

Agro-processing opportunities identified through a novel mosquito repellent from a medicinal plant

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INTRODUCTION

Traditional healers provide CSIR scientists with indigenous knowledge (IK) that stimulates research and can eventually lead to discovery and development of new herbal remedies. The rights of these providers of IK, to share in future benefits that might be derived from commercial exploitation of any such products, are protected through a Memorandum of Understanding (September 1999) and a Benefit Sharing Agreement (February 2003) signed between the CSIR and a Traditional Healers Committee. Through this research programme, a novel mosquito repellent was discovered, based on biodiversity and indigenous knowledge.

OBJECTIVE

The objective of this study was to evaluate through research, develop and commercialise a novel mosquito repellent based on indigenous knowledge.

METHODOLOGY



Figure 1: *Lippia javanica*

Local populations in certain regions of South Africa have traditionally utilised an indigenous plant, *Lippia javanica*, as a mosquito repellent. The cut branches are wiped on the skin and around the entrances to dwellings at night or the branches are thrown on an open fire at night to keep away mosquitoes.

Steam distillation was used to prepare an essential oil from a selected chemotype of *Lippia javanica* (Figure 1). Specialised techniques, including headspace volatiles technology in combination with biological assays were used to identify the active ingredients and constituents of the oil. Olfactometer assays at the South African Bureau of Standards were employed to determine efficacy of the samples to repel mosquitoes. A standard protocol was followed using thirty yellow fever mosquitoes (*Aedes aegypti*).

Trial commercial scale cultivation of the plant, design of industrial scale steam distillation equipment and candle manufacturing techniques were used to develop the technology for the commercial production of the essential oils and formulated candles. Technology was transferred to disadvantaged communities through intensive training and skills development programmes (Figures 2 and 3).

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Figures 2 & 3: Hi-Hanyile community

RESULTS AND DISCUSSION

This material, an essential oil, proved to be a potent mosquito repellent and expellant in tests using an olfactometer. The active constituents in the essential oil of *Lippia javanica* were isolated and identified (Figure 4). The results showed that the CSIR-developed products are significantly more efficient at repelling and expelling mosquitoes when compared to the current products on the market (Graph 1).

The safety of the plant components is further demonstrated by the fact that it is used as an herbal tea and as infusions (leaves and roots) for coughs, colds and bronchial problems.

Wild crafted plant material identified and extracted to produce the essential oil and the supply of seeds for agricultural production purposes, were secured by the CSIR.

The CSIR has developed and implemented commercial scale cultivation and distillation of the plant to give the active ingredient in the form of the essential oil. The efficacy of the essential oil obtained

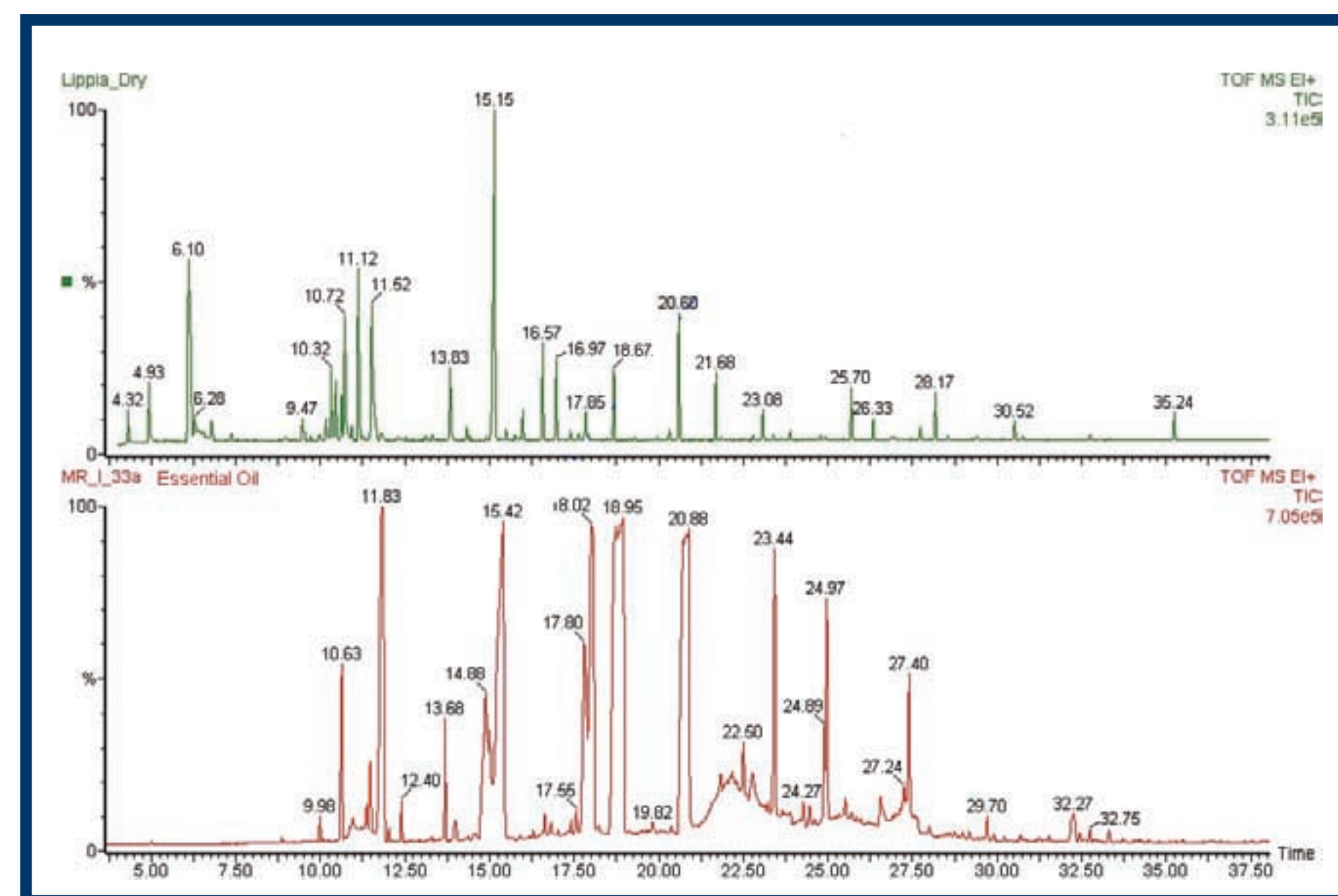
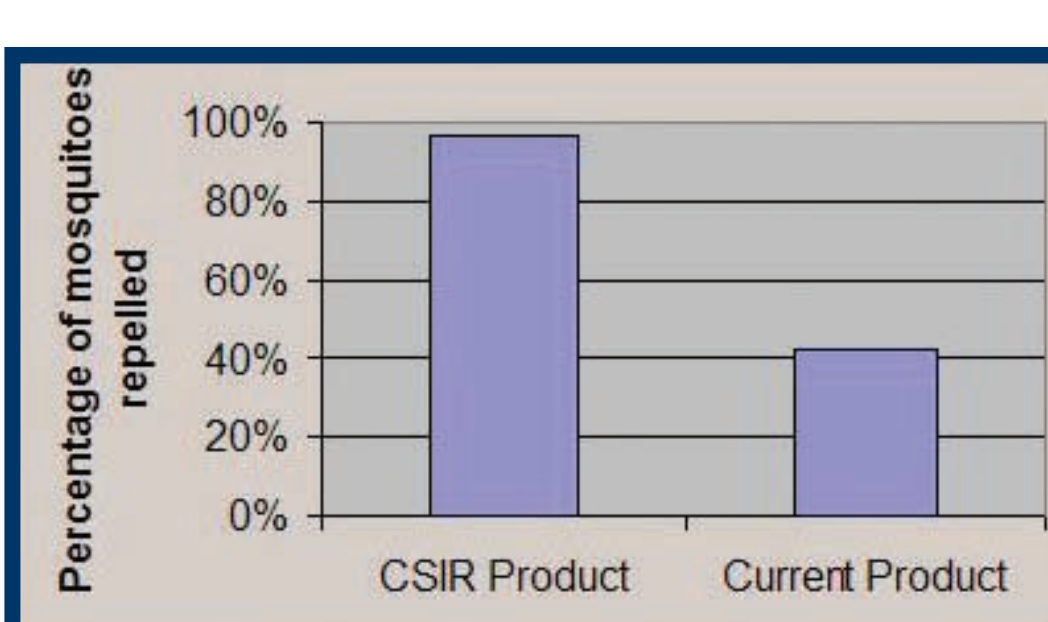


Figure 4: GC profiles of volatiles and essential oil of *Lippia javanica*

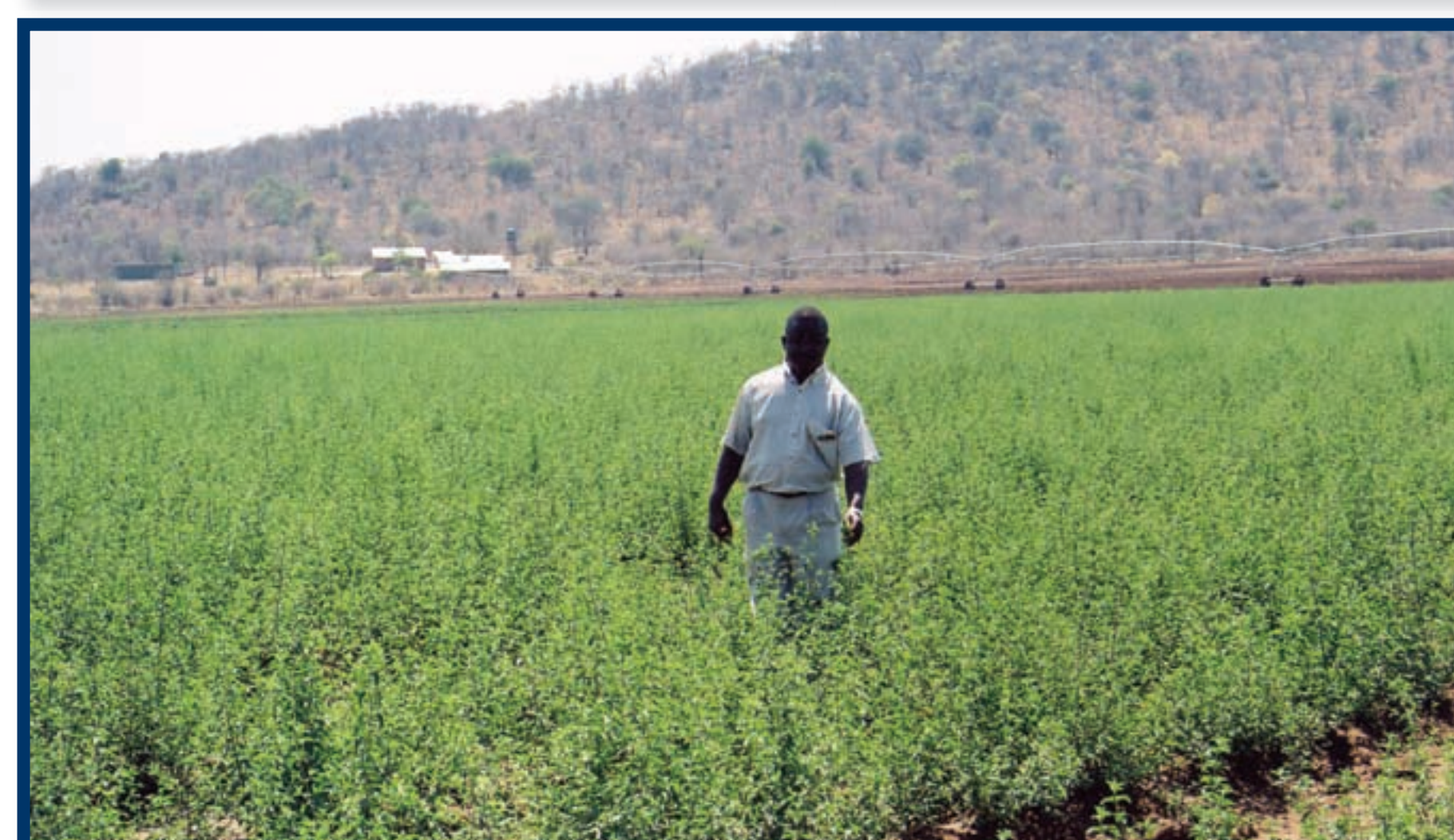
from these cultivated plants was confirmed in mosquito repellency assays. A mosquito repellent patent was filed. [1]

The product, in the form of a candle, was registered for use as a mosquito repellent under Act 36 of the Department of Agriculture. The CSIR registered a company, Ulwazi Botanicals, for the marketing and sale of the mosquito repellent.

The technology for the cultivation and processing of the plants to an essential oil was transferred to community-owned businesses in the Limpopo, pumalanga, Eastern and Western Cape provinces (Figures 5 and 6).



Graph 1: SABS comparison of candles containing *Lippia javanica* vs. citronella oil



Figures 5 & 6: *Lippia javanica* crop and steam distillation factory

The essential oil was formulated into candles and a candle-manufacturing factory was installed at Giyani (Limpopo province, Figures 7 and 8).

The technology transferred to communities was supported by the Department of Science and Technology.



Figure 7: Candle factory at Giyani, Limpopo province.

Modern science fused with indigenous knowledge, has led to a novel mosquito repellent and business and job opportunities for disadvantaged communities.



Figure 8: Candle formulated product

CONCLUSIONS

The commercial production of the essential oil of *Lippia javanica* for the manufacturing of mosquito repellent products has created significant new job opportunities for rural communities. The CSIR is in the process of establishing community-owned essential oil businesses in various provinces in the country. The project demonstrates how the fusion of modern science with ancient knowledge – in this case an agro-processing opportunity – can lead to business and job opportunities for disadvantaged communities, thereby reducing poverty.

REFERENCES

1. CSIR patent, Mosquito repellent, South African Patent No 95/9583, April 1995.