



# A comparative ethnopharmacological analysis of traditional medicine used against respiratory tract diseases in Mauritius



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## ABSTRACT

**Ethnopharmacological relevance:** Despite laudable advances in conventional medicine, respiratory tract diseases (RTD) induced morbidity and mortality continue to inflict a substantial burden on healthcare systems worldwide. Similarly, in the tropical island of Mauritius, 13,320 hospital admissions and 8.2% mortality rates were attributed to RTD solely in the year 2013. Consequently, the therapeutic benefits and relief experienced with traditional medicine (TM) against RTD by the local inhabitants cannot be underestimated. The present study aims to report and quantitatively determine the extent of utilization of plant based therapies and other miscellaneous TM preparations concocted against RTD over the island. Additionally, a similarity index was generated which is indicative of the extent of harmonisation of individual plant species against RTD when the uses mentioned in the study are compared to previous ethnobotanical studies.

**Materials and methods:** Data was compiled using a semi-structured questionnaire via face-to-face interviews with TM users and practitioners ( $n=384$ ). Three quantitative ethnopharmacological indices (the use value (UV), informant consensus factor (ICF), and ethnobotanicity index (EI)) were calculated. We also calculated the similarity ratio, similarity percentage, new uses for each plant species and percentage of new use against RTD to compare primary data collected in the present study.

**Results:** Fifty five plants were documented to be in use against 18 RTD. The most used plant species belonged to the following taxa; Lamiaceae (9%), Fabaceae (7%) and Rutaceae (7%). Thirty two plants recorded in this study have been reported to be used against RTD in previous ethnobotanical studies, of which 22 of these plants have been attributed new uses against RTD based on the results of the present study. The remaining 23 plants species have been recorded for the first time to be used traditionally against RTD. Altogether, 81 different recipes were concocted from the medicinal plants and the most common route of administration was oral intake. Common methods of obtaining medicinal plants were from the wild, cultivation and as imported herbal products. Cough was the most common RTD managed by plant species. The largest proportion of plants were employed against cold. The preference ranking both for UV placed *Curcuma longa* L., *Zingiber officinale* Roscoe, *Citrus × limonia* Osbeck and *Cymbopogon citratus* (DC.) Stapf as the most useful plant species. Only a small proportion of the indigenous plants (7.73%) proved to be useful in TM.

**Conclusion:** This study provides empirical primary ethnopharmacological data on the use of TM to manage and/or treat RTD and can contribute in preserving indigenous knowledge in Mauritius. It is anticipated that these primary data will open new avenues to identify novel drugs that can help to alleviate sufferings.

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**Abbreviations:** CSO, central statistics office; EI, ethnobotanicity index; IPNI, International Plant Name Index; IUCN, International Union for Conservation of Nature; UV, use value; MOHQL, Ministry of Health and Quality of Life; RTD, respiratory tract disorders; TM, traditional medicines; WHO, World Health Organization

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## 1. Introduction

Respiratory tract diseases (RTD) amalgamate a varied proportion of mild to chronic pathological conditions which upset the airways, nasal passages, bronchi and lungs (WHO, 2015). RTD account for up to 4 million cases of premature deaths resulting in 25% of all lethality figures worldwide every year (York et al., 2011) and remains the prominent cause of decease in underdeveloped

nations (York et al., 2011; Ferkol and Schraufnagel, 2014).

A medley of RTD including allergy, asthma, lung cancer, cough, chronic obstructive pulmonary disease (COPD), rhinitis, pneumonia, sinusitis and tuberculosis induce billions of dollars out pocket costs on both prescription and over the counter drugs (OTC) round the globe (Rigat et al., 2013; Lopes, 2014). Besides, the burden on healthcare systems posed by RTD is staggering at an expeditious rate (Ferkol and Schraufnagel, 2014). Accordingly, asthma; a devastating RTD accounts for more than 235 million sufferers and 180,000 deaths every year (Ferkol and Schraufnagel, 2014). Additionally, 3.5 million premature mortality results from chronic RTD including chronic obstructive pulmonary disease (COPD) and lung cancer (Yach et al., 2004; Ferkol and Schraufnagel, 2014). Due to this upsurge of mortality and morbidity from RTD, the World Health Organisation (WHO) foresees COPD to become the leading cause of death worldwide by 2030 (WHO, 2014a).

Interestingly, panoply of conventional drugs have been developed that can offer a wide array of therapeutic benefits to RTD patients (Zanasi et al., 2014). Patients suffering from asthma have recourse to an inhaled corticosteroid and employ a bronchodilator to mitigate the disease. For cough management an antitussive or a protussive agent is administered for symptomatic relief while for COPD the use of bronchodilators remains the mainstay (Zanasi et al., 2014; Bourdet and Williams, 2014; Kelly and Sorkness, 2014).

Nonetheless, the use of conventional drugs for RTD management have been associated with a plethora of side and/or lethal effects such as death, altered consciousness and arrhythmias (Lopes, 2014). Similarly, failure of asthma therapy remains a significant risk for morbidity and reduced quality of life. In addition, evidence exists that patients having recourse to conventional medications for allergy management are not satisfactorily relieved despite adhering completely to their drug regimens (Sibbrit et al., 2014).

Given this need to seek relief, a major resurgence in traditional medicine (TM) to benefit once again from nature's invigorating powers has been witnessed in recent years (Maregesi et al., 2007; Fomogne-Fodjo et al., 2014; Kayani et al., 2014). Indeed, a panoply of ethnopharmacological studies tend to show that RTD sufferers still rely to a great extent on phytomedicines to assuage their suffering (Alzweiri et al., 2011; Tangjanga et al., 2011; Sadeghi et al., 2014; Fomogne-Fodjo et al., 2014; Kayani et al., 2014).

Interestingly, the local inhabitants of Mauritius hold an inherent use of TM emanating from their ancestors for decades (Sussman, 1980; Gurib-Fakim and Brendler, 2004; Suroowan and Mahomoodally, 2013). Additionally, the island is home to a vast array of plant species that are employed to a significant extent in TM (Sreekeesoon and Mahomoodally, 2014; Mootosamy and Mahomoodally, 2014).

Notoriously, RTD prevail as a consequent cause of morbidity and mortality over the island as depicted by the 2013 health report; 13,320 hospital admissions were due to upper respiratory tract infections, bronchitis, pneumonia, COPD, emphysema and asthma combined (Ministry of Health and Quality of Life (MOHQL), 2013). Concurrently, mortality rates from the year 2012 to 2013 resulting from RTD have increased by 0.4% rising from 8.2% to 8.6% (MOHQL, 2013).

Given the burden that RTD pose over the island and the fact that no single study has assessed the use of TM, particularly herbal remedies for RTD, it is relevant to bring into the scientific limelight the multiplicity of TM concocted by the indigenous people in defiance to the disease. The present study aims to report and quantitatively determine the extent of utilization of plant based preparations as well as cultural healing practices and other miscellaneous TM preparations concocted against RTD over the island. Additionally, a similarity index was generated which is indicative of the extent of harmonisation of individual plant species against RTD when the uses mentioned in the study are compared to previous ethnobotanical studies. It is anticipated that the present study will help to safeguard primary data that could generate a multiplicity of avenues with motives of developing better alternative therapeutic regimens as well as actuating the goal of discovering novel drug agents that can spark enhanced management and treatment of RTD.

## 2. Materials and methods

### 2.1. Study area

The tropical island of Mauritius forms part of the African continent and lies in the southwest Indian Ocean bearing coordinates with latitude and longitude 20.1625°S, 58.2903°E covering a total land area of 1864.8 km<sup>2</sup> (Fig. 1). The climate is dominated by 2 seasons; summer lasts from November to April and winter extends from June to September (Sreekeesoon and Mahomoodally, 2014).

The people of Mauritius are multi-ethnic and multi-cultural. The various ethnic groups that make up the whole of the populace include; Indo-Mauritian 68%, Creole 27%, Sino-Mauritian 3% and Franco-Mauritian 2% (Anonymous, 2014). Mauritians are multi-lingual and commonly spoken languages include; Mauritian creole, English, French, Bhojpuri and other Asian dialects.

As at 01st July 2014 the population of the island stood at 1,219,265 individuals with 603,473 males and 615,792 females (Central Statistics Office (CSO), 2014). Interestingly, due to its volcanic origin Mauritius has a diverse flora and has been

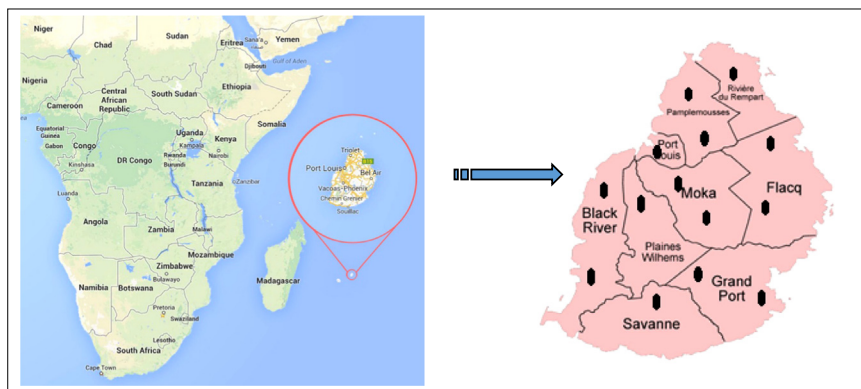


Fig. 1. (Political-Districts Map of Mauritius, 2015) Location map of Mauritius and study areas represented by black dots (Adapted from Mauritius attractions, 2013 and Pearl Beach Hotel: Climate and Map of Mauritius, 2014).

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