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## The Sweet Smell of Success

*by Andre Lachance*

In Morocco, there are regions full of wild fragrances where aromatic plants make up a large part of the natural vegetation: sagebrush, rosemary, thyme, verbena, henna, and rose. Cottage industries for extracting essential oils have existed in Morocco since the Muslim conquest in the 7th century AD.

Nowadays, although trucks have replaced donkeys for transportation purposes, the distillers still travel the countryside buying plants and processing them on the spot. Their equipment is obsolete and slow: it also has an unfortunate tendency to overheat, which damages the plants and lowers the quality of the extracted oils. Some of the oil, moreover, is lost during collection.

A team of Moroccan and Canadian researchers, supported by IDRC, have now developed two pilot stills; one of them has a double chamber to avoid overheating and is twice as fast. Other benefits of these stills, which are easy to assemble and transport, are that they can be manufactured by local tinsmiths and use plant residue as fuel, like the traditional boilers. The first model, developed jointly by researchers from Rabat's agronomic and veterinary institute, L'Institut agronomique et veterinaire Hassan II and the Agriculture Canada Research Station at Saint-Jean-sur-Richelieu, costs only \$2,500. The second model, which is significantly more effective, costs \$3,000. Similar equipment sold by French companies costs around \$200,000.

Ever since the country became a French protectorate in 1912, companies specializing in the export of essential oils have primarily belonged to French nationals. Today, Morocco's entire output is still exported abroad, where it is made into perfume. Many of the foreign companies are, however, fading from the scene.

### MADE IN MOROCCO

The Moroccans are taking over the trade: two wholly Moroccan-owned companies have recently been formed, one of which is the direct result of the first phase of the Canada-Morocco project. Others are in the process of being set up, at a time when demand for natural products is rising steeply.

"In the overall scheme of things, this is a small operation," admits Bachir Benjilali, head of the Aromatic Plants and Essential Oils Laboratory at the Institut agronomique et veterinaire Hassan II in Rabat. "But this activity provides work, and hence an income, for hundreds of thousands of people for several months a year. Just imagine, to export our 60 metric tons of rosemary oil a year, 15,000 tons of the plant must be picked, cut, gathered and distilled between May and October. The same is true for other plants. In some villages, over 70% of total income comes from rose bushes, although the harvest period is very short -- barely a few weeks."

It is hardly surprising that the study of aromatic and medicinal plants is one of the priorities of Morocco's development plan. The study could be of great benefit to small stockbreeders and farmers in mountainous

and semi-desert areas. These are people who traditionally followed their flocks of sheep and goats but are now encouraged by the government to settle. This sometimes has a devastating impact on the fragile environment owing to overgrazing, use of plants for fuel, erosion caused by ploughing, etc.

"We recognized that the traditional distillation method involved a great deal of waste," adds Professor Benjilali, himself the son of a peasant farmer from the Tangiers region. "In addition to improving the stills, we were able to study the effect of the various distillation processes, both with regard to the yield of essential oils and their commercial quality. The results are extremely encouraging."

The project team now has a clearer understanding of the composition of plants and their essences (or oils), as well as the impact of cultivation techniques on plants and their yields. It was discovered that different varieties of the same plant contain different essential oils; this led to the development of special formulas for mixing oils from various regions and the creation of a consistently higher-quality product. The researchers even identified constants in the speed of the chemical reaction from one variety of plant to another, thereby establishing ideal temperatures for distillation and increasing the ultimate yield of essential oils, as well as improving their composition and quality.

The researchers were also able to improve their knowledge of the effects of the desiccation of plants on the yield and quality of essential oils. They even discovered that a short period of drying increased the level of essential oils in several aromatic plants. Verbena, for example, yields 70% more essential oils three to five days after it has been harvested.

Verbena oil has, moreover, been chemically described for the first time anywhere in the world and improved techniques have been developed for cultivating the plant, which grows in oases in the shade of date palms. Some verbena oil distilled in Morocco has even been sold in France; this is a first, because the local people had hitherto been content to export the dried leaves to France. Potential income per hectare has accordingly increased by 400%, much to the delight of the local farmers.

The same is true for sagebrush. Although Morocco has ten million hectares of wild sagebrush, on which flocks of sheep graze, not all of it yields essential oils of the same quality. The project enabled researchers to identify a large quantity of sagebrush rich in alpha-thujone in the Errachida region. This discovery is of great practical interest, since mixing the essential oils of camphor sagebrush (abundant in Morocco) with those of alpha-thujone sagebrush produces a standard essential oil that is much sought after by perfume makers.

## **THE BATTLE AGAINST DESERTIFICATION**

The chemotaxonomy of sagebrush has been enriched: six new chemotypes have been catalogued. The origin of the chemical polymorphism of this species has been explained: researchers have proved that it was of genetic origin and not the result of environmental influences. It was therefore easy to identify the variety of sagebrush producing the strongest concentration of alpha-thujone, to grow it and remove its seeds for subsequent sowing by aircraft over the country's vast desolate areas. This procedure is of added interest because sagebrush binds the soil and is proving a valuable ally against desertification.

"A door has opened on the future," claims Professor Benjilali, who has been studying aromatic plants for 13 years and has even greater hopes for the second phase of the project. "The peasants worked ... without using any cultivation techniques. As a result of Phase I, yields have increased threefold and an excellent-quality product has been obtained. Phase II, in addition to allowing us to conduct an in-depth study of the ecosystems associated with aromatic plants and the impact of harvesting them, will finally give us an opportunity to improve the techniques for the cultivation, distillation and development of the end product. We will disseminate the findings to local farmers, cottage industry, industrial users and potential customers abroad. Everyone will benefit!"

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