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Validating traditional knowledge: Rwanda



GENERAL INFORMATION

◆ **Implementing institution**

Centre for Research in Phytomedicines and Life Sciences,
Institute of Scientific and Technological Research (IRST)

◆ **Head**

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◆ **Details of institution**

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◆ **Implementation period**

1997-present

◆ **Costs**

Although the main source of funding of the Institute of Scientific and Technological Research (IRST) is the Government of Rwanda, it is difficult to estimate the cost of the implementation of the project because, although the Centre existed from 1982, it was destroyed in 1994 during the uprisings. Presently, it is being rehabilitated and needs new equipment.

SUMMARY

Research on traditional medicine in Rwanda began in 1972 and was formalized in 1982 with the creation of the *Centre Pharmacopée*, which has since been renamed the Centre for Research in Phytomedicines and Life Sciences. The overall aim of the project is to exploit local plant species and traditional botanical knowledge. The main objectives are to:

- promote Rwandan traditional medicine;
- investigate the botany and agronomy of the flora traditionally used in Rwandan herbal medicine;
- research the efficacy of medicinal plants used to treat both infectious and non-infectious diseases;
- study Rwanda's aromatic plants and, it is hoped, exploit their essential oils;
- develop techniques for producing medicines, pesticides and other products from local plants for commercial sale; and
- develop a national pharmacopoeia for Rwanda.

Since the start of the project, ten medicines and several herbal teas have been made available on the local market and a technology for extracting essential oils has been developed. In the wider community, the project has helped to improve the way of life of the local population by providing low-cost medicinal products and a market for the cultivation of medicinal and aromatic plants.

BACKGROUND AND JUSTIFICATION

Prior to the implementation of this project, it was demonstrated that, at any given moment, the Rwandan health care system was unable to deal with the overall medical situation in the country. In addition, approximately 80 per cent of the population consulted tradipracticians rather than medical doctors. It was decided, therefore, that the contribution of traditional medicine to the country's health care system should be evaluated scientifically.

At the time, however, Rwandan traditional medicine was regarded more as a "magical art" than as a science. The tradipractician was a lay person who would serve the needs of a small number of villagers, and people did not believe that the nation's flora could be used for anything other than for fuel, decoration or building animal shelters. As qualified doctors did not believe that herbal medicines could play an important role in the primary health care, tradipracticians were regarded as liars. Also, some tradipracticians were unaware that certain medicinal plants could be toxic or that their administration could induce adverse effects.

Among the needs that stimulated the creation of the Centre for Research in Phytomedicines and Life Sciences were:

- improving people's accessibility to health care;
- reducing the cost of some essential drugs to counteract the weak purchasing power of the population;

- verifying the efficacy and safety of traditional phytopharmaceuticals;
 - improving people's knowledge of and confidence in traditional medicine;
 - increasing public access to traditional medicines and tradipracticians;
 - enhancing the capacity of traditional medicines to treat various diseases, including asthma, diabetes and hepatitis; and
 - producing phytopharmaceutical remedies as good as or better than currently used modern medicines.
- *medical doctors*: Disease diagnosis and clinical follow-up of patients;
 - *technical personnel*: Maintenance of laboratory equipment and other technical support; and
 - *administrative personnel*: Human and financial management.

With such a wide remit, a team of specialists was required to carry out the research:

- *biologists*: including:
 - botanists: Ethnobotanical studies of medicinal plants, and
 - microbiologists: *In vitro* tests and study of the biological activities of the plant extracts;
 - *agronomists*: Preparation of a botanical garden and selection of the species to be maintained. Rare and endangered species, together with plants found in areas far from the research centre, are cultivated in the botanical garden;
 - *chemists*: Phytochemical studies, including screening of medicinal plants, chemical analyses, determination of correct doses, extraction and analysis of active ingredients, and studies on the properties of traditional remedies;
- re-evaluation and exploitation of traditional medicine practices;
 - research into the phytochemistry and pharmacology of medicinal plants; and
 - production of phytopharmaceuticals and such other botanical products as herbal teas and alcohol.

DESCRIPTION

Based on the state of traditional medicine in Rwanda at the start of the project, the Centre for Research in Phytomedicines and Life Sciences decided to focus on three main areas:

The strategies defined to achieve the project's goals included:

- *management of tradipracticians*. Traditional medicine practitioners were organized into associations and provided with training in human anatomy, disease diagnosis, health care and hygiene.
- *collection of data*. Efforts were made to collect and collate the botanical and health care knowledge of the tradipracticians, although this met with some resistance as much of this knowledge is passed from

generation to generation within individual families. Bibliographical searches of the scientific literature were also carried out.

- *ethnobotanical investigations*. Plants used in traditional medicine were identified and specimens lodged in the Centre's herbarium.
- *phytochemical, toxicological and clinical studies*. Of the many plants used in traditional medicine, a small sample was selected for further study and characterization. The choice of plant species depended on advice received from a community clinic that used traditional medicine and qualified tradipracticians. Plant extracts were screened for the presence of such active ingredients as alkaloids, saponins and tannins, using laboratory procedures such as gas chromatography, high performance liquid chromatography (HPLC), mass spectrometry and nuclear magnetic resonance imaging. Potential active ingredients or partially purified extracts were screened in bioassays against such pathogens as *Salmonella* and *Shigella*. Toxicity tests were performed on laboratory rats and mice by observation and autopsy. Clinical assessments were made of the health of patients, including measuring their weight, temperature, appetite, liver and kidney functions, and the progress of the disease or their response to treatment.
- *drug formulation*. When the above lines of investigation led to significant results for a particular plant

species, the herbal remedy derived from it was considered both safe and effective. Following World Health Organization (WHO) guidelines, safe, effective and quality-controlled phytopharmaceuticals were then developed for commercialization.

PATENTING AND COMMERCIALIZATION

Derived from these lines of research, several phytomedicines are now available on the local market. Among them are:

- *alcohol*: Ethyl alcohol (85 per cent) is distilled on a commercial scale from sugar molasses. It is used primarily as a disinfectant for wounds and during various medical procedures (fig. 1).
- *Batankor*: A syrup derived from *Plantago lanceolata* (narrow-leaved plantain, family Plantaginaceae) is used as an expectorant, anti-inflammatory and antipruritic (anti-itching) drug. It can be used to treat coughs and acute and chronic infections of the respiratory tract.
- *Tusinkor*: A syrup derived from *Eucalyptus globulus* (blue gum eucalyptus, family Myrtaceae) and *Datura stramonium* (jimsonweed, family Solanaceae) is a milder expectorant than Batankor and is used to treat coughs as well as acute and chronic bronchitis and chronic pulmonary tuberculosis (fig. 2).
- *Gifurina*: A syrup derived from *Datura*

stramonium is used to reduce stomach acidity and as an antispasmodic.

- *Timutusilinga*: A liquid solution derived from *Eucalyptus globulus* is used to alleviate coughing and to disinfect the respiratory tract. In particular, it can be used to treat fits of whooping cough (pertussis) and other dry, irritating coughs.
- *Tembatembe*: A pomade, or perfumed ointment, made from *Neorautanenia mitis* with anti-inflammatory activity is used to treat skin infections, including scabies, caused by the skin-burrowing mite *Sarcoptes scabiei*.
- *Calendular*: A pomade made from *Calendula officinalis* (marigold, family Compositae) is used as an anti-inflammatory and to treat burns, wounds and other skin complaints.
- *Rusendina*: A pomade and anti-inflammatory drug made from *Capsicum frutescens* (cayenne pepper, family Solanaceae) has local pain-relieving properties and can be used to treat skin irritations.
- *Umugote*: Medicines derived from the *Syzygium parvifolium* tree (family Myrtaceae) have powerful anti-amoebic and antibacterial properties and are used to treat infectious diarrhoeas and amoebic dysentery.
- *Umuravumbra*: Capsules of powder derived from *Tetradenia (Iboza) riparia* (misty plume bush, family Lamiaceae) are used to treat angina and as an antibiotic against such sexually transmitted diseases as syphilis and gonorrhoea.
- *herbal teas*: Teas are made from various plant species, including: *Thymus vulgaris* (thyme, family Lamiaceae), used to treat asthma, bronchitis, laryngitis and whooping cough, as well as diarrhoea and chronic gastritis in children; *Plantago lanceolata* (narrow-leaved plantain), used as an expectorant and for gargling to treat asthma, bronchitis, catarrh and pulmonary tuberculosis; and *Calendula officinalis* (marigold), used as an anti-inflammatory, an antispasmodic, and to ease menstrual pains and heal wounds.
- *essential oils*: These are extracted from various species, including *Cypriss* (family Cupressaceae), *Pelargonium graveolus* (geranium, family Geraniaceae) and *Eucalyptus globulus*,

Figure 1 | Distillation facility for producing ethyl alcohol from sugar molasses. The alcohol produced is used for disinfecting wounds and during other medical procedures.

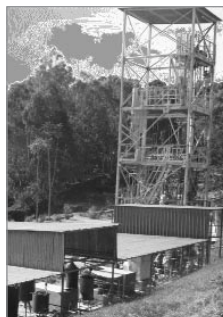


Figure 2 | Tusinkor, a syrup used to treat coughs, and the leaves of *Eucalyptus globulus* from which it is partly derived.



E. citriodora and *E. maideni*. Among other uses, they can be added to wax candles. When burned, the smoke repels mosquitoes, the vectors of several tropical diseases.

PARTNERSHIPS

Nationally, the project has been implemented with the close cooperation of various partners. These include most of Rwanda's higher education establishments, other research institutes and the Ministry of Health.

The project would also have been impossible to develop and carry out without the participation of many tradipracticians. After some initial wariness, the tradipracticians soon developed confidence in the researchers and cooperated readily, especially when provided with feedback information from each step of the research programme relating to their contribution.

At the regional level, the Centre for Research in Phytomedicines and Life Sciences has developed partnerships with scientists working in such neighbouring countries as Burundi and the Democratic Republic of the Congo as well as Benin, Madagascar and Togo. Researchers from these countries are regularly invited to the Centre to attend workshops and seminars. Rwanda is also a member of the Conseil africain et malgache sur l'enseignement supérieur (CAMES), an organization of mainly francophone African countries that aims to share and exchange scientific and

cultural knowledge. Within this framework, the Centre coordinates a programme on diarrhoeal diseases and traditional medicine for the east Africa and Madagascar subregion.

Internationally, the Centre is partnered by two German universities (at Hohenheim and Koblenz-Landau), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Health Organization's Regional Office for Africa (WHO-AFRO).

REPLICABILITY

The Centre's experiences in developing knowledge of traditional herbal medicines into safe and effective commercial products could easily be transferred to other developing countries, especially those neighbouring Rwanda.

POLICY IMPLICATIONS

The Government of Rwanda provides part of the annual budget for the Centre for Research in Phytomedicines and Life Sciences to support research on traditional medicine and promotional activities. As yet, however, research results cannot legally be used in Rwanda's health care system, although the results from the project have been disseminated and are widely used. Efforts are under way to obtain official validation and certification of the phytomedicines developed during the programme from the relevant health authorities.

At the same time, the Government has confirmed that it will introduce the concept of traditional medicine into national law and the Ministry of Health has already created a traditional medicine department.

LESSONS LEARNED

There is a lack of trained technical staff in Rwanda and many scientists have inadequate experience to lead research projects. However, collaboration among research institutions and universities has allowed the exchange of personnel and the ability to harmonize and streamline research. The lack of laboratory equipment also makes collaboration essential, especially with institutions in such developed countries as Germany or international organizations.

The initial resistance of some tradipracticians to working with the researchers was overcome through discussions and by providing training workshops on such subjects as hygiene, plant toxicity and human anatomy. Likewise, skepticism and misunderstanding of traditional medicine by modern doctors were overcome by organizing seminars.

IMPACT

The project has demonstrated the possibility of exploiting Rwanda's botanical heritage and tradition of herbal medicine to add value to herbal products and develop a micro-industry that is now providing jobs for a number of people and

helping to fight poverty.

Public conferences, radio and television were used to disseminate the project's results and make the public aware of the benefits of the phytomedicines developed. The presence of these products in local pharmacies also helps to raise the profile of the project and the Centre.

There has also been a large reduction in the number of amoebiasis and malaria cases being reported by local hospitals. This could be due to people being treated with the phytomedicines against amoebas and other intestinal infections and to the now widespread practice of people growing geraniums in their family gardens for treating their homes against mosquitoes. It is hoped that proper statistical surveys will verify these conclusions.

The long-term sustainability of the project is assured with the low cost of the phytomedicines (typically between US\$0.50 and US\$1.50) and, to avoid a shortage of plant materials, the cultivation of the species involved in a botanical garden — especially those that are either rare or are becoming so because of over-harvesting or other threats.

FUTURE PLANS

To improve and extend the project, young researchers and technicians will be provided with training, and a system that will allow the ongoing management of tradipracticians will be created. Funds provided by UNESCO are allowing 60 tradipracticians to be properly trained.

Efforts are also being made to seek assistance to redevelop the Centre's pharmacology, microbiology and chemistry laboratories, and there are plans to open sales outlets throughout the country to help to bring the products — and the message that research is important — to the wider population.

Finally, attempts are being made to adapt and develop research protocols to tackle HIV/AIDS using a model proposed by WHO-AFRO in 2002.

PUBLICATIONS

Published papers

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Nkurunziza, J.P., Williams, L.A.D. and Conrad, J. *Antiprolifération/cytotoxicité evaluation of the methanolic extract ME and the tannin castalagin from Syzygium parvifolium on the human SH-SY5Y neuroblastoma cells in vitro. Soumis au Bulletin de l'Institut rwandais de recherche scientifique et technologique, IRST, 3.*

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