Ethnobotanical survey of biopesticides and other medicinal plants traditionally used in Meru central district of Kenya

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A B S T R A C T

Ethnopharmacological relevance: The purpose of this study was to carry out a survey and document plants used in Meru-central district by traditional healers with emphasis on those used as biopesticides.
Materials and methods: The study was carried out at Igane and Gatuune sub-locations, Abothuguchi East division of Meru-Central district, Kenya. The data collection involving 23 traditional healers was done using semi-structured questionnaire, focused group discussion and transect walks. Plants samples were collected and botanically identified at the herbarium of the Department of Land Resource Management and Agriculture Technology in the University of Nairobi.
Results: The results of the ethnobotanical survey revealed that herbalists belonged to both gender with the majority being male (82.6%) and female (17.4%). Their ages ranged from 28 to 82 years. Seventy (70) plant species, belonging to 35 families, were identified as being used as biopesticides and also as medicinal. The families encountered were Asteraceae (10%), Euphorbiaceae (8.6%), Lamiaceae (8.6%), Fabaceae(8.6%), Caesalpiniaceae (5.7%), Rubiaceae (5.7%), Liliaceae (4.3%), Apocynaceae (2.9%), Flacourtiaceae (2.9%), Verbenaceae (2.9%) and the rest of the 24 families had 1.4% each. These medicinal plants were used to treat and manage a wide range of diseases and conditions including parasitic, microbial, helminthosis, protozoa, cuts and wounds, fractures, dental, arthritis, allergic, snake bites, reproductive as well as metabolic. Among the plants used, shrubs were the commonest at 42.8%; trees were 32.9%, while herbs and liana were at 22.9% and 1.4%, respectively. Majority of the respondents used leaves, roots and bark to make their herbal preparations with only a few using seeds, flowers, whole plant, flower sap and pods. The plants that were cited by the respondents to be used as biopesticides were *Prectranthus barbatus* Andr. (47.8%), *Tephrosia vogelii* Hookf. (39.1%), *Ocimum gratissimum* L (34.7%), *Vernonia lasiopus* O.Hoffm. (8.7%), *Cascabella thevetia*(L.)Lippold (4.3%) and *Oncoba routledgei* Sprague (4.3%).
Conclusion: Meru central district is rich in biodiversity of biopesticides and other medicinal plants and there is need for further pharmacological studies to validate their use as potential drugs for pests and disease control.

1. Introduction

It is estimated by the World Health Organization (WHO) that around 80% of the population in Africa use traditional medicines and about 85% of traditional medicine involves the use of plant extracts (Farnsworth and Soejarto, 1985; Hack-Seang, 2005). Similarly in developed countries 70% to 80% of the population has used some form of alternative or complementary medicine (World Health Organization (WHO), 2008). There is a refocusing interest on traditional medicine due to global demand for more affordable therapeutics and concern for side effects (Singh, 2007). Plants have been used in traditional medicine for several thousand years

(Abu-Rabia, 2005). The higher plants who mostly originate from Africa, Asia and South America are estimated to contribute 33% of drugs produced in developed countries (Rogo, 2004).

Medicinal plants are the major raw materials for both traditional and conventional medicine. These plants are also used as source of nutrition (soup and tonics in children milk), appetizers (*Acacia nilotica*), and energy boosters (*Catha edulis*) and for aroma in teas (*Ocimum* spps) (Maundu et al., 2004). They are harvested for local use and also an ingredient of herbal medicine for use in pharmaceutical industry both locally and internationally. The traditional medical knowledge of medicinal plants and their utilization by indigenous cultures are vital for conservation of cultural traditions and biodiversity, community healthcare and also in the current drug development and in the near future (Pei, 2001).

Many communities in Kenya rely on a wide range of indigenous practices to manage human and animal diseases and conditions (Gathuma et al., 2004; Githiori, 2004; Kokwaro, 1993; Miaron et al.,

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2004). Kenya is endowed with diverse range of plants with a number of them being used by indigenous people to make infusions, decoctions and other traditional dosage forms to manage various ailments. Traditionally this knowledge is passed on through generations by word of mouth. There is therefore, an urgent need for ethnobotanical surveys among the native people in order to document the wealth of knowledge of folk medicine before it is lost by erosive effects of modernization. Several authors have documented medicinal plants used by various communities in Kenya (Kokwaro, 1993; Kaendi, 1997; Miaron et al., 2004; Bussmann, 2006; Kareru et al., 2007; Nguta et al., 2010; Muthee et al., 2011; Wambugu et al., 2011).

Recent surveys conducted using semi-structured questionnaires, transect walks, oral interviews and focus group discussions, documented 80 medicinal plants used for different ailments belonging to 70 genera in Loitoktok district of Kenya (Muthee et al., 2011). Similar surveys conducted in Msambweni district of Kenya reported 40 species of plants used as antimalarial belonging to 35 genera and 24 families (Nguta et al., 2010). In the treatment of chronic joint pains due to osteoarthritis in Machakos and Makueni district, it was reported that herbalists used 37 plant species belonging to 32 genera and 23 families (Wambugu et al., 2011).

Pest control is a major concern for human, livestock and plant health and productivity. A screening for pesticidal activity of plant extracts with some known medicinal attributes could lead to the discovery of novel agents for pest control (Sertkaya et al., 2009). Globally there has been search for alternatives to chemical pesticides with the aim of testing the use and efficacy of natural products for pest control and crop protection (Balasubramanian et al., 1997, 2008). Biopesticides are cost effective, safer, readily available, biodegradable and therefore more environment-friendly and will offer alternative to conventional pesticides (Ranasing, 2007; Gupta and Dikshit, 2010).

Several studies in Kenya and other countries have documented the efficacy of plant biopesticides. The larvacidal activities of five Meliaceae plants species have been documented to act against *Anopheles gambiae* (Ndung'u et al., 2004). Crude methanol extracts of *Turraea wakefieldii* and *Turraea floribunda* were found to be more potent than Azadiractin against *Anopheles gambiae* (Ndung'u et al., 2004). The larvacidal effects of Neem extracts have been reported by Vatandoost and Vaziri (2004).The acaricidal effects of some plants and the traditional knowledge in tick control have also been documented (Wanzala et al., 2006). Other plants reported to act as biopesticides include; *Nicotiana rustica* as an insecticide (Krieger, 2001), *Ryania speciosa* against European stockborer (Krieger, 2001), *Zingiber officinale* L. against *Biomphalaria glabrata* and *Schistosoma mansoni* (Adewunmi et al., 1990), *Tagetes species*, *Crotalaria spectabilis*, *Ricinus communis*, *Azadirachta indica* against nematodes (Sharma and Trivedi, 2002; Germani and Plenchete, 2004; Wang et al., 2007), *Tephrosia virginiana*, *Lonchocarpus utilis*, *Lonchocarpus urucu*, *Derris elliptica*, *Verbascum thapsus* producing rotenone and therefore potentially used as rodenticide (Fang and Casida, 1999).

Meru County is among the regions in Kenya where traditional knowledge about the use of plants in the environment has relatively remained fairly intact. In this region of Kenya, there is scanty information and documentation of the knowledge on traditional medicine. The knowledge is only available to the members of the community especially the older generation. The purpose of the current study was to document the traditional uses of medicinal plants among the people of Meru Central region especially those used as biopesticides to form a basis for developing biopesticides for the control of animal and plant pests.

2. Materials and methods

2.1. Study area

Meru Central District is one of the districts in Meru County and lies to the east of Mount Kenya whose peak cuts through the southwest border of the district. It borders other districts in Laikipia, Meru, Tharaka Nithi, Isiolo, Kirinyaga and Nyeri counties.
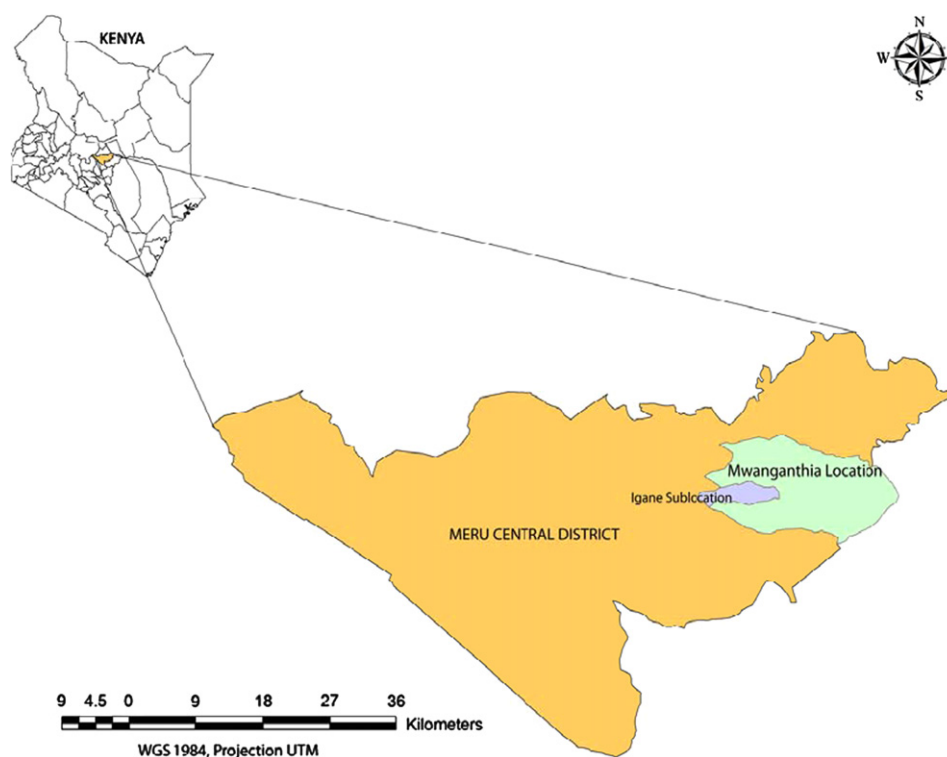

Fig. 1. Map of Kenya illustrating the geographical location of Meru Central district.