

Physical Evaluation of Selected Eight Medicinal Plants Used for the Treatment of Diabetes, Malaria and Pneumonia in Kisii Region, Southwest Kenya

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Abstract: Medicinal herbs constitute effective sources of natural products consumed as phytomedicines. For instance leaf decoctions of *Carissa spinarum*, *Urtica dioica*, *Warburgia ugandensis*, *Senna didymobotrya*, *Physalis peruviana*, *Bidens pilosa*, *Leonotis nepetifolia* and *Toddalia asiatica*, are used for the treatment of diabetes, malaria and pneumonia among other diseases in Kisii region, southwest Kenya. However, the pH levels of aqueous extracts of these herbs have not been adequately described yet these would have implications on the body's biological system. Consequently, a study was carried out on these herbs in the year 2011 to 2012. The objective was to determine pH levels of the aqueous extracts of the herbs. In the study, leaf samples of the eight selected plants were obtained from Kisii region, washed, air-dried and milled. A portion of the powdered leaves was dissolved in distilled water to obtain aqueous extract. The pH levels of the aqueous extracts of the samples were measured using a pH meter. Results showed that the pH levels of *Carissa spinarum*, *Warburgia ugandensis*, *Senna didymobotrya*, *Physalis peruviana*, *Bidens pilosa*, *Leonotis nepetifolia* and *Toddalia asiatica* are acidic with pH ranged from 5.27 to 5.99. The exception was *Urtica dioica* which had basic pH of 7.5. It was concluded that the acidity and basicity of the eight herbs evaluated is within the permitted pH range of 4.0 to 7.5.

Key words: Medicinal Herbs • pH Range • Evaluation

INTRODUCTION

Plants consist of a number of biologically active ingredients therefore they are used for the treatment of a large number of infectious diseases [1-6]. Medicinal plants are those herbs which contain substances used for the treatment or prevention of diseases or infections and other health disorders in human body [7]. They are herbs whose chemical contents have some physiological effect on the body chemistry. The medicinal value of herbs is due to substances found in the plant tissues that produce a definite physiological action on the human body [7]. Herb species have been identified that they contain nutrients displaying new beneficial medicinal or therapeutic properties [8]. The most important of these substances found in the medicinal herbs are the alkaloids,

tannins, saponins, steroids, terpenoids and flavonoids [9]. There has been a significant increase in the use of herbal medicine due to their minimal side effects, availability and acceptability to the majority of the population, so medicinal herbs play an important and vital role in traditional medicine and are widely consumed as home remedies [10]. The medicinal herbs have the characteristics of all being extracted with boiling water during the decoction process [11]. Herbal medicine, also called botanical medicine or phytomedicine, refers to the use of any plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes [12]. In the Kisii region, the leave decoction of *Carissa spinarum*, *Urtica dioica*, *Warburgia ugandensis*, *Senna didymobotrya*, *Physalis peruviana*, *Bidens pilosa*, *Leonotis nepetifolia* and *Toddalia asiatica*, are used for the treatment of diabetes,

malaria and pneumonia [13]. Herbs may be contaminated easily during growing and processing. So it is important to have a good quality control for herbal medicines in order to protect consumers from contamination [14]. The pH of the herbs is one of the physical parameters which might determine the good quality control for medicinal herbs. The pH value of an aqueous liquid may be defined as the common-logarithm of the hydrogen ion concentration expressed in grams. Potentiometrically pH value is determined by a glass electrode and a suitable pH meter [15]. Acids and bases perform specific functions to balance the pH levels in the body. Therefore acid and base control is an important part of biological homeostasis (balance) in humans. Herbs have been used for medicinal purposes long before recorded history. Indigenous cultures (African and Native American) used herbs in their healing rituals, while others developed traditional medical systems (Ayurveda and Traditional Chinese Medicine) in which herbal therapies were used systematically [15].

The objective of the study was to determine pH levels of the aqueous extracts of the selected herbs used for the treatment of diabetes, malaria and pneumonia in Kisii region, Southwest Kenya.

MATERIAL AND METHODS

Plant Collection: In this study the leaves of the *Carissa spinarum*, *Urtica dioica*, *Warburgia ugandensis*, *Senna didymobotrya*, *Physalis peruviana*, *Bidens pilosa*, *Leonotis nepetifolia* and *Toddalia asiatica* were collected from Kisii region, southwest Kenya. The verification of the herbal species was done by the Botanist; Egerton University. The leaves of the authenticated herbal plants were then collected from their site in Kisii region and air-dried for twelve weeks to obtain constant weight. The dried sample was cut into smaller pieces and then ground into fine particles with a grinder at the Department of Food Science and Technology, Faculty of Science, Jomo Kenyatta University of Agriculture and Technology. The powdered sample was bagged in black plastic bags and stored in an air-tight container for further work.

Determination of pH Levels

Sample Preparation: In this study 1.0 g of powdered herbal leaf of each eight selected herbs was measured by an electrical balance and then transferred into different 25 ml conical flask and 25 ml of distilled water was added and heated on hot plate to boiling and

left to cool down. The aqueous herbal extracts were filtered into 25 ml volumetric flask and filled by distilled water to the mark.

Physical Analysis: The pH value for the eight herbs was determined by using a calibrated pH meter (Hanna, HI8519N) according to Hegazy [16].

Data Collection: The pH levels of the selected eight herbs were measured by PH-meter. The PH obtained was compared with that of the pure solvent distilled water. The PH was expressed as the mean of three replicates of the herbal extracts.

Data Analysis: The null hypothesis being tested is that there is no significant PH level displayed by the aqueous extracts of the selected traditional herbs used in Kisii region to treat diabetes, malaria and pneumonia diseases. Results obtained in this study were expressed as mean log $[H^+] \pm S.D$ of three replicates. The mean and the S.D of each herbal extract were used to compute the calculated t-value. Differences between the critical t-value and calculated t-values of the herbal extracts on pH were computed. For all the eight herbal species, the null hypothesis was retained because the calculated t-value was less than the critical t-value at $p \leq 0.05$.

RESULTS AND DISCUSSION

Results obtained indicate that a higher pH levels of the aqueous herbal leaf extract was recorded in *Urtica dioica* 7.50, followed by *Warburgia ugandensis* (leaves) 6.03, *Bidens Pilosa* 5.99, *Leonotis nepetifolia* 5.94, *Carissa spinarum* 5.90, *Warburgia ugandensis* (bark) 5.79, *Physalis peruviana* 5.67, *Toddalia asiatica* 5.64 and *Senna didymobotrya* 5.27 (Table 1). However, the lowest pH levels from the aqueous herbal leaf extracts was recorded 5.27 in the *Senna didymobotrya* as per researcher explanations Vaikosen and Alade [17].

Table 1: Shows the pH levels of herbs (mean log $[H^+] \pm S.D$)

Plant samples	pH
<i>Carissa spinarum</i>	5.90±0
<i>Urtica dioica</i>	7.50±0
<i>Warburgia ugandensis</i> (leaves)	6.03±0.0
<i>Warburgia ugandensis</i> (bark)	5.79±0
<i>Senna didymobotrya</i>	5.27±0
<i>Physalis peruviana</i>	5.67±0
<i>Bidens pilosa</i>	5.99±0
<i>Leonotis nepetifolia</i>	5.94±0
<i>Toddalia asiatica</i>	5.64±0
Water	7.00±0

CONCLUSIONS

The pH levels of *Carissa spinarum*, *Warburgia ugandensis*, *Senna didymobotrya*, *Physalis peruviana*, *Bidens pilosa*, *Leonotis nepetifolia* and *Toddalia asiatica* are acidic with pH ranged from 5.27 to 5.99 while *Urtica dioica* has a basic pH of 7.5. The acceptable pH levels set for medicinal plants in other countries range from 4.0 to 7.5 [17]. Therefore, the acidity and basicity of the selected eight herbs used as phytomedicines for the treatment of diabetes, malaria and pneumonia among other diseases in Kisii region, southwest Kenya is in the acceptable range of 4.0 to 7.5.

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