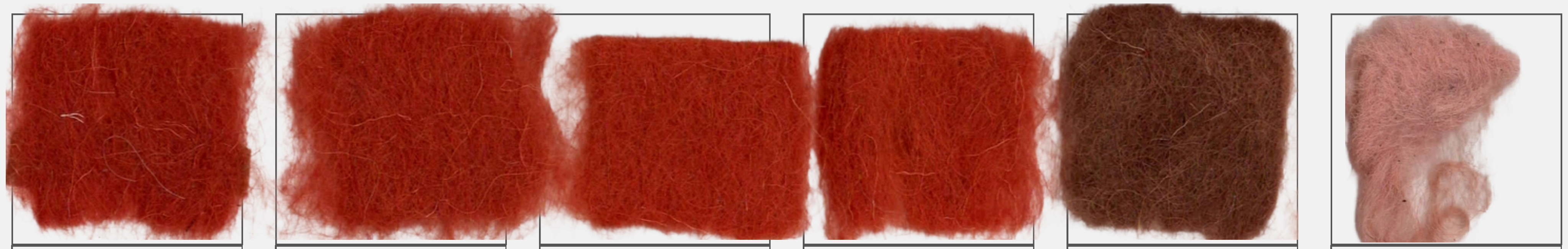
Oak galls (Quercus spp.)

NO MORDANT

TAP - No scouring	RAIN - No scouring	TAP + iron	RAIN + iron	Ink (+iron) on paper

Madder (Rubia tinctorum) - Second bath

MORDANT IN DYE BATH



TAP - No scouring	TAP - Scouring	RAIN - No scouring	RAIN - Scouring	TAP + iron	Pigment dyeing

Walnut husks (Juglans regia)

NO MORDANT

TAP - No scouring	TAP - Scouring	RAIN - No scouring	RAIN - Scouring	TAP + iron

Local water is recommended whenever possible, as its mineral composition and pH help shape unique dye results.

Water use: coloring comparison

Conventional	Scouring	Mordant bath	Dye bath	Water disposal	Full rinse
	3 different baths				
WATER REQUIRED (small scale)	2.5 L (WOF: 150g)	1.5 L (WOF: 95g)	2.5 L (WOF: 150g)		

Tested system	(No scouring)	Mordanting and dye bath	Bath reuse: second dye, pigment extraction, colour modification	Rapid rinse
WATER REQUIRED		2.5 L (WOF: 150g)	2.2 L (still available for biomaterials and baths)	


FIBER
ACTIVATOR
Felting
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Felting

One of the oldest textile techniques is wet felting, in which water, soap, and friction interlock fibers to create a dense fabric without machines.

Later, needle felting emerged, interlocking fibers mechanically and reducing the need for water.

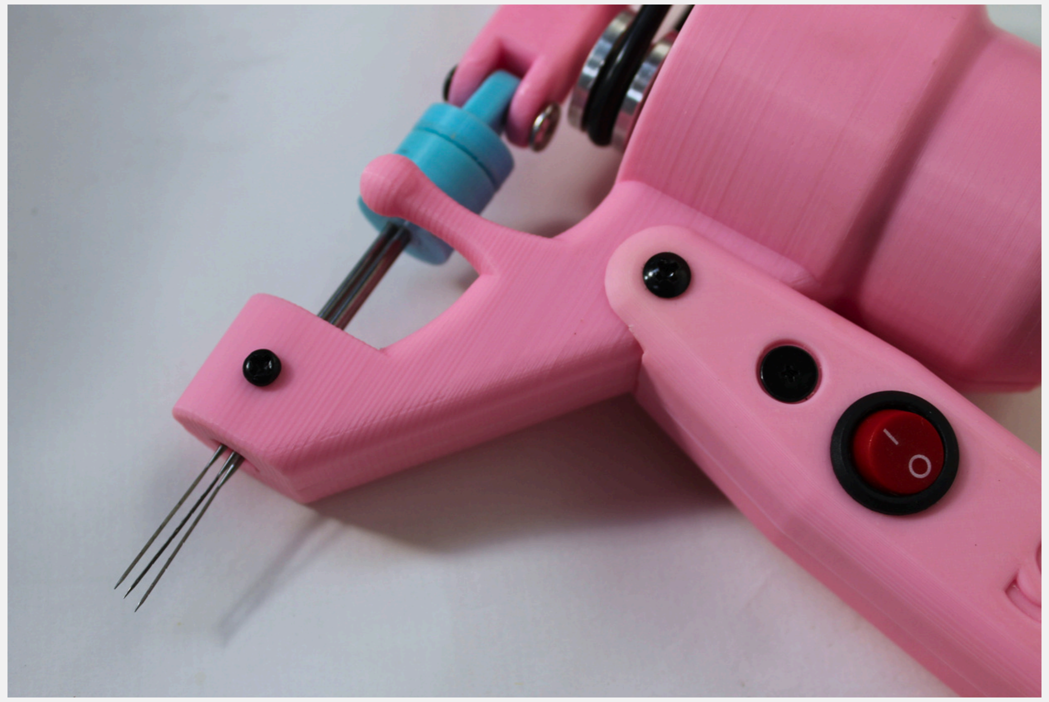
Today, technology can support these techniques, reducing manual effort while expanding creative possibilities.

My research focused on the interaction between water-based and dry techniques and technological support.

Supporting tools (low-, medium-, high-tech)

A selection of tools and systems (see examples below) was tested through shared parameters to evaluate performance and produce comparative felt panels as outcomes.

ROLLING PIN (Wet felting)
Low-tech



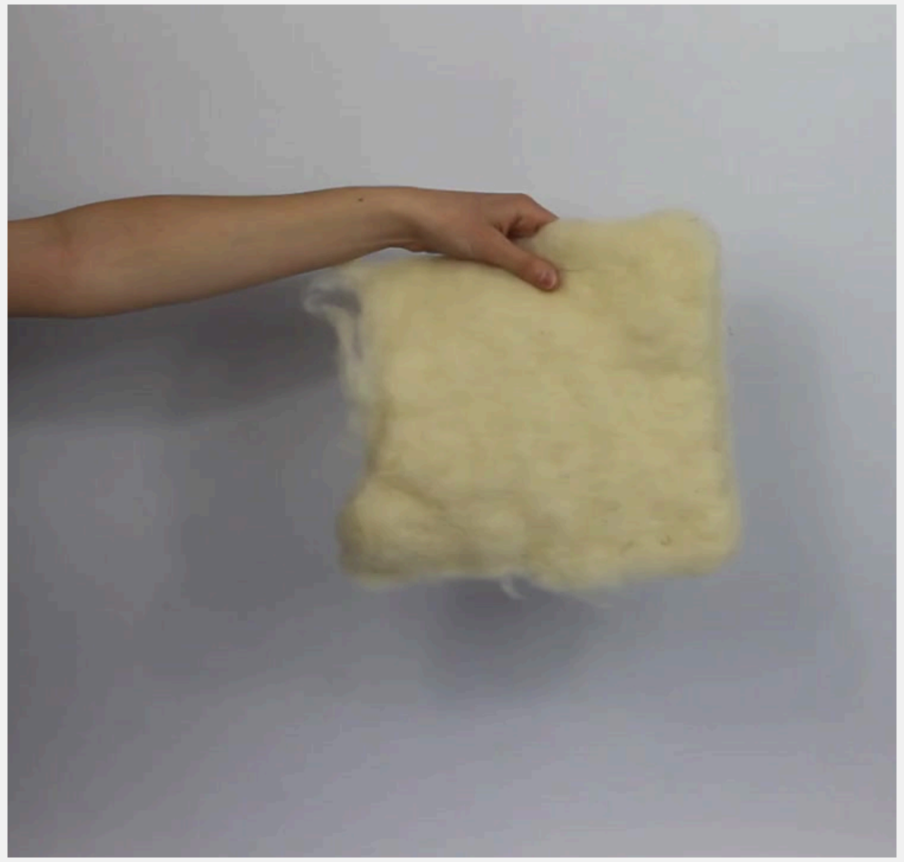
FELTING GUN (Needle felting)
High-tech

FELTLOOM (Needle felting)
Hight-tech

Parameters

Observation time	Sample weight	Sample size	Layer structure
10 minutes	50g	25x25	4 layers cross-laid

Technology interventions: some results



TOOL	FeltLOOM	Felting gun	Rolling pin	Sanding machine
TECH LEVEL	High	Medium	Low	Medium
MANUAL EFFORT	Low	Medium	High	Low

Comparison with all tools and more details available here

Experimenting pieces

I combined tools and techniques to create experimental pieces, including garments where rustic wool is usually not used.

Bag
wet felting, details with needle felting
rolling pin and felting gun

Vest
wet felting
sanding and washing machine


MATERIAL
MEDIUM
Biocomposite
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Wool biocomposite

In combination with Alginate (algae-based binder)

Water is used in the recipe and can be locally sourced, I tested with rainwater, and also reused from the dyeing bath.

My goal was to design a replicable workshop setup for collective learning, where participants could experiment and reflect on possible applications. On top of building a material archive.

The workshop setup includes guidelines outlining roles and recipes (printable version).

WOOL-ALGINATE WORKSHOP — RECIPE

MATERIALS
- 12 g Alginate
- 20 g Glycerin
- 400 ml
- 10 g seed oil
- Calcium Chloride solution (10 g calcium chloride per 100 ml water)

Note: double/triple the dose based on the number of participants.

- Food-waste powder ingredients (e.g. orange peels, banana peels, coffee grounds)
- Wool fibres (washed and carded, optional test with unwashed wool)

TOOLS
- Containers or mixing bowls
- Digital balance
- Spatula
- Mixer
- Paper towels
- Spray bottle
- Embroidery hoops and texture dense fabric
- Dehydrator (optional)
- Grinder (fine powders)
- Camera/smartphone for documentation
- Printer, papers and markers for sample tracking

INSTRUCTIONS

Step 1: Prepare the sodium alginate mix
- Add the sodium alginate to the water.
- Blend the mix until it becomes homogeneous.
- Add the glycerine and blend again.

Step 2: Prepare the calcium chloride mix
- Mix 100ml of water with 10 grams of calcium chloride.
- Stir until completely dissolved.
- Place the mix in the sprayer bottle and shake the bottle before use.

Step 3: Prepare and spray the mold
- Take the waterproof texture dense fabric, place and fix it in the embroidery hoop.
- Spray the textile mold with calcium chloride.
- Remove excess with a paper towel.

Step 4: Pour and spray the mix
- Pour the mix onto the textile mold.
- Tap the mold so the mix distributes evenly over the surface.
- Spray the surface of the mix with calcium chloride.
- Remove excess with a paper towel.

Step 5: Dry
Let dry over a radiator or in a food dehydrator (40°C for 24 hrs)

Step 6: Remove from the mold
- Take out of the frame.
- Pull slowly from the border of the bioplastic until completely detached.

WOOL-ALGINATE WORKSHOP — ROLES

FACILITATOR

BEFORE THE WORKSHOP:

- Prepare and label powder ingredients in jars
- Prepare calcium chloride solution and alginate mixture (step 1 and 2)
- Cut wool fibres into smaller pieces (washed and unwashed)
- Prepare sample documentation sheets
- Prepare sample storage area

DURING THE WORKSHOP:

- Introduces workshop concept and materials
- Guides participants through process
- Supports safe and inclusive participation

AFTER THE WORKSHOP:

- Checks drying process in the lab
- Ensures each sample sheet is associated to the material sample
- During second meeting with participant (if planned), shares dried materials and collects reflections on possible applications and future experimentation.

PARTICIPANTS

- Select the wool and powder ingredients and record your choices in the sample sheet
- Prepare the mold: first spray the calcium solution, add the ingredients, then pour in the alginate mixture. Spray again with calcium chloride and let it dry
- Share feedback on the experience and material observations
- Enjoy the session!

DOCUMENTATION LEAD (Facilitator/assigned person)

- Collects participants' consent for photos and videos
- Documents the process through photos and videos
- Archives results for open knowledge sharing and gathers participant feedback

cut along the dotted lines

BIOCOMPOSITE

SAMPLE:

fold on the other side

DATE: **PARTICIPANT:**

FIBRE INFORMATION
Wool type / breed (if known):
□ Washed □ Unwashed □ Carded □ Other: ______
Approximate fibre weight (if measurable): ___________

COMPOSITE RECIPE
Food-waste fillers used:
Powder granulometry (fine/coarse/mixed):
Quantity of fillers: □ Low □ Medium □ High □ Weight: _______

WATER TYPE (TAP, RAIN, DYE BATH): ______________________

OBSERVATIONS (TEXTURE, FLEXIBILITY, ETC):

REFLECTIONS/APPLICATIONS:

BIOCOMPOSITE

SAMPLE:

DATE: **PARTICIPANT:**

FIBRE INFORMATION
Wool type / breed (if known):
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COMPOSITE RECIPE
Food-waste fillers used:
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WATER TYPE (TAP, RAIN, DYE BATH): ______________________

OBSERVATIONS (TEXTURE, FLEXIBILITY, ETC):

REFLECTIONS/APPLICATIONS:

fold on the other side

BIOCOMPOSITE

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OBSERVATIONS (TEXTURE, FLEXIBILITY, ETC):

REFLECTIONS/APPLICATIONS:

BIOCOMPOSITE

SAMPLE:

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COMPOSITE RECIPE
Food-waste fillers used:
Powder granulometry (fine/coarse/mixed):
Quantity of fillers: □ Low □ Medium □ High □ Weight: _______

WATER TYPE (TAP, RAIN, DYE BATH): ______________________

OBSERVATIONS (TEXTURE, FLEXIBILITY, ETC):

REFLECTIONS/APPLICATIONS:

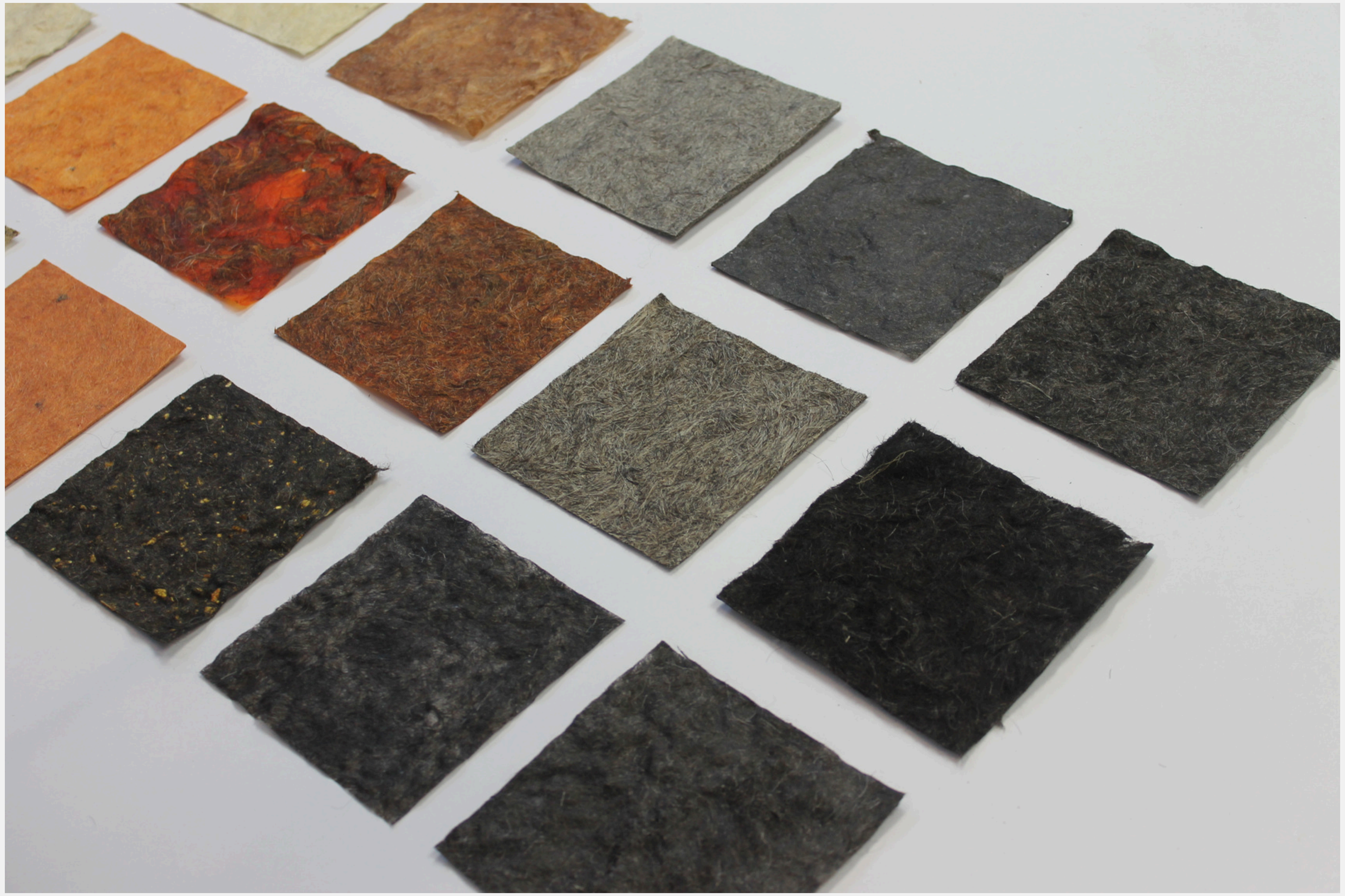
Workshop session (test)

A first session was held at Le Textile Lab on February to explore how different combinations of wool and natural binders could support collective experimentation, allowing participants to influence texture and material behaviour through their material choices.

Different water sources were introduced to test their influence on the composite behaviour but no significant differences were observed between the water sources, as all produced stable and consistent results.

Workshop results

During the session, participants created around 15 samples and explored additional recipes.

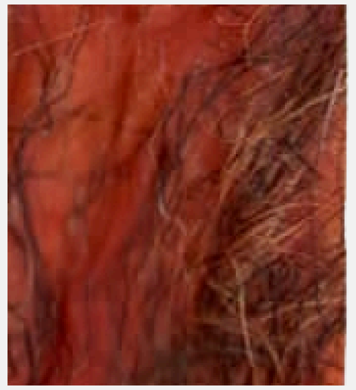


Biocomposites Archive

*Alginate refers to the full mixture (incl. additives)

Rain water
Alginate: 98g
Washed wool

Madder dye bath
Alginate: 105 g
Washed wool: 4.8 g



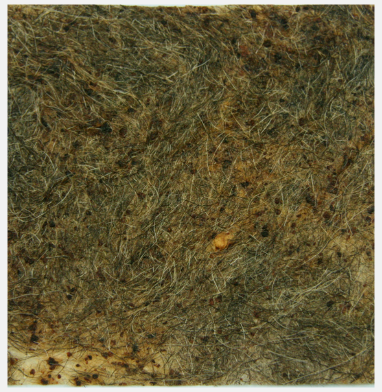
Madder dye bath
Alginate: 119 g
Washed wool: 3 g

Madder dye bath
Alginate: 130 g
Washed wool: 1.5 g

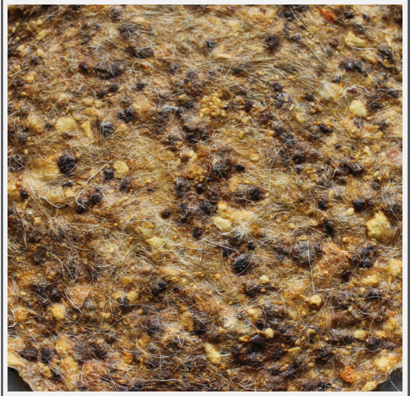
Walnut dye bath
Alginate: 235 g
Wool: 5.4 g

Tap water
Alginate: 100 g
Unw. wool: 10 g

Rain water
Alginate: 211 g
Washed wool: 6 g
Orange filler: 6.20 g



Rain water
Alginate: 81 g
Washed wool: 2.4
Orange filler: 1.5 g



Rain water
Alginate: 85 g
Washed wool: 2 g
Orange filler: 15 g

Tap water
Paper pulp
Unwashed wool: 1g

Tap water
Alginate: 70 g
Washed wool: 5 g

Tap water
Alginate: 70 g
Washed wool: 1 g

Tap water
Alginate: 70 g
Washed wool: 8 g

Tap water
Alginate: 70 g
Washed wool: 10 g

Tap water
Agar: 1 g
Washed wool: 2 g

WHAT'S NEXT: expanding the research

I tested suint fermentation on several Alpine sheep breeds, all with promising results. Ongoing research will extend to Italian wool breeds and involve knowledge-sharing with farmers to foster collaborative testing and locally rooted practices.

I am currently investigating wool biocomposite applications through experimentation and dialogue with designers, farmers, and Woolshed partners, intending to develop a scientific analysis of the materials.

I also take part in events and exchanges to deepen my knowledge, connect with producers and explore ongoing initiatives.

Interreg Alpine Space
Co-funded by the European Union
Woolshed

LE TEXTILE LAB

FABRICADEMY
textile and technology academy

This project is co-funded by the European Union through the Interreg Alpine Space programme.

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