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Use of Ethnobotanical Data in the Search for and Identification of Potential Drug Plants.

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Traditional medicine has utilized plants to palliate, cure and/or prevent diseases in both humans and animals. The acquisition of knowledge has been through trial and error, and observation. Today, the enhanced search for botanical drugs throughout the world has increased the need for accurate means of identifying plants with possible pharmacological and biological activity. A number of methodologies have been used in selecting plants likely to possess pharmacological properties, but many have recorded low success rates. Data reported in this paper reveal that the accuracy of identification of these herbal drugs for pertinent ailments using ethnobotanical data is almost as accurate as techniques applied in modern medical practice. This paper discusses the value of ethno-botanical data in the preliminary search for potential drug plants

Key words: *Ocimum, Plectranthus,* ethnobotany, medicinal plants.

INTRODUCTION

Plants have for many centuries been the primary source of medicines. It is estimated that about 70-80 % of the world's population depends on traditional medicine from medicinal plants [1]. Although there are about 120 plant-based drugs on the global market [2], it is predicted that 'about 328 drugs in the rain forests await discovery' [3].

Today there is a growing concern that the rate of study of medicinal plants is lagging behind the rate of loss of medicinal plant biodiversity and the associated indigenous knowledge. In the tropics, where about half of the world's flowering plants are found and where more medicinal plants are expected to exist, only 2 % of plant species have been analyzed for their medicinal properties [4].

The quick identification of plant species with pharmaceutical potential remains the biggest problem to-date. Various approaches like random selection, taxonomic and chemical relationships among plants, have yielded low success rates and proved to be expensive [2,5]. The most successful approach has been plant selection through ethnobotany, which is a multi-disciplinary study of relationships between plants and people. This view is corroborated by the fact that out of the 120 known plant derived drugs on the market, 74 % of them were already cited in medicinal folkloric data [2,6].

The present study describes the extent to which ethnobotanical data can be used as a positive indicator of pharmaceutical potential using the case of *Ocimum* spp and *Plectranthus* spp (Labiatae). It also shows the importance of synthesized ethnobotanical data in development planning for the utilization and conservation of plant resources and the maintenance of species diversity.

MATERIALS AND METHODS

Ethnobotanical information was collated through examination of the herbarium specimens at both the East Africa and Nairobi University herbaria and literature review of previous projects in the Rift Valley, Central, Eastern, Western and Nyanza provinces (zones K3, 4, 5, 6 and 7 of the Flora of Tropical East Africa, FTEA).

RESULTS

Seventeen different species of *Ocimum* and *Plectranthus* were recorded as being used in the treatment and alleviation of sixteen categories of diseases or health related conditions in both human and animals (Figures 1 and 2). The disease categories for which the

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largest numbers of species were utilized from the two genera were gastrointestinal (90 % of all species), general pain (52 %), respiratory (41 %), fever/malaria and skin complaints (35 %).

The most sought after species are *O. gratissimum* followed by *O. kilimandscharicum, O. basilicum* and *P. barbatus* (Figure 2). All the medicinal *Ocimum* species investigated are utilized in the treatment of respiratory and/or gastro-intestinal problems while the majority of *Plectranthus* species are used in the treatment of gastro-intestinal problems, skin problems and as painkillers (Figure 2). Other than *P. barbatus*, the other frequently used *Plectranthus* species are *P. caninus, P. montanus* (syn. *P. cylindraceus*) and *P. sylvestris.*

Ocimum gratissimum and *P. barbatus* are the most popularly used medicinal species in the treatment of gastrointestinal conditions (Figures 2 and 3). The next most frequently treated category is 'general pain', with *Plectranthus* species being most popularly used. The respiratory and fever/malaria conditions are also treated using a high number of *Ocimum* species and rank third. The fourth most frequently treated disease category is skin problems where an equal number of species from both genera are used, particularly *Plectranthus barbatus, O. kilimandscharicum and P. montanus* (figures 1 and 2). The remaining medical conditions are sensory conditions like ear and eye disorders, dental disorders and poisoning.

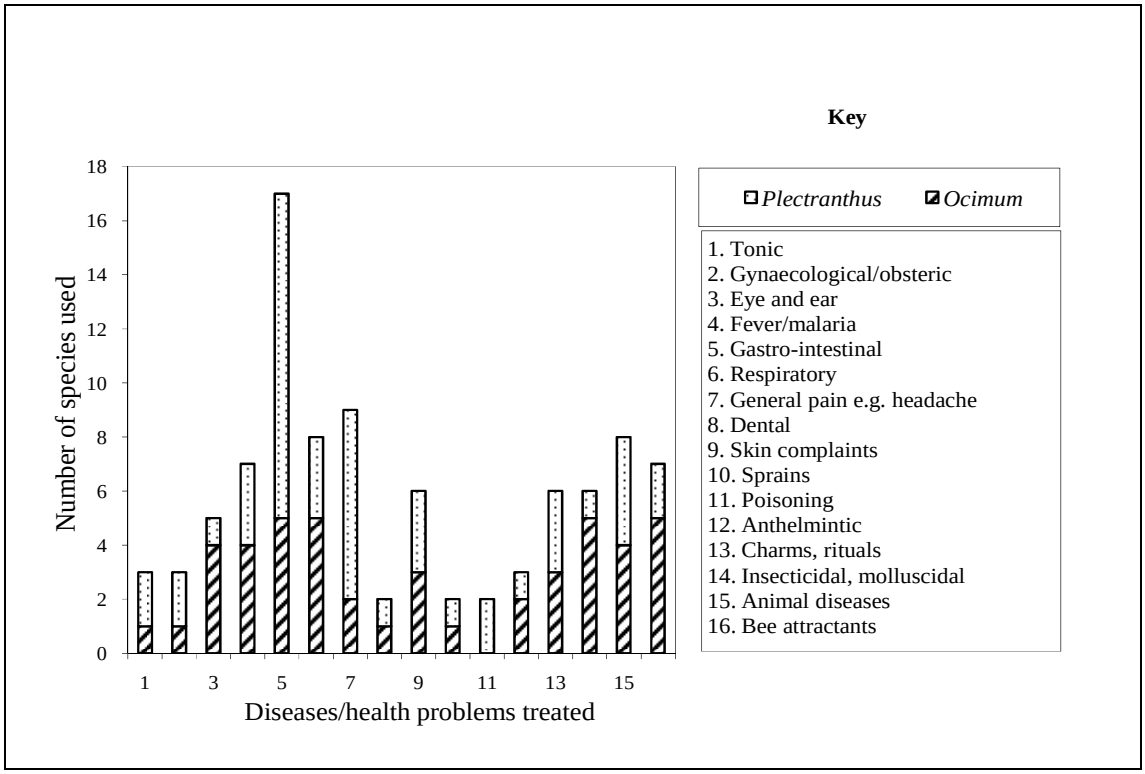

Figure 1: Number of *Ocimum* and *Plectranthus* species used in various forms of diseases or other health-related problems in Kenya

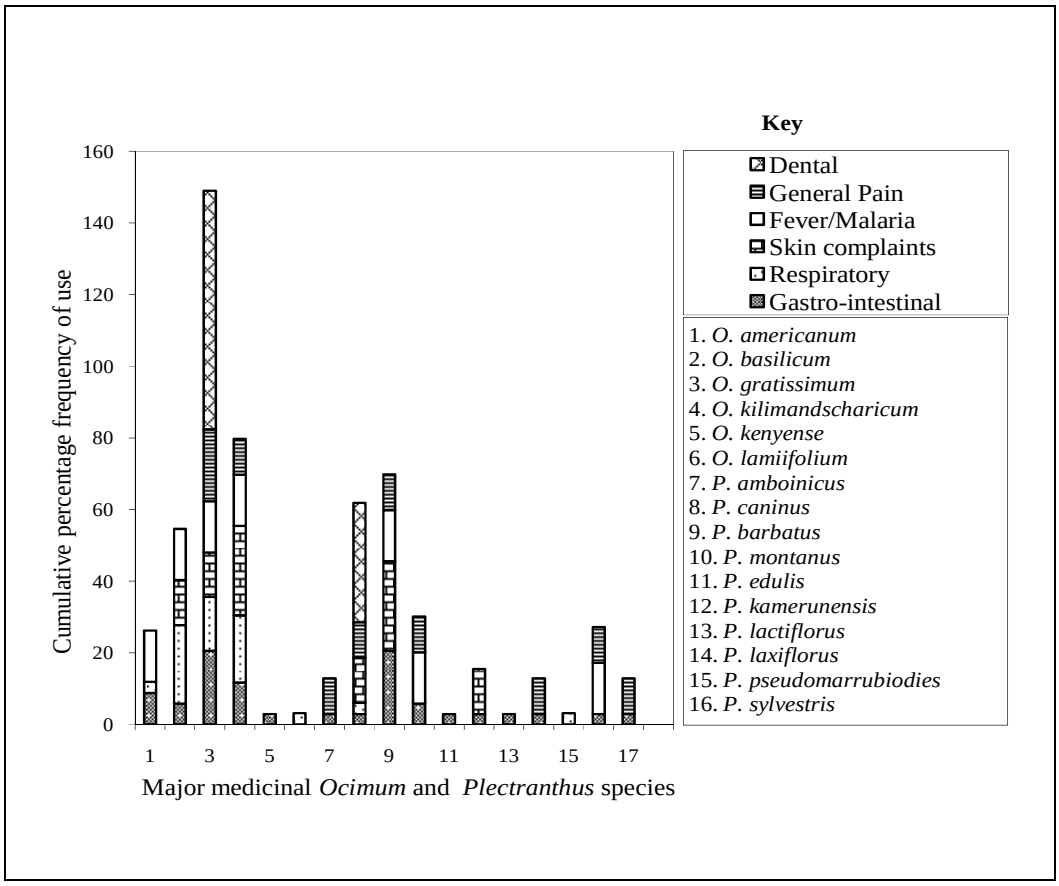

Figure 2: Percentage frequency of use of *Ocimum* and *Plectranthus* species against major diseases in Kenya.

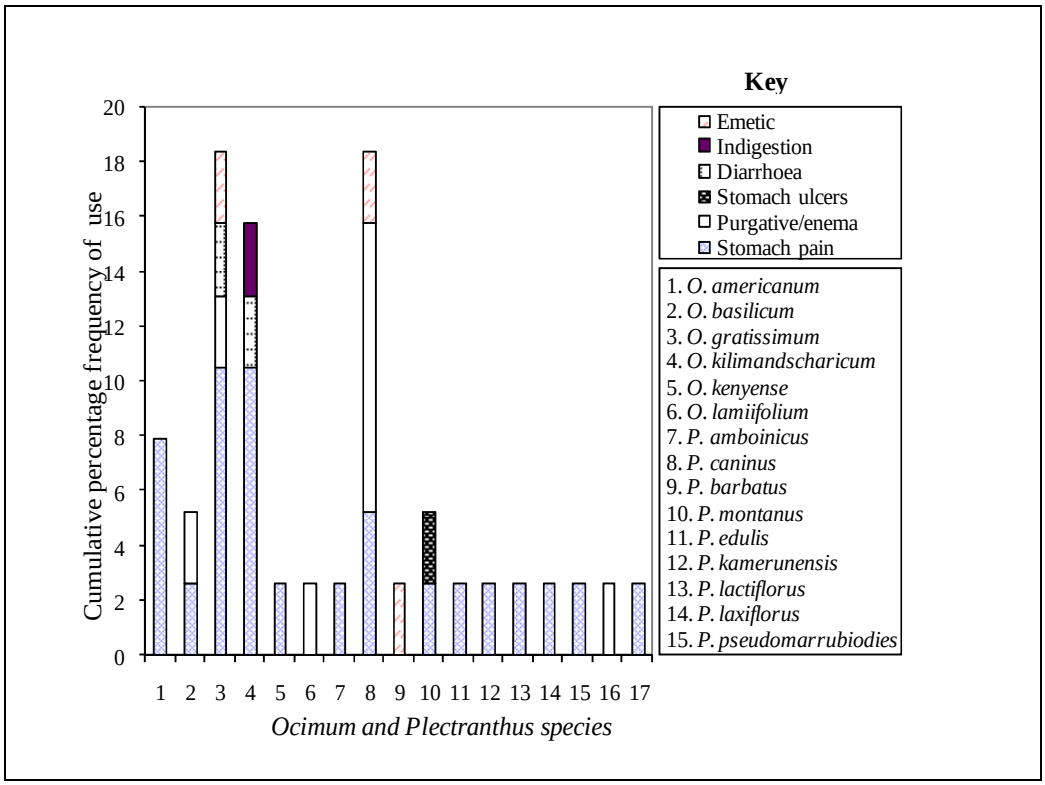

Figure 3: Percentage frequency of use of *Ocimum* and *Plectranthus* species for the treatment of gastro-intestinal ailments.

DISCUSSION

The data obtained in this study suggests that ethnobotanical data can be used as a positive indicator of pharmaceutical potential of a medicinal plant species. The ethnomedicinal observation of *Ocimum* and *Plectranthus* species used in this study are supported by scientifically validated presence of known antimicrobial compounds. The bioactive compounds in *Ocimum gratissimum* include thymol and other essential oils which have been shown to be effective against diarrhoea [7-11]. Methyl carvicol found in *O. basilicum* is effective against Gram-positive and Gram-negative bacteria [12]. Linolenic acid from *O. basilicum* and *O. americanum* is an anti-inflammatory compound [13] and eugenol from *O. gratissimum* is a dental analgesic [14]. Several bioactivity tests on the efficacy of these plants are available including tests of *O. basilicum* extracts against microorganisms involved in stomach ailments [15]. *Ocimum gratissimum* has the ability to increase the number of nucleated cells in the spleen, liver and peripheral blood in both infected and uninfected mice and has demonstrated anti-malarial efficacy [16]. In other studies, *O. gratissimum* oil was found to inhibit dermatophyte strains [17]. The use of these *Ocimum* species in the treatment of gastrointestinal, respiratory and skin ailments as well as fever/malaria suggests that *Ocimum* species may be containing broad-spectrum antimicrobial, anti-inflammatory, analgesic and expectorant substances.

Plectranthus species have been utilized in the treatment of gastrointestinal, pain/fever and skin conditions (Figures 1-3). This high frequency of use in the treatment of a wide range of diseases is indicative of the possibility that they possess broad spectrum antimicrobial activity as well as compounds with analgesic and anti-inflammatory activity. *Plectranthus barbatus* is the most popular medicinal *Plectranthus* species. Scientific validation to confirm the popular use of *P. barbatus* in traditional medicine has shown that the species contains a large number of mono- and sesquiterpenoids such as humulene and β-caryophyllene which possess antimicrobial activity [18]. Antimicrobial compounds also occur in several other medicinal *Plectranthus* species. These include myrcene and thymol in *P. amboinicus* [19], menthone and thymol in *P. montanus* [20] and germacrene D in *P. sylvestris* [21].

Another group of compounds known to have antimicrobial activity and found in *Plectranthus* are the diterpenoids. The abietane diterpenoids are the most diverse. Coleonol C, coleon F, cariocal and plectrin are found in *P. barbatus* while coleon M, N, O, P, Q and R occur in *P. caninus* [22-23]. The antimicrobial activity of these compounds explains why *Plectranthus* spp. are commonly utilized in the treatment of microbial infections, fever and inflammation. Forskolin found in *P. barbatus* is known to stimulate gastric secretions [24-26].

Plectranthus barbatus is the most popular species used in the treatment of respiratory ailments. This activity may be attributed to the diverse terpenoids compounds such as forskolin which has bronchidilalor properties [27]. Recently, products of *P. barbatus* have been used in slimming treatments probably due to the capacity of forskolin to break down fat in the liver [28-29].

The genus *Plectranthus* is the most frequently used in the treatment of skin complaints. The conditions cited in this study were largely unspecified but are most likely to be microbial and allergic thus suggesting the presence of antimicrobial and anti-inflammatory compounds. Known anti-inflammatory flavonoids have been isolated from *Plectranthus* species [30-31]. Further investigations need to be conducted on these compounds as potential drug sources.

CONCLUSION

The high frequency of use of *Ocimum* and *Plectranthus* species in the treatment of gastrointestinal, respiratory and skin ailments suggests that these species could be a source of novel antimicrobial, anthelmintic and purgative drugs as well as anti-inflammatory and analgesic compounds. The data obtained in this study shows that the more often a plant is used traditionally to treat a particular ailment, the higher the chances that it will contain biologically active components. Thus ethnobotanical data of plant species can be used as a positive indicator of their medicinal potential.

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