

CHEMICAL PROFILE AND BIOACTIVITY OF WESTERN SAHARA PLANTS

The research activities of this PhD project are part of a wider collaboration between the University of Ferrara and the Sahrawi people.

Starting from the consideration that the Sahrawi population suffers from malnutrition, due to the condition of refugee for over 40 years in the Sahara desert, the research work was oriented towards 4 of the 17 global goals of the 2030 Agenda for sustainable development: no poverty, zero hunger, good health and well-being, quality education.

These general objectives were then declined in specific objectives:

- 1) to identify some plants of Western Sahara with adequate micro and macro-nutrients content that could be suggested for the integration of the Sahrawi diet
- 2) to evaluate the content of secondary metabolites and the antioxidant activity
- 3) to investigate from a phytochemical and biological point of view some drugs more in-depth
- 4) to formulate some health products for topical use.

Ammodaucus leucotrichus L. (fruits), *Atriplex halimus* L. (leaves), *Cleome amblyocarpa* Barratte & Murb. (aerial parts), *Matricaria pubescens* (Desf.) Sch. Beep. (aerial parts), *Anvillea garcinii* subsp. *radiata* (Coss. & Durieu) Anderb (leaves), *Anastatica hierochuntica* L. (aerial parts), *Nucularia perrinii* Batt. (leaves) were harvested in the wild in Western Sahara in March 2016 (Bir Lehlu). In addition, a sample of *Acacia tortilis* subsp. *raddiana* (Savi) Brenan gum was purchased in the local market of the liberated territories.

The proximate analysis of the selected species represents an aspect of novelty in the related literature and has allowed to identify interesting values of macro and micronutrients for *A. leucotrichus*, *A. halimus*, *N. perrini*: the obtained data will have to be evaluated by nutritionists to determine the applicability of these drugs as supplements of the sahrawi diet.

The polyphenol content and the antioxidant activity were not interesting.

As regards *A. leucotrichus*, the chemical composition of the essential oil, already known in the literature, and of two preparations, the decoction and the ethanol extract, titrated by HPLC-DAD in perillaldehyde and ammolactone, were performed. Biological activity has shown for essential oil a fungicidal capacity towards dermatophytes and fungistatic activity towards phytopathogens. Its inclusion in a cosmetic formulation, oleolite at 2%, despite being safe for topical use, returned only a weak antifungal activity and, in addition, a moderate antimicrobial activity towards *S. aureus* and *C. albicans*. It will be considered whether to increase the concentration of essential oil in the formulated product to suggest its use as a topical antimicrobial and antifungal agent.

Perilladehyde was found to be interesting for its anti-inflammatory activity with the enzymatic 5-lipoxygenase assay and, together with the ammolactone, it showed the ability to reduce

inflammation on IB3-1 cells, inhibiting the expression of IL-8. The two molecules can be considered promising compounds to control inflammation in cystic fibrosis. These results also contributed to the validation of ethnomedical uses for the treatment of airways diseases due to infections.

After purification, the gum of *A. tortilis* subsp. *raddiana*, has been the subject of an accurate chemical characterization. The biological activity centered on the wound-healing test has proven the traditional use of the gum as healing agent. The 10% hydrogel formulation resulted safe for topical use.

The emerged results open perspectives for the formulation of some products at a local level and the possible integration of the Sahrawi diet with some of the studied drugs.