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## Nutritive potential of a polyherbal preparation from some selected Ghanaian Herbs

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### ABSTRACT

'Abemudro' is a polyherbal formulation that is used traditionally in Ghana for recuperation and rejuvenation during pregnancy, lactation and convalescence. The purpose of this study was essentially to determine the nutritive properties of *Nephrolepis undulata*, *Secamone afzelii*, *Dracaena mannii*, *Lantana camara*, *Costus afer* and *Solanum torvum* used in this polyherbal formulation in order to validate its traditional use. Mineral content, vitamin analysis and protein contents of selected plants were determined according to standard methods. *Solanum torvum* was found to be a rich source of vital minerals; containing relatively the highest amount of most of the minerals analysed. This includes iron (0.34%), magnesium (51.17%), zinc (1.32%), sodium (5.55%) and potassium (49.62%). *Nephrolepis undulata* was found to be the only herbal component in the combination that contained vitamin A. Vitamin B-12 was found in *Solanum torvum* and *Nephrolepis undulata*. Vitamin C was present in all the herbal components except *Nephrolepis undulata*. In the protein analysis, *Solanum torvum* had the highest protein content (11.38%) with *Dracaena mannii* having the least amount of protein (1.44% w/w). Thus the constituent plants of the Ghanaian polyherbal formulation 'Abemudro', contain essential vitamins, minerals and proteins for maintenance of well-being, wound healing and prevention of anaemia. The folkloric technique of combining these herbs is justified as the individual plants, used alone, would not be able to provide the adequate amounts of nutrients.

**Key words:** Anaemia, Ghanaian herbs, Nutrients, Lactation, Polyherbal formulation, Pregnancy

### INTRODUCTION

Malnutrition continues to be a significant public health and developmental concern around the globe. Pregnant, lactating women, infants and young children are among the most nutritionally vulnerable groups [1]. Their nutritional frailty emanates from their higher nutrient requirements, which are often not met [2]. Pregnancy and lactation place demands on women. In sub-Saharan Africa, the economic conditions place an extra burden on the nutritional status of women and children [3]. The frequent and short reproductive cycles often leave the African woman moving from one pregnancy to the next without adequately replenishing body nutrient stores [4]. Some expectant mothers lose their babies with some babies born preterm as a result of poor nutritional habits. Lactating mothers might not be able to produce the required nutrients for infants' daily needs thus retarding their growth and development. These factors predispose them to morbidity and mortality.

In most indigenous Africa societies, a number of herbs and vegetables are incorporated in the diet of pregnant and lactating mothers for maintenance of well-being, prevention of anaemia and stimulation of milk production. These green leafy vegetables form an indispensable component of the diet and are good sources of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron, and phosphorous. They also contain phytochemicals which are nutritionally and medicinally useful [5-6]. The abandonment of traditional diets filled with fruits, vegetables, and whole grains in favor of diets with processed foods and simple carbohydrates is taking hold even among the middle class of most developing countries and has added to the reign of malnutrition in Sub-Saharan Africa. This may be attributed to lack of information on the nutritional composition of these indigenous traditional foods, which have limited their use. Therefore, the purpose of this study was to investigate the nutritive values of some herbs used in pregnancy and lactation, which are readily available and underutilized, in order to optimize their use.

‘Abemuduro’, literally meaning ‘palm-drug’, is a collection of some herbs and vegetables purported to be highly nutritious. It has great nutritional support in pregnancy, breastfeeding as well as in convalescence, forming a major part of diet given to individuals in these periods [7]. Some functions of this poly herbal blend include postpartum anti-inflammatory effects, wound-healing of the perineum, antipyretic, fibrinolytic and analgesic effects [8]. There are vast array of plants (herbs) employed in this poly herbal blend. Some selected components of this polyherbal formulation are given in Table 1. For this research, only six of these herbs, *Nephrolepis undulata*, *Secamone afzelii*, *Dracaena mannii*, *Lantana camara*, *Costus afer* and *Solanum torvum*, were investigated due to their availability and frequency of use. There is the need to investigate the nutritive value of these plants as they could be viable and cheaper alternatives to costly conventional haematinics and nutritional supplements in a continent plagued with poverty and malnutrition.

## MATERIALS AND METHODS

### Collection and processing of plant samples

The plant samples, *Nephrolepis undulata*, *Secamone afzelii*, *Dracaena mannii*, *Lantana camara*, *Costus afer* and *Solanum torvum*, were sourced from Nkawkaw, in the eastern region of Ghana as well as the Kumasi Central Market and authenticated by Dr. George Henry Sam of the Department of Herbal Medicine, Faculty of Pharmacy (KNUST) where voucher specimens have been deposited in the herbarium section. The fresh samples were chopped and blended with 70% ethanol. It was then macerated for 48 hours, filtered, concentrated and evaporated to dryness. The crude extracts were transferred into appropriately labeled airtight sample tubes.

Table 1. Selected herbal components of 'Abemuduro'

Botanical name	Family	Local name	Part(s) used	Specific function
<i>Nephrolepis undulata</i>	Oleandraceae	'Aya'	Shoot	Pregnancy booster
<i>Persea americana</i>	Lauraceae	'paya'	Leaves	Antimalarial, antihypertensive
<i>Ocimum gratissimum</i>	Lamiaceae	'Nunum'	Leaves	Anti helminthic, anti-microbial
<i>Tetrapleura tetraptera</i>	Leguminosae	'prekese'	Fruits	Anti-ulcerogenic
<i>Secamone afzelii</i>	Asclepiadaceae	'kwatema'	Leaves and twigs	Prevent postpartum contraction
<i>Dracaena mannii</i>	Dracaenaceae	'Akosenekosene'	Leaves	Antioxidant activity
				Antimicrobial
				Anticaries
<i>Sesamum radiatum</i>	Pedaliaceae	'sinsam'	Leaves	Relaxation effect on the smooth muscles
<i>Newbouldia laevis</i>	Bignoniaceae	'sesemasa'	Leaves	Decrease risk of gestational diabetes
<i>Piper guineense</i>	Piperaceae	'esorowisa'	Leaves	Anti-emetic, carminative
<i>Solanum torvum</i>	Solanaceae	'kwahunsusua'	Leaves/fruits	Hematinic
<i>Dracaena arborea</i>	Dracaenaceae	'ntome'	Leaves	Antimicrobial
<i>Vernonia amygdalina</i>	Asteraceae	'awonwono'	Leaves	Antipyretic
<i>Paullinia pinnata</i>	Sapindaceae	'tuantini'	Leaves	Haemostatic agent
<i>Lantana camara</i>	Verbenaceae	'anase dokono'	Leaves and stalk	Analgesic and antipyretic activity
<i>Costus afer</i>	Costaceae	'Sommebaa'	Leaves	Hypoglycemic

### Mineral analysis

The crude extracts obtained were taken through analysis for the mineral content at Crop and Soil Research Institute, Kwadaso-Kumasi using atomic absorption spectrophotometry (AAS, model AA240FS). For the analysis, specific masses of the crude extracts were taken, dissolved (digested) in specific volumes of distilled water and solution was appropriately diluted. The instrument was set up and calibrated (or zeroed). Each of the sample solutions was analyzed for five (5) elements; sodium (Na), potassium (K), iron (Fe), zinc (Zn) and magnesium (Mg). Absorbances

were recorded and conversions to concentrations (mg/L) were made. The various concentrations of the elements, were projected from the crude extract level to the raw sample level; converting the amounts into percentages.

#### Vitamin analysis

Qualitative test for vitamins were analysed on the plant extracts using thin layer chromatography as described by Keemia [9]. They were tested for the presence of Vitamins A, B2, B6, B12 and C. Pure samples of these vitamins were used as standards

#### Protein analysis

The Kjeldahl method [10] was used to determine the protein content. The protein content was obtained by multiplication of the nitrogen value with a conversion factor of 6.25.

### RESULTS AND DISCUSSION

'Abemuduro' is a polyherbal formulation that is used traditionally in Ghana for recuperation and rejuvenation during pregnancy, lactation and convalescence [7]. The purpose of this study was essentially to determine whether the individual plants in this polyherbal formulation, contain essential minerals and nutrients to justify their use traditionally. Considering the results for the mineral analysis, *Solanum torvum* was found to be a rich source of vital minerals; containing relatively the highest amount of most of the minerals analysed with iron (0.34%), magnesium (51.17%), zinc (1.32%), sodium (5.55%) and potassium (49.62%) (Table 2). Iron aids in the prevention of anaemia via enhancement of the haematopoietic process. The high amount of zinc helps in boosting the immune system. Similarly, its high proportion of magnesium helps reduce pyrexia associated with any infection. *Nephrolepis undulata*, *Secamone afzelii*, *Costus afer* and *Lantana camara* have their mineral contents in moderation (Table 2), thus used to supplement that of *Solanum torvum* and *Dracaena mannii*, which recorded relatively the highest amount of minerals. Based on this result, it is clear that the folkloric technique of combining these herbs is justified as the individual plants, used alone, would not be able to provide the adequate amounts of nutrients. This is further supported by the results of the vitamin analysis (Table 3). *Nephrolepis undulata* was found to be the only herbal component in the combination that contained vitamin A indicating the reason why it is found in almost all 'Abemuduro' combinations. Vitamin B-12 was found in *Solanum torvum* and *Nephrolepis undulata* (Table 3). Vitamin C was present in all the herbal extracts except *Nephrolepis undulata*. Thus, to ensure fast convalescence, immune system boosting as well as increased iron absorption, one or more of these herbs *Costus afer*, *Lantana camara*, *Dracaena mannii*, *Secamone afzelii* and *Solanum torvum* should be predominant in the combination. Vitamins B-2 and B-6 are both needed in haematopoiesis. *Dracaena mannii* and *Costus afer* contain vitamin B-2 while *Nephrolepis undulata*, *Secamone afzelii*, *Dracaena mannii* and *Solanum torvum* contain vitamin B-6 (Table 3).

Table 2. Mineral content of plant samples

Samples	Mineral content % <sup>w/w</sup>				
	Fe	Zn	Mg	Na	K
<i>N. undulata</i>	0.07	0.28	26.57	1.64	20.45
<i>S. afzelii</i>	0.01	0.09	12.23	0.52	5.64
<i>D. mannii</i>	0.05	0.47	18.83	1.94	9.33
<i>L. camara</i>	0.02	0.13	9.32	0.43	6.43
<i>C. afer</i>	0.06	0.13	6.03	0.05	6.66
<i>S. torvum</i>	0.34	1.32	51.17	5.55	49.67

Table 3. Vitamin contents of plant samples

Plant samples	Vitamins				
	A	B-2	B-6	B-12	C
<i>Nephrolepis undulata</i>	+	-	+	+	-
<i>Secamone afzelii</i>	-	-	+	-	-
<i>Dracaena mannii</i>	-	+	+	-	+
<i>Lantana camara</i>	-	-	-	-	+
<i>Costus afer</i>	-	+	-	-	+
<i>Solanum torvum</i>	-	-	+	+	+

From the results obtained for the protein analysis, it was evident that *Solanum torvum* had the highest protein content (11.38%). This high protein content, among other functions, aids in the production of haemoglobin for

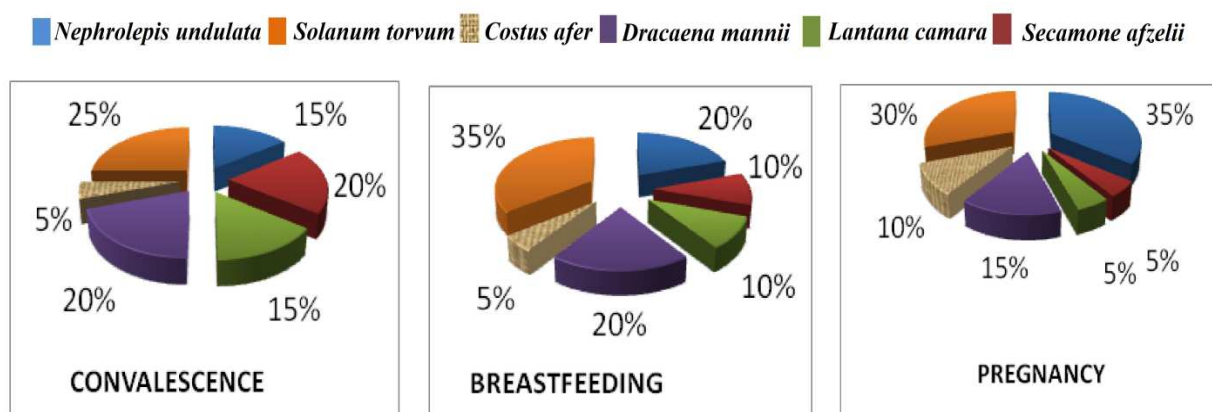
anaemia prevention. *Dracaena mannii* was found to have the least amount of protein (1.44%  $w/w$ ) (Table 4). The anti-inflammatory property and the presence of vitamin A and proteins result in the early synthesis of collagen fibres necessary for wound healing [11]. Thus supporting the use of this polyherbal formulation for wound healing following delivery.

**Table 4. Protein content of plant samples**

Plant sample	Protein content (%)
<i>Nephrolepis undulata</i>	1.94
<i>Solanum torvum</i>	11.38
<i>Dracaena mannii</i>	1.44
<i>Secamone afzelii</i>	3.94
<i>Costus afer</i>	3.63
<i>Lantana camara</i>	1.75

Apart from these essential nutrients, the plants used are reported to contain other secondary metabolites useful for the recuperation and rejuvenation process. *Secamone afzelii* has been shown to be a potent anti-infective and wound healing agent as well as an effective antioxidant and galactagogue [12]. The main constituent of the plant was found to be vitamin E, a potent antioxidant with beneficial properties for general reproductive health. Similarly, *D. mannii* extracts exhibited anti-inflammatory activity *in vitro* [13]. Several reports have also described antifungal, anti-proliferative and antimicrobial activities of *L. camara* [14-16]. The hydroalcoholic extracts of the leaves have shown an effect on fertility and general reproductive performance in rats [17]. Aqueous extract from dried fruits of *Solanum torvum* reduces blood pressure, has anti-ulcerogenic, anti-viral, analgesic, anti-inflammatory and antioxidant activities [18-19].

Thus strong synergism of the constitutive herbs of the polyherbal formulation 'Abemudro' may afford wound healing, analgesic, anti-inflammatory, antimicrobial, antioxidant and galactagogue activities in pregnancy, lactation and convalescence as suggested by folklore medicine. From the results of the vitamins, mineral and protein analysis and based on recommended daily values of these essential micro and macronutrients for each consumer as well as reported pharmacological activities of the herbs from literature; the proportions and combinations of the indigenous polyherbal formulation in Figure 1 is suggested. This represents the proportions of the constituent herbs required to provide the recommended daily amounts of essential minerals, vitamins and proteins in pregnancy, lactation and convalescence. This provides a cheap and readily available source of nutrient for these groups especially in developing countries where conventional haematinics and nutritional supplements are inaccessible in large percentage of the population due to poverty. It is believed that the validation of the traditional use of this polyherbal formulation, as shown in the present study, will help promote the utilization of this indigenous Ghanaian herbal blend. It has been used for hundreds of years and its safety is well established through a long history of human use. However we recommend toxicity studies to establish scientifically its safety especially in pregnancy and lactation.



**Figure 1. Proposed combinations and proportions of herbs for the target groups of consumers.**

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## CONCLUSION

The constituent plants of the Ghanaian polyherbal formulation 'Abemudro', contain essential vitamins, minerals and proteins for maintenance of well-being, wound healing and prevention of anaemia.

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