



Funded by
the European Union

Erasmus+ Programme cooperation partnership (Key Action 2) project „Natural paints for Sustainable art and crafts” (Plant&Paint)” Grant Agreement Nr. 2024-1-LV01-KA220-VET-000252528

STUDY REPORT

ON NATURAL PIGMENTS & FABRICS

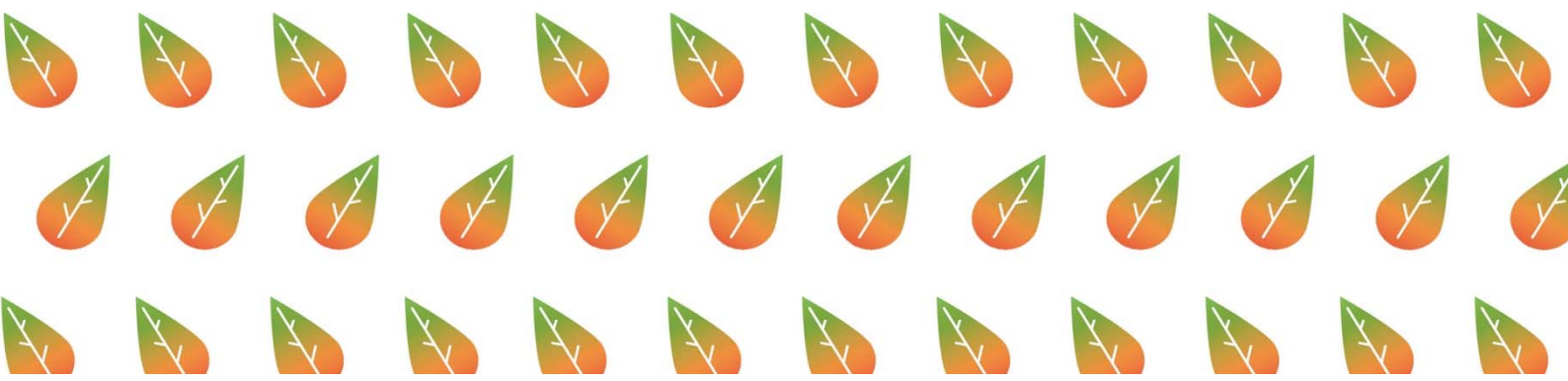
Entrepreneurship and eco-sustainability challenge:

workshop with Martinelli Ginetto Company

A practical exploration of local plant-based dyes in creative education by



Italy 2024-2026



Introduction

About the Study

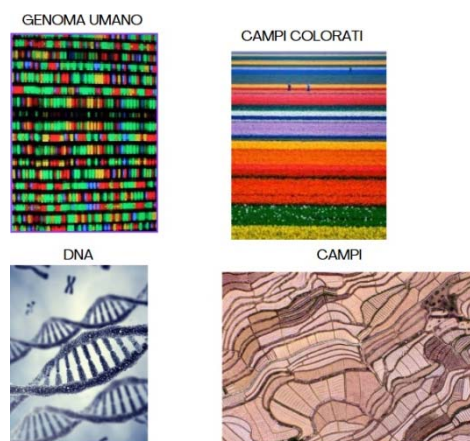
The project was born from the synergy between the local textile company Martinelli Ginetto and the 5B class of the figurative arts program at the Liceo Artistico A. Fantoni.

The aim of the project is to investigate and understand the use of natural color in the textile industry.

The Martinelli Ginetto company's request was to create an artistic interpretation highlighting the parallels between human biometrics (iris, fingerprints, genome...and the biometrics of nature) by creating a pattern to be printed on

linen. The product will be used to cover a wall, creating a furnishing surface for luxury spaces.

The study addressed eco-sustainability, the limitations of using natural color, and profitability with a forward-thinking vision for the product's production.



Project & Work Package Overview

The art school has a long tradition of painting techniques, from paper to mural techniques.

The Erasmus+ Plant & Paint project expanded the use of pigments, applying natural color through watercolors and inks.

This research allowed for experimentation by offering students a new medium: textiles.

The project includes a laboratory component, a phase of analysis and historical research into the use of color by master dyers, and an aspect related to the chemistry of color.

The other significant aspect is related to dyeing plants, from knowledge of local plants to the different types of color extraction, their practical application, and the objective limits of their use in textile production.

Participants

Teachers and Experts

- Alessandra Burini – Teacher of pictorial discipline
- Daniela Balduzzi - Human Resources Manager at Martinelli Ginetto
- Chiara Oberti - Digital fabric design specialist at Martinelli Ginetto

5B grade Fine Arts students

- Baroni Valentina
- Bettoni Gaia

- Bramati Rebecca
- Colnago Giulia Thao Van
- Daminai Chiara Rachele
- Dolci Davide
- Fassi Lorenzo Mario
- Frattini Valentina
- Maffiuletti Laura
- Plebani Federico
- Reguzzi Camilla
- Rodolfi Anna
- Rota Bruna
- Siribelli Giorgia

1. Discovering Plant-Based Colors

1.2. Exploring Plants and their historical use

Historically, natural dyes have been rooted in the use of plants, minerals, and other natural resources, some native to Italy, others imported via trade routes.

This research has allowed us to explore a broader use of dyeing plants, beyond just the local ones found in the school garden. Below are the plants used for this project.

Botanical name **Calendula Officinalis**

Italian informal name Calendula

Color Yellow/Orange

History The flowers were used in Greek, Roman, Middle Eastern, and Indian cultures as a medicinal herb and as a dye for fabrics, foods, and cosmetics. Many of these uses persist today.



Botanical name **Isatis Tinctoria**

Italian informal name Guado, pastello

Color Blue

History The blue dye was extracted in Egypt, as in the rest of the ancient world, from various species of Indigofera (Indigofera Tinctoria, Argentea) or Isatis Tinctoria.



In the Middle Ages, it was cultivated throughout Europe, and in Lombardy, it became one of the most important exports by the end of the 14th century. Cultivation began to decline in the 16th century with the opening of the trade routes to the East and America, which introduced *Indigofera tinctoria*, a plant with a much higher indigo content, to Europe.

Botanical name **Hibiscus Sabdariffa**

Italian informal name Karkadè

Color Red

History Hibiscus Sabdariffa is thought to be native to Central America, although few documents exist



regarding this. It is possible that the plant was imported into Africa during the slave trade and takes its name from the term “karkadeb,” which in Ethiopian dialect refers to the hibiscus plant used to prepare the drink. Karkadè was imported into Italy only at the outbreak of the war against Ethiopia (1935), when the League of Nations imposed economic sanctions on Italy and the fascist government organized the sabotage of foreign products. Thus, tea, produced in the English colonies, was replaced with karkadè (which was greeted with little enthusiasm). In the United States, during the Prohibition period (the 1920s and 1930s), karkadè was used instead of wine.

Botanical name **Reseda luteola**

Italian informal name Guaderella

Color Yellow

History Native to the Mediterranean Sea, Reseda has been used since the Neolithic, but the most substantial evidence is found in the Hebrew Bible and the Romans (Pliny, in particular, mentioned and described it for its phytochemical properties).



Reseda was said to be the dye used by the Roman Vestal Virgins to dye their clothes and those of their young brides in the flourishing Rome of the Emperors, but it was also used by the emperors on the borders of the Empire, particularly by the Gauls in the French territories.

Botanical name **Curcuma longa**

Italian informal name Zafferano delle indie

Color Yellow

History Turmeric's history dates back over 4,000 years. It originated in South Asia, where it

was used in Indian cuisine and Ayurvedic medicine. It was considered a sacred plant and revered in religious ceremonies. It reached the Middle East and Europe (and later America) via trade routes, where it was prized as an exotic spice and remedy.



Botanical name **Rubia tinctorum**

Italian informal name Rosso di Garanza o Rosso Adrianopoli

Color Red

History Rubia was a very important dye in both textiles and art, used in oil and watercolor techniques.

Rubia is rather fleeting; in Lorenzo Monaco's painting, "Coronation of the Virgin," the Virgin's cloak, painted with madder, has faded to colorless.



1.3. Historical & Cultural Insights



Papyrus Graecus Holmiensis

The first true "code" or manual regarding the dyeing of textile fibres is owed to the Egyptians: Papyrus Graecus Holmiensis o The Stockholm papyrus.

It is a codex consisting of 15 leaves containing 154 recipes for the manufacture of dyes and colors used in textile.

Written in Greek around AD 300, it is one of the earliest complete treatises of its kind and an important vehicle for the transmission of practical information from the Alexandrian (Old Egyptian) world to Byzantium and Western Europe.



Bacco ed Arianna (1520-1523)

The painting by Tiziano Vercellio (1480/1485–1576), now at the National Gallery in London, represents a kind of catalog of the pigments known until the sixteenth century.

It lists sixteen of them, including three "blue" pigments (azurite, lapis lazuli, smalt) and three "red" pigments (cinnabar, madder lake, and hematite).

Sustainable Aspects

The project with the Martinelli Ginetto company aims to better understand the ecological aspect of natural color, and to move toward eco-sustainability while considering new horizons and possibilities, while being aware of the history and research of natural color.



The company's eco-sustainable proposal:

Reduction of Water Consumption

Compared to other natural fibers, linen and hemp require significantly less water throughout their life cycle. Using less water means supporting more responsible and sustainable production practices.

Environmental Benefits of Linen and Hemp

Innovation and environmental responsibility in fabrics.

Linen and hemp are natural fibers that require fewer pesticides and chemical fertilizers, promoting a healthier ecosystem. Furthermore, their characteristics make these fabrics biodegradable and easily recyclable, reducing environmental impact.

Global Market Vision for a Sustainable Future

The Group is committed to becoming a leader in the global textile market through sustainable practices. With ten years of fabric durability and supply chain control, they offer high-quality, responsible products that meet the needs of modern consumers.

The Martinelli Ginetto Spa Group has consolidated its commitment to a sustainable future through eco-friendly production practices and promoting environmental sustainability at every stage of the supply chain.

2. Experimenting with Natural Pigments

2.2. Methods of Extraction

Calendula Officinalis	hot extraction by boiling
Isatis Tintoria	maceration of the leaves
Rubia Tintoria	root pulverization
Reseda luteola	hot extraction by boiling
Hibiscus Sabdariffa	hot extraction by boiling
Curcuma longa	root pulverization

2.3. Testing on Different Materials

Paper	for the design phase, pattern research, and color testing
Natural linen	for the executive design and presentation of the result

2.4. Challenges Faced & Solutions Found

The difficulty of the biometrics theme required knowledge and investigation of natural and human characteristics that could have similarities.

After identifying the elements to relate, the students faced a challenge: creating an image that was simple yet simultaneously embodied the synergy of natural and human elements.

The second challenge was preparing the color and watercolors.

The dye plants used had different extraction methods: hot extraction by boiling, maceration, etc., so the students had to experiment with color extraction methods and watercolor preparation.

The watercolor test on linen was complex due to the color variations between the paper and fabric tests and the different application of color on the fabric.

Colors that posed some difficulties:

Curcuma longa	unlike when applied on paper, it creates streaks on linen. Solution: Increase the watercolor density by using tempera paint that dries faster and contains less water.
Hibiscus sabdariffa	on linen it produces a bright, vibrant red; however, it reacts with the chemistry of the paper, losing the correspondence between the paper and linen. Solution: Sample the color directly on the linen.

2.5. Reflections from the Participants

What students and teachers found most interesting about this project was the way it brought together nature, creativity, and science in a practical and meaningful way. The process of transforming locally grown or harvested plants into usable pigments—and then transforming these pigments into real products—was surprising and rewarding.

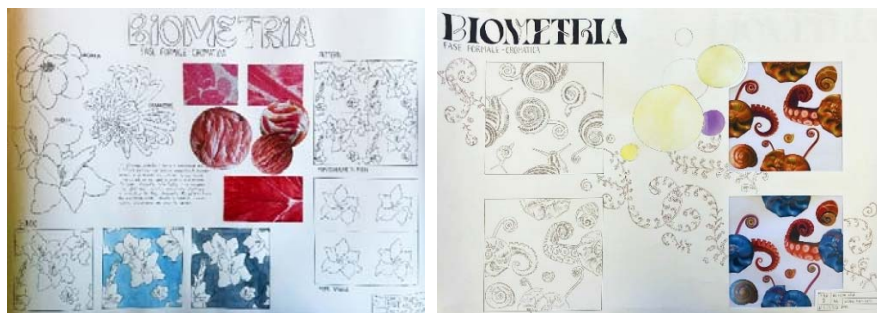
Positive reflections	Completeness of the process and vision of a complete work process, from historical research to final production. Conversation with an international manufacturing company for the creation of a high-quality product that will be marketed.
Criticisms	The project needed more time to explore the history of dyeing plants and their applications.

3. Practical Applications & Creative Outcomes

3.2. Students & Teachers Creations



Initial request from the Martinelli Ginetto company



Full projects



Patterns





Painting on natural linen

3.3. Masterclass Takeaways



From the garden to the colour



From the colour to the watercolor

4. Conclusion & Next Steps

4.2. Key Insights & Lessons Learned

The project offered much more than artistic techniques: it taught students and teachers to coexist with the unpredictability of natural processes, developing flexibility, patience, and a keen sense of observation.

Through the use of plant pigments, students learned that even small changes can radically alter the outcome, making mistakes and surprise an integral part of learning.

The discovery of plants transformed common plants into resources rich in color and aesthetic value, rooting sustainability in everyday life.

The teaching methodology emphasized experimentation, rigorous documentation (notes, photographs, samples), and communication of results: an approach that strengthened critical thinking, collaboration, and structured presentation skills in both students and teachers.

Finally, the integration of science, creativity, and sustainability demonstrated that ecological alternatives are not just abstract ideals, but feasible, innovative, and immediate solutions, from a STEAM perspective.

4.3. Potential for Future Work:

This project culminated with the company's choice of a texture. The production will be realized on silk.

4.4. Expanding the Knowledge

The results of the pigment and textile study will be shared through a variety of channels to ensure wide dissemination and active engagement:

- **Plant&Paint Digital Platform**

Partner schools will upload the report, 360° photographs, videos, and teaching materials to a single, accessible online space.

- **Social media and school websites**

The main results will be published on the Fantoni School's Facebook and Instagram pages, as well as on the official websites of the participating schools, to broaden their visibility.

- **Dissemination events**

Each school will organize public meetings to present the results, share best practices with other schools, local stakeholders, and professionals, and hold an exhibition at the FantoniHUB.

- **Educational integration**

The results will be incorporated into art school activities and disseminated among the teaching staff.

5. Appendix – Additional Visuals & Resources

5.1. Extended Photo Gallery of the Process



Students and their projects

Collecting plants from the school garden [WP3-4-2-2 Garden photo MAY 2025 - Google Drive](#)

Extracting methods [WP2-7-1-2 Extracting methods - Google Drive](#)

Designing texture on fabrics [WP2-7-1-3 Designing texture on fabrics - Google Drive](#)

5.2 Detailed List of Plants & Color Results

Plant	Part used	Color	Coloring principle
Isatis tinctoria	Leaves	Blue	Indigotine
Reseda Luteola	Stem (dry or fresh)	Yellow	Luteolin
Rubia Tinctoria	Root	Red	Carotenes and Flavonoids
Calendula Officinalis	Flower	Yellow/Orange	Carotenes and Flavonoids
Curcuma longa	Rhizome	Yellow	Curcumin
Hibiscus Sabdariffa	Flower	Red	Ibiscina

5.3 Additional Feedback from the Participants

L.F.: “This project was a wonderful experience and I hope that the Martinelli Ginetto company will choose my project to put it into production”

A.R.: “It's wonderful to be able to take care of the garden and watch the plants grow”

A.B.: “It would be nice to be able to plant more essences to obtain ever more colors... too bad that some are toxic!”

Alessandra Burini, Diana Conte, Federica Madeddu

June 2025

Bergamo, Italy