

WARMIPURA: RECOVERY OF ANCESTRAL TECHNIQUES FOR DYEING WOOL AND NATURAL FIBERS IN NORTH-WEST ARGENTINA

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Abstract

WarmiPura is the name of a group of women belonging to the Diaguita - Calchaquies indigenous community located in Tafi del Valle (Argentina) producing handcraft tissues made of sheep wool coloured with natural dyes. The founder, Liliana Pastrana, has been working for the past fifteen years toward a recovery of traditional textile methods based on the extraction of natural dyes from wild plants.

When the harvest of autochthonous plants becomes too intensive, the availability of raw material results insufficient to face the needs and a significant loss of biodiversity may occur. In order to overcome this and other constraints, WarmiPura is evolving in an international venture, with the University of Florence (Italy) and the University of Morón (Argentina) as participants, aiming to fulfil their needs joining academic research and local know-how. The main objective of the project is to satisfy the demand of raw material for pigments extraction, according with economic and environmental sustainability, through the establishment and management of an experimental field for the cultivation of the required plants. In this paper some general aspects on WarmiPura group, the environmental characteristics of WarmiPura area of activity and the pool of utilized plant species were investigated, and the main practical approaches of the project supporting WarmiPura it is illustrated.

WarmiPura è il nome di un gruppo di donne appartenenti alla comunità indigena Diaguita – Calchaquies di Tafi del Valle (Argentina) che si occupa della produzione artigianale di tessuti di lana ovina tinti grazie all'utilizzo di coloranti naturali. La fondatrice, Liliana Pastrana, lavora da quindici anni per il recupero della tessitura tradizionale basato anche sull'estrazione di coloranti naturali dalle piante native. La raccolta intensiva di queste piante potrebbe portare ad una insufficiente disponibilità di materie prime per la produzione oltre che a possibili perdite di biodiversità. Per superare queste ed altre limitazioni WarmiPura sta partecipando a un progetto internazionale con l'Università di Firenze (Italia) e l'Università di Morón (Argentina). Il progetto cerca di soddisfare le esigenze produttive di WarmiPura unendo la ricerca accademica alle conoscenze locali. Il punto focale del progetto è garantire la richiesta di materie prime per l'estrazione dei pigmenti in un'ottica di sostenibilità economica e ambientale attraverso la costruzione e la gestione di un vivaio sperimentale per la coltivazione delle principali specie utilizzate dal gruppo. In questo articolo viene presentato il team WarmiPura, le caratteristiche ambientali della zona in cui opera, le specie vegetali impiegate ed i principali aspetti pratici del progetto che supporta le attività del gruppo.

Keywords

Berberis mikuna, Diaguita-Calchaquies, Biodiversity, Barcoding, Natural Dyes

Introduction

During the colonial period, in Argentina, there was a strong textile activity carried out by indigenous people and some local communities, namely the most isolated groups, have maintained their methods until today. Liliana Pastrana, in her book “Volver a lo nuestro... Rescate y preservación de las técnicas ancestrales sobre tintes naturales” (Pastrana, 2016), collected information related to plants, dyes extraction and dyeing techniques explaining how to obtain certain colours and where pigments are stored in plants. Tissue coloration is essential to give style, emotions, and beauty to the clothes and handicrafts, since especially in ancient time, colours were signs of social status, power, and identity. Many of the still used pigments are extracted from autochthonous species (plants, shrubs, and herbs) of Tafi del Valle environment. The latter aspect is not changed since decades and the current extraction and use of natural pigments is posing several problems in terms of genetic erosion. Objective of this investigation was to have a closer knowledge of WarmiPura activity, to have an insight of the approaches adopted to collect and use plant material for pigment extraction and, in relation to the local context, to define the boundaries and activities of a cooperation project in order to support WarmiPura activities in a frame of environmental, social, and economic sustainability.

Materials and methods

The investigation was carried on at different stages, which included bibliographic research, local monitoring, and interviews to Liliana Pastrana.

The bibliographic research was done both online and locally, with the support of the researchers of the University of Morón (Argentina). During December 2018, a team formed by researchers of the University of Florence and the University of Morón spend a week in the area of Tafi del Valle, interviewing Liliana Pastrana and visiting the areas of plant material collection. Special attention was dedicated to the native populations of *Berberis mikuna*, one of the species threatened by genetic erosion due to its massive exploitation.

The Social and Geographic Context

“Among women” is the meaning of the Quechua word “*WarmiPura*”. The team has been founded by Liliana Pastrana and consists of women of different ages (Figure 1) belonging to the Diaguita-Calchaquies community, located in Tafi del Valle - Tucumán province (Argentina) (Figure 2) dedicated to the production of handicrafts using natural pigments for locally produced sheep wool.

The information gathered by Liliana Pastrana was obtained by interviewing elderly women (50-108 years old) living in the surroundings of Tafi del Valle who have preserved the tradition of producing handcrafted clothes and decorations made by sheep wool.

WarmiPura represents a rural community that tries to organize itself and uses its own know-how to be resilient and increase its autonomy in one of the poorest provinces of Argentina. Actually, in the nearest urban area of Gran Tucumán unemployment rate is 10,7%, people living under poverty line are 40,4% and, at national level, the percentage of people in a state of extreme poverty has increased from 4,8% of 2017 to 7,7% (Figure 3) in 2019 (second quarter of 2019 data: source <https://www.indec.gob.ar/>).



Figure 1. WarmiPura group with their handcrafted products; Liliana Pastrana sitting in front of the group (picture by Liliana Pastrana).

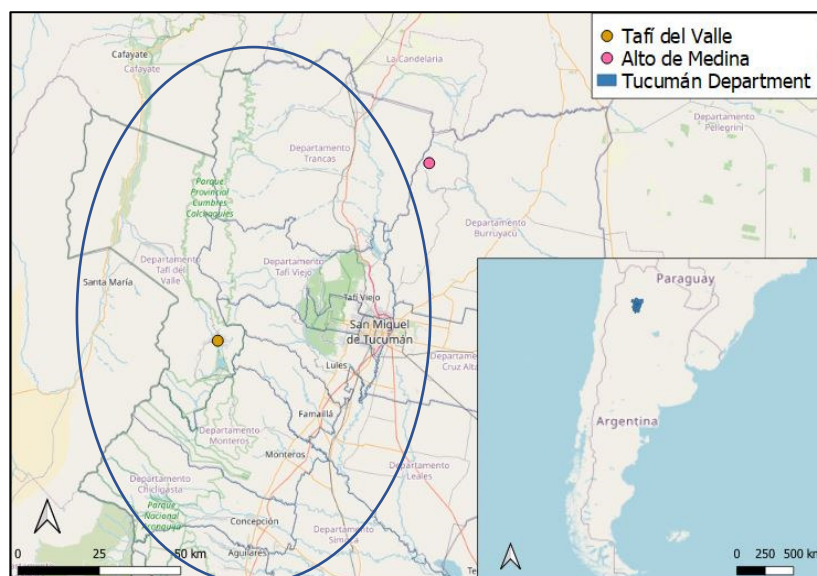


Figure 2. Tucumán province position (purple); Part of the Diaguita-Calchaquies territories (within the blue circle) from <https://www.argentina.gob.ar/derechoshumanos/inai/mapa>.

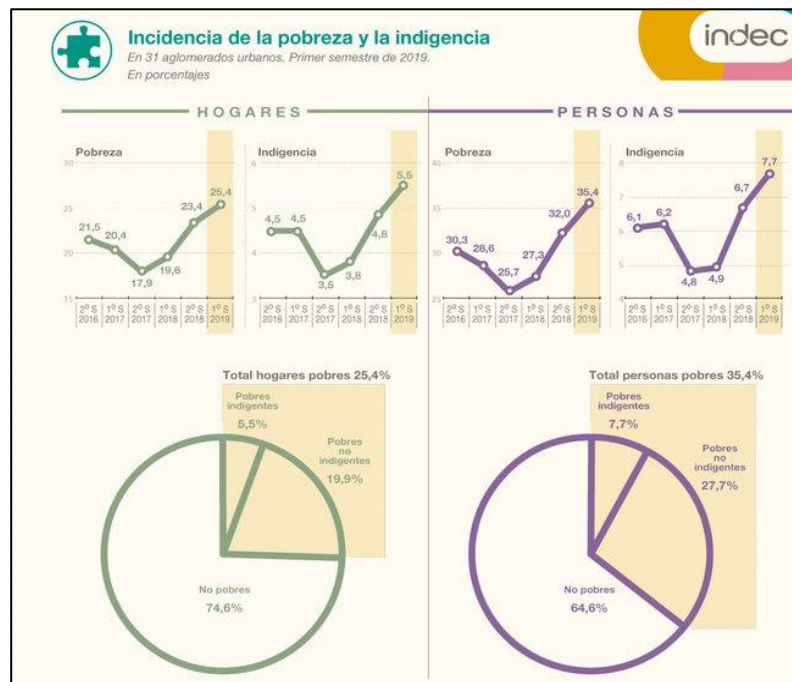


Figure 3. Infographic of Argentinian poverty and extreme poverty average (<https://www.indec.gov.ar>).

The Production of Dying Tissues

The process begins with the harvest of required plants (*Tab. 1*), or part of them, from the surrounding environment according with seasonality and availability. Many plants are considered autochthonous of *Taft del Valle* (such as *Berberis mikuna* and *Aliso*), while others are commonly used and spread in the region (e.g., *Jarilla* and *Yerba mate*). Pigments can be extracted from fruits, roots, stems, or leaves, depending on where they are stored by the plants. This aspect turns out to be crucial to maximize the extraction efficiency and becomes a very critical point for those plants having dye molecules in their root system, since this approach requires the uprooting of the plant determining a significant reduction of living specimens.

Next steps imply crushing of harvested vegetal material and boiling the obtained powder in order to solubilize the pigments. Successively, the previously washed wool is plunged into the warm dye solution and is fixed. Once the tissues are dyed, they have to dry out the water previously absorbed (Figure 4).

<i>Local names</i>	<i>Scientific names</i>	<i>Botanic Family</i>	<i>Pigment colours</i>
Aliso	<i>Alnus acumita</i>	<i>Bertulaceae</i>	Red
Ataco	<i>Amarantus sp.</i>	<i>Amaranthaceae</i>	Light purple
Azafran	<i>Chuquiraga juss.</i>	<i>Asteraceae</i>	Orange
Cebolla	<i>Allium cepa</i>	<i>Liliaceae</i>	Light orange
Chincho	<i>Shinus gracilipes</i>	<i>Anacardiaceae</i>	Light yellow
Eucalipto	<i>Eucaliptus sp.</i>	<i>Myrtaceae</i>	Dark brown
Frutilla	<i>Fragaria x ananassa</i>	<i>Rosaceae</i>	Light pink
Grateo	<i>Crataegus monogyna</i>	<i>Rosaceae</i>	Light orange
Jarilla	<i>Larrea cuneifolia</i>	<i>Zygophyllaceae</i>	Yellow
Mikuna	<i>Berberis mikuna</i> Job	<i>Berberidaceae</i>	Intense yellow
Molle	<i>Schinus polygamus</i>	<i>Anacardiaceae</i>	Green
Morera	<i>Morus alba</i>	<i>Moraceae</i>	Light purple
Nogal criollo	<i>Juglans australis</i>	<i>Juglandaceae</i>	Beige, brown
Pacar	<i>Enterelobium contortisiliquum</i>	<i>Fabaceae</i>	Black, grey
Palo azul	<i>Cyclopeis genistoides</i>	<i>Asteraceae</i>	Light blue
Poposa	<i>Xenophyllum poposum</i>	<i>Asteraeae</i>	Light yellow
Queoa	<i>Polylepis australis</i>	<i>Rosaceae</i>	Cinnamon-coloured
Retama	<i>Bulnesia retama</i>	<i>Zygophyllaceae</i>	Green
Remolacha	<i>Beta vulgaris</i>	<i>Amaranthaceae</i>	Bordeaux
Ruibarbo	<i>Rumex sp.</i>	<i>Polygonaceae</i>	Brick-coloured
Siempreverde	<i>Salix babylonica</i>	<i>Salicaceae</i>	Green
Suncho	<i>Baccharis salicifolia</i>	<i>Asteraceae</i>	Dark green
Tusca	<i>Acacia cavens</i>	<i>Fabaceae</i>	Grey
Yerba mate	<i>Ilex paraguariensis</i>	<i>Acquifoliaceae</i>	Light green
Zarzamora	<i>Rubus ulmifolius</i>	<i>Rosaceae</i>	Wine red-coloured

Table 1. List of plants used to dyes extraction (Source: “Volver a lo nuestro... Rescate y preservacin de las tcnicas ancestrales sobre tintes naturales” by Liliana Pastrana).



Figure 4. On the left: manual crushing of vegetal raw material; in the centre: plunging of wool into dye solution; on the right: dyed wool tissues drying outdoor (pictures by Liliana Pastrana).

Results

Characterization of Biodiversity

Local survey showed that the most endangered species of the area, due to overexploitation and increase of the pasture areas, was the shrub locally known as “mikuna”, from which a brilliant yellow berberine pigment is extracted. Hence, particular focus has been placed on the identification of “mikuna” (*Berberis mikuna* Job) and the distinctness between “mikuna” and another plant known as “sacha mikuna” (meaning “false mikuna”). Both of them are shrubs thriving in the upper Yunga forest. The first one (“mikuna”) was widely spread in the area where WarmiPura is located, while the second (“sacha mikuna”) has been found just in Alto de Medina (Figure 3) far from Tafi del Valle and unknown to WarmiPura group.

Berberis mikuna description. “Mikuna” is the name used by the community of Tafi del Valle to identify a particular plant belonging to the *Berberidaceae* family, classified as *Berberis mikuna* in studies carried out in 1942 by Job. The genus *Berberis* L. in Argentina consist of 18-26 species (Orsi, 1984; Zuloaga et al., 2008; Landrum, 1999) and there are two main geographic areas of distribution: the subtropical regions of Tucumán and Salta in the North-West as well as the Patagonian steppe and sub-Antarctic forest in the South.



Figure 5. *Berberis mikuna* blossoms (picture by Massimo Gori).



Figure 6. "Sacha mikuna" leaves and fruits.

The Joint Venture

The cooperation among the Argentine community (Diaguita-Calchaquies) and the academic world is the pathway chosen by the founder of the project Liliana Pastrana, after many years of work and promotion of its culture and traditions, to face constraints and needs of their production process. For this purpose, a joint venture has been established between the following researching department and experts:

- Department of Plant Physiology (FAyCA-UM - CONICET) - <https://www.unimoron.edu.ar>;
- Dipartimento di Scienze e Tecnologie Agrarie, Alimentari e Forestali (DAGRI) -Università degli studi di Firenze (UNIFI) <https://www.dagri.unifi.it/>;
- Agronomist engineer Oscar Dantur, local advisor.

The following points are practical steps considered as essential to raise up the quality of production:

- the establishment of *in-situ* and *ex-situ* collections of endangered local species.
- the definition of a propagation protocol and the installation of a plant nursery.
- the establishment of a cultivation field to provide raw materials for extraction.
- the building of a basic infrastructure for extraction, dyeing, tissue drying and production.
- the formal constitution of a cooperative to further develop local handcrafted.
- the development of a business plan focused on the economic, environmental, and social sustainability.

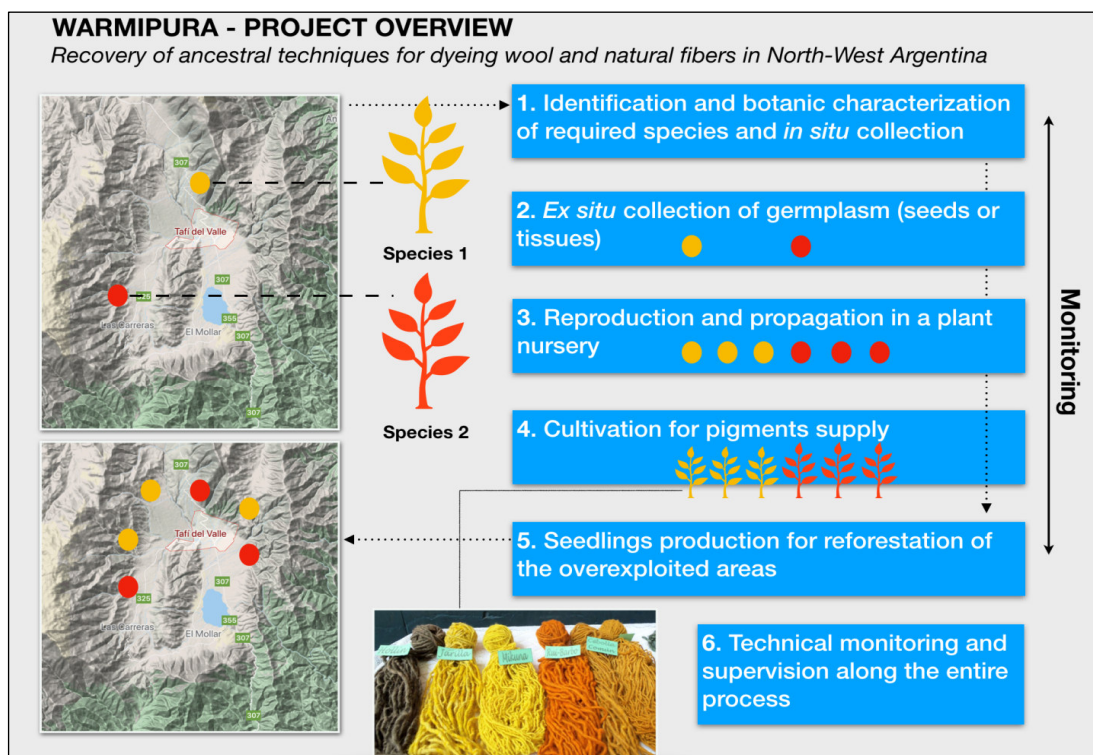


Figure 7. Steps of the project.

The integration of the latter 6 items will bring the actual production in a new framework, as illustrated in Figure 7, increasing organization, availability of some plant species, stabilizing production, regulating the harvest and will also allow to monitor the environment status.

Research activities will focus on: i) morphologic and genetic characterization, identification of the species and assessment of genetic resources; ii) ethnobotany, soil and environment, plant resistance and system resilience; iii) plant reproduction and propagation; iv) cultivation techniques and strategies for the production of raw material; v) dye extraction techniques; vi) environmental and economic sustainability, vii) commercialization of native products.

Discussion and conclusion

Warmipura project is at the beginning and, as indicated in the previous sections, several weaknesses of the production chains have been outlined. Among others, WarmiPura is still carrying out both production and commercial activities without a dedicated building and a proper location. A basic laboratory in which the group can develop and sell all the product could give the possibility to increase sales and to arise incomes. WarmiPura have the aspiration to become a corporate model-based project; this will require the implementation of a management plan. The support of research institutions is crucial for the proper and sustainable development of WarmiPura future activities. The bi-national research team is dealing with one of the main issues related to the use of native plants for pigment extraction, and it is trying to propose adequate solutions to produce the raw material (namely, roots, shots and leaves of a list of specifically selected plants), nevertheless other expertise is needed for a sustainable development of WarmiPura activities in the future.

A holistic view of the process would require the participation of teams dealing with several disciplines, among which chemistry of natural dyes, handicraft design, circular economy and international marketing and social promotion. At this regard, it is worth noticing that WarmiPura represents an interesting case study about sustainable agriculture, scientific research, and international cooperation.

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Acronyms

CONICET	Consejo Nacional de Investigaciones Científicas y Tecnológicas
DAGRI	Dipartimento di Scienze e Tecnologie Agrarie, Alimentari Ambientali e Forestali
FAyCA	Facultad de Agronomía y Ciencias Agroalimentarias
UM	Universidad de Morón
UNIFI	Università degli Studi di Firenze