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NEUTRACEUTICAL STUDY OF EXTRACT OF DRY LEAF OF T. CATAPPA LINN.

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ABSTRACT
This study investigated a novel approach for extracting anthocyanin from T. Catappa Linn Dry leaves that mature and drop peel from the tree. The solvent used respectively were 100ml of 85ml ethanol containing 15ml Hcl; 2% citric acid; 1% citric acid in ethanol and water respectively. 10g of dry leaf was batch extracted with 100ml of respective solvent each, pooled together and standard methods used to determine phenolic, vitamin C, zinc, calcium, magenissuim, sodium, potassium and iron content in each extract in triplicates. Mean values were respectively subjected to single analysis of variance test and compared with Turkey krammer multiple comparison test using Graphpad Prism version 7. Significant difference was considered at 95% confidence level and result presented as mean Istandard error of mean. Statistical significant ($P<0.05$) difference were observed when mean value in extract were compared except for comparable phenolic content in extract in the respective solvent and aqueous medium, 5.00; 0.14mg/250ml. Aqueous medium extracted the highest vitamin C content, 1500 +1.00mg/100ml. The highest Zn content was observed in Ethanol/Citric and medium. This study provided evidence(s) that rationalizes the viability for the usage of T. Cattapa leaf for economic empowerment and neutraceutical benefit.

KEYWORDS: Novel, Extracting, Anthrocyanin, Viability.

1. INTRODUCTION

Terminalia Catalopa leaf is a species of the family combretaceaean dis (Hyttel et al, 2009; Vucurovic and Razmovski 2012). It is distributed in tropical and sub-tropical regions including Africa. It is an attractive, long-lived tree well suited to ornamental and amenity plantings. The water content of *T.catappa* leaves have been known in folk medicine for anti-pyretic, haemostatic, hepatitis and liver-related disease purposes. (Meen and Raja 2006, Vucurovic and Razmovski, 2012) Literature also show that the polar extract from different parts of the leaves, fruits and bark exhibit biological activities like antimicrobial, and antioxidant (Vartanian et al., 2007); anti- metastic, anti-inflammatory, lepato-protective (Chen and Li, 2005); mutagenic (Mininet et al 2014); aphrodisiac (Hammond *et al.*, 1993); and anti-diabetic (Azrul *et al.*, 2013).

Izumar et al has reported on the anti- secretory effect of ethanolic extract from the leaves. The leaves of *T.catappa* contain 1-degalloyl- eugenilin, 2,3 (4, 5, 5, 6, 6-hexahy droxyl diphenoy!) glucose, chebulagic acid, gestistic and corilagin, geranum, granatin B, Kaempferol, Punicalagin, punicalin quercetin, tergallagin terflavin A, and terfleavin B among others (Mininet et al 2014, Mandloi et al 2013). Contemporarily there is increasing emphasis in addressing oxidative status in stress situations with the use of tea leave extract and other neutraceutical preparation. In the light of this, this investigation simulated extracting conditions for phytochemicals in a manner that it can be used in compounding drinks/flavor water in carbonated /non-carbonated types. The study reported examined the extent of some anti-oxidant/minerals extracted and highlighted benefit of these.

1. RESULTS

The results of some analysis carried out in this study are presented in below. Statistical significant ($P<0.05$) difference was observed in the level of analytes in extractants solvents in respective solvent. The amounts of phenolic extracted with the respective solvents were comparable. The highest ascorbic acid was extracted into aqueous medium. The least ascorbic acid extraction was into HCl/Ethanol solvent. Ethanol/Citric acid solvent recorded the highest dissolved Zn ion whereas aqueous

medium recorded the least. Sodium in ion was not detected in HCL- Ethanol or 2% Citirc Acid solvent at the level of analysis.

	K (x/mol/L)	Phenolic (mg/250ml)	Ca^{2+} (mg/L)	Fe (xy/L)	Mg2+ mg/L	Zn µg/L
HCL –Ethanol	2.24 ± 0.05	5.67 ±0.08	16.33 ± 6.15	3.31 ± 0.12	6.67 ± 1.33	135.00 ± 13.20
2% Citric Acid	0.62 ± 0.05	5.25 ±0.00	20.63 ± 0.87	0.45 ± 0.09	6.67 ± 1.33	181.66 ± 30.13
Ethanol-Citric Acid	3.19 ± 0.05	5.75 ± 0.14	20.83 ± 1.82	0.21 ± 0.06	6.67 ± 1.33	275.00 ± 5.00
H_2O	0.67 ± 0.13	5.00 ± 0.14	29.12 ± 2.81	0.93 ± 0.08	6.67 ± 1.33	66.66 ± 17.55

2. DISCUSSION

A factor responsible for the biological activity of phytochemical extract is the phenoli content. The phenolic content in the respective solvents were comparable. Hence equal amount is extracted Phenolic compounds are present in the form of glycosides in plants (Shikhamandloi *et al.*, 2012). Inflammation is a natural protective mechanism that occurs when the body tissue homeostatic mechanism are disrupted by biotic, physical or chemical agents (Khan et al., 2014). The immune respond generates pro- inflammatory mediator and excessive output occurs in chronic-inflammation especially in conditions that contribute to many persistent diseases conditions. Some phenolic compounds work in tandem with non-steroildal anti-inflammatory drugs (NSAID) to inhibit pro- inflamatory mediators activities or gene expression including cyclooxygenase (COX) (Shikhamandloi *et al.*, 2012). Hence presence of phenolic in the respective extract will be beneficial when used in compounding carbonated/non-carbon/tea drink. Phenolic compounds have been demonstrated to have anti-inflammatory properties found suitable in rheumatoid arthritis, inflammatory bowel diseases, anti-aging, anti bacterial and some anti-viral treatment conditions (Ashurst, and Hargitt, 2009, Masibo and Qian, 2008). Under these conditions respectively phenolic react to prevent negative activity of undesired reactive oxygen produced by metabolic activity under stress especially in disease condition. Ascorbic acid content or Vit C content in the respective extract when compared was least in Hcl-Ethanol solvent. The result suggest that aqueous medium have the strongest effect in attracting ascorbic acid to its self- compare to other solvents. The relationship between solute and solvent is very important in determining solubility, solute-solvent attraction equates to greater solubility. The effect can best be explained by Le-chaterlier's principle. However, the benefit of this study is in the high level of vitamin C extracted observed in aqueous medium. This makes of the most preferred medium considering the anti-oxidant role of Vitamin C.

Zinc/iron is an important element that plays significant role in physiological and metabolic processes of many organisms (Adriana and Dana 2013). However, high concentration of Zn can be toxic to organism (Khan et al., 2014). WHO limit for Zn in juice is 0.01 to 0.07 mg/kg (WHO 1996).

Calculated value for respective solvent extract is presented below

Hcl/Ethanol	2% CA	Ethanol	H_20
0.14 ± 0.01	0.18 ± 0.03	0.28 ± 0.01	0.09 ± 0.02

As can be seen in the Table above only aqueous medium (H20) extract contain maximum level acceptable level in juice (WHO 1996) Extract in other -respective solvent studied recorded values greater than highest limit expected in juice per liter In a study of local drinks in Northern Zone of Nigeria, Zn content ranging from 0.12-0.39mg/liter was observed in Kunu, Zaki and a range of 0.06-0.22 mg/1 was observed in Zobo drink (Bakare-O dunola and Mustapha 2014) The result In this, study compared favorably to the content in these local drinks. Also in terms of Zn level there is no need to be anxious since a study have reported a range of 63-65 mg/100ml in varieties of Zobo drink (Aimola et al., 2014). These suggest that the consumption in 1 litre of the extract as compounds drinks will not be deleterious as content of Zn is in the range of consumed sample of Zobo drink or Kunu consumed in Northern Zone of Nigeria are higher than observed (Bakare and Mustapha 2014). Dietary Calcium is the main source of calcium in the body as it is not synthesized in the body (Yang 2015). Epidemiological studies have shown that it is inversely associated with blood pressure (MC Carron et al 1994; Stift et al., 1973 MC Carron et al 1982; Ackey et al 1983; Crigio et al 1989). Recommended FAO/WHO daily intake of calcium range from 200- 300mg for ages between 6 months to 10 years and for adult to a maximum of 1300mg per day (FAO/WHO2001). The level of calcium in the respective solvent entrant can serve for dietary supplementation that can contribute to meeting this daily needs in the body. The Level of Calcium intake is usually associated with the intake of diary product like milk, yoghurt and cheese. These are not easily affordable to average income persons especially in developing countries. The usage of any of these extract is to prepare soft drinks or drawn as tea will provide affordable source to less privilege/low income individuals. The level of Mg in the respectively solvent extract were lesser in value compare to as observed in Hibiscus sab dariffa (Zobo) drink blended with aqueous entrant of ginger with and garlic (Adesokan et al 2013).

Magnesium plays significant role in over 500 processes in human physiology (Kumar et al 2020), it is important in normal functioning and well-being of humans, its serve as co- factor in enzymatic reaction and maintenance of protein structure. Universal drinking water/beverages contain 10 to 100ppm magnesium. It has been postulated to have potential to prevent heart diseases and stroke. The level in respective entract approximates the lower limit in universal drinking water/ beverages. The level of Mg also in any of the entrant can supply 13.8 mg per 2 litre suggested as daily need (Ogichor et al 2008).

The amount of Fe in extract of *T. catappa*, mg/litre is presented in the present study is the table below

HCL-Ethanol	86.00
2% CA	11.70
Ethanol CA	5.46
H20	24.18

WHO/FAO, UN standard for quality criteria for mineral recommend 10-12.5mg elemental iron for infants /young children-6-23 months and 30-60mg for children-5-12 years (WHO 2016). It can be seen from the table above that using any of the solvents for compounding soft drink will meet this need. Using ethanol/CA solvent mixture will meet this needs the least but will approximate the lower limit for infants/young children. The delivery of micro nutrients to infants and children is in line with the right to health (WHO 2016). It is also a constituent's component of the WHO frame work for ethics medicine. i.e.

1) Respect for individual/autonomy
2) Beneficence
3) Non-maleficence and
4) Justice (WHO 2016)

The need for iron supplements especially for infants/young persons is predicated on P` iron deficiency is a major cause of chemical (DeBonwist 2008; Kasse baurn et al 2014, WHO 2011, WHO 2008; WHO 2011) It has been known to result from in adequate intake or absorption of dietary iron; increased need in periods of growth or pregnancy or losses from menstruation/infestation with helminths (WHO 2008) WHO 2011, Tolentino and Friedman 2007). These goes to emphasize the need for iron supplementation that can be MEANT with usage of any of these extract when compounded as drink or drawn as tea. The level of K in the respective solvent when compared were statistically ($P<0.05$) significantly different. The highest was observed in Ethanol-citric acid solvent with 2% citric acid solvent recording the least. Sodium ion was not detected in HCL-Ethanol or 2% citric acid solvent at the level of analysis.

3. CONCLUSION

This study has provided a rational biochemical basis for planting T. catappa. It takes it a step out of just being an ornamental/amenity planting alone to nutraceutical/economic essences. The phenolic/Vitamin C content will provide antioxidants/anti-inflammatory benefit among others. The elements contained in the extracted "waste" leaves as reported have benefits and even packaging the dry leaves as tea bags to be drawn as such will provide to discuss. Empowerment/boast economy. This will help save foreign exchange in sourcing tea of equivalent types from foreign countries. Potassium (K) is an essential nutrient to maintain fluid and electrolyte balance in the body (Hussan and Emitonique 2018). It is third most abundant minerals functioning of the body. The calculated amount in mg/dl in the irrespective assayed solvent entrant is presented 'below.

Hcl-Ethanol	87.36
2% Citric acid	24.18
Ethanol-citric acid	124.41
H20	26.13

The food and drug Administration (FAD) to set limit for over the counter potassium chloride supplements is 100mg per service daily (Ryan 2020). The amount per litre if compounded as drink with respective entract will meet this requirement. The level of potassium as observed in the respective solvent were less than reported in *Hibiscus Sabari Ha* (Zobo) drinks blended with aqueous entrant of ginger and garlic (Adesokan et al 2013). Also there who lesser than reported in hot aqueous entrant of Zobo drink (Olayemi et al 2011, Izah et al 2015). Sodium is the principal cation in the extracellular fluid (Terry 1994). Its main functions are related to blood volume maintenance, water balance, cell m embrane potential, acid-base balance and nerve conduction. The table in this study showed that only aqueous medium or citric acid- ethanol media respectively is sodium extracted. The level of extract in citric acid - ethanol medium compared to the amount reported in quince - fruit juice. The result in aqueous medium is higher/greater than reported for grape fruit juice in the same study. Foods contribute more to the daily intake of the Na than drinking water (NRC, 1977), hence usage of extracted portion of HCl-ethanol or 2% citric acid when compounded as drink will be of benefit to physiological supply of Na as shown in this study. Their usage is not likely to be associated with excess Na intake that can cause age related blood pressure and hypertension concern as will stimulate usage of Quince or grapes fruits juice drink.

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