

EFFECT OF COMBINATIONS OF *COCOS NUCIFERA* WATER AND *ANTHOCLEISTA VOGELII* AQUEOUS LEAF EXTRACT ON RED BLOOD CELL AND PACKED CELL VOLUME INDICES OF EXPERIMENTAL RATS

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The study was conducted to evaluate the effect of the combination of *Cocos nucifera* water and aqueous leaf extract of *Anthocleista vogelii* on the production level of red blood cells in experimental rats. Twenty-one Wistar rats (150-180 g) of either sex were grouped into three of seven rats per group. The control group was administered normal saline (10 ml/kg), while the treated groups received the combinations of *C. nucifera* water and aqueous leaf extract of *A. vogelii* at the doses of 200 and 400 mg/kg. There was significant ($P < 0.05$) increase in red blood cell counts and packed cell volume in animals administered both doses of the combination as compared to the control group. This improvement was as a result of increasing the dosage. *C. nucifera* water in combination with the aqueous leaf extract of *A. vogelii* has positive effects on red blood cell production in experimental rats.

Key words: Haematopoiesis, *Cocus nucifera*, *Anthocleista vogelii*, blood cells.

INTRODUCTION

There has been much focus on plant research due to the immense potential use of medicinal plants in traditional systems in treating various ailments (Aliyu et al., 2007). Medicinal plants are now being recognized as possible alternatives and rich sources for new drugs discovery and development (Idu et al., 2006; Okigbo and Mmeka, 2006).

Cocos nucifera Linn (coconut) water is an ancient tropical beverage that is found in the inner part of coconut fruit and it is a sweet refreshing drink taken directly from the inner part of the coconut fruit (Steiner and Desser, 2008; Prades et al., 2012). Coconut water has nutritional and medicinal effect as it serves as food and drink and is used to increase semen production, promotes digestion and clearing of the urinary path (Reddy and Lakshmi, 2014). Consumption of either coconut water or coconut oil has been reported to exert both

hematinic and immuno-stimulatory effects (Akinjayeju and Adebolu, 2019).

Anthocleista vogelii plant (*Loganiaceae*) is a common tree that grows around the edges and banks of rivers or in marshy areas of the tropical humid forest of West Africa (Jegade et al., 2011). In African traditional medicine, the stem bark of *A. vogelii* plant is used for the treatment of ailments such as gastro- intestinal disorders, fever, stomach ache etc (Ateufack et al., 2013). A combination of *A. vogelii* stem bark and its leaves is used as anti-inflammatory and anti-diabetic agents (Ateufack et al., 2013; Sunday et al., 2016). A decoction of the leaves of *A. vogelii* prevents malaria, reduces symptoms of malaria such as fever, and is used to treat jaundice (Alaribe et al., 2012). There are reports of the positive effect of *A. vogelii* on red blood cell production (Sunday et al., 2016; Apiamu et al., 2019).

The hematopoietic system consists of the

bone marrow and the cells it produces. These cells include leukocytes, erythrocytes, and thrombocytes. Following loss of haematopoietic precursors, deficiencies of their corresponding blood cells may result, thus, increasing the risk for tissue hypoxia, overwhelming infection, malignant neoplasms, and hemorrhage (Gwaltney-Brant, 2014). Blood acts as a pathological reflector of the status of exposed animals to toxicant and other conditions (Olafedehan et al., 2012). Haematological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to the blood (Bimerew et al., 2018). The individual positive haematological effects of *C. nucifera* water and that of *A. vogelii* extracts have been reported, hence the need for this study which will evaluate the effects of their combinations using experimental rats.

MATERIALS AND METHODS

Animals

Twenty-one Wistar rats (150-180 g) were obtained from the Animal Facility of the Faculty of Basic Medical Sciences, Delta State University, Abraka, Nigeria. The animals were acclimatized for a period of two weeks prior to the study, and were placed on grower feed and clean water *ad libitum*. Guidelines followed in the handling of animals were in accordance with the global standard adopted by the Ethical Committee of the Faculty of Basic Medical Science, Delta State University, Abraka, Nigeria (FBS/CT/091720).

Plants

C. nucifera fruit was bought from the school market. The coconut fruit was split open by hitting it hard on a concrete floor. The water from the fruit was filtered into a container and stored in the refrigerator. Fresh leaves of *A. vogelii* plant were collected in the school environment and authenticated in the Department of Pharmacognosy, Faculty of Pharmacy, Delta State University, Abraka, Nigeria. The fresh leaves of *A. vogelii* plant were air dried for three days after they were collected. Then the leaves were blended into powdered form. The powdered form (400 g)

was soaked and macerated in aqueous solution for 48 h, at room temperature in a well closed container with constant stirring and agitation. The mixture was then filtered using sieves and filter papers to obtain a filtrate that was concentrated to dryness with the aid of a heating mantle at a temperature of 40- 50°C. The final extract was placed in a Petri dish and stored in the refrigerator prior to use.

Experimental design

Animals were randomly grouped into three of seven rats per group. The stock of the aqueous leaves of *A. vogelii* was constituted in *C. nucifera* water to give 200 and 400 mg/kg of its combinations. The control group was administered normal saline.

Group A – Normal saline 10 ml/kg

Group B – *C. nucifera* water + *A. vogelii* 200 mg/kg

Group C – *C. nucifera* water + *A. vogelii* 400 mg/kg

The experimental animals were administered the extracts orally for 14 days via oral cannula according to their body weights.

Animal weight measurement

The weights of the animals were recorded using a weighing balance before the start of the experiment (initial-day 0) and on the fourteenth day of administration of the extracts.

Determination of haematological indices (RBC, PCV)

At the end of the fourteen days' treatment, the animals were anesthetized using chloroform. Blood samples were collected by cardiac puncture into labeled EDTA bottles for haematological analysis. The method as described by Baker et al. (1998) was used for determining the blood cells counts and packed cell volume.

Statistical analysis

Results were expressed as mean \pm standard error of mean (Mean \pm SEM). Differences between normal and treated groups were the criteria for the pharmacological activities. Statistical analyses of results were done using one-way analysis of variance (ANOVA) followed by Dunnet's t-test. *P*-values of less than 0.05 ($P < 0.05$) were considered statistically significant.

RESULTS AND DISCUSSION

Anaemia is a medical condition in which there is deficiency of circulating red blood cells (Agarwal and Prchal, 2009; Besarab and Coyne, 2010). Haematological analysis can be used to determine the degree of toxic effects of foreign compounds on the blood constituents of the body (Bimerew et al., 2018). This assessment can be used to explain the effects of chemical compounds of plant extracts on the blood and its physiology (Ashafa et al., 2009).

In the present study, it was observed that there was insignificant ($P>0.05$) increase in body weight of the animals when compared with the control group (Table 1).

This is an indication that the extracts'

combinations are unlikely to cause obesity since the feeding patterns of the animals were normal (Obi et al., 2012). Animals that received 200 mg/kg and 400 mg/kg of the *A. vogelii* and *C. nucifera* combinations showed a significant ($P<0.05$) increase in the red blood cell count (RBC) when compared to the control group (Table 2). The significant ($P<0.05$) increase observed in RBC count was more profound with the group administered the combination at 400 mg/kg. This implies that the combination of *C. nucifera* and *A. vogelii* extract boosts the production of red cells (erythropoiesis) and it can be useful in the treatment of anaemia, which will be more effective when used at a higher dose.

Furthermore, the result on the effect of

Table 1. Effect of the combination of *C. nucifera* water and *A. vogelii* aqueous leaves extract on body weight of Wistar rats.

Groups	Initial (g)	Final (g)	% Increase
Normal saline 10 ml/kg	160 ± 3.58	188 ± 2.87	17.50
<i>C. nucifera</i> water + <i>A. vogelii</i> 200 mg/kg	165 ± 2.16	196 ± 3.47	18.79
<i>C. nucifera</i> water + <i>A. vogelii</i> 400 mg/kg	162 ± 2.22	192 ± 2.39	18.52

All values are expressed as Mean ± SEM (where n=7). * $P<0.05$ was taken to be statistically significant.

Table 2. Effect of the combination of *C. nucifera* water and *A. vogelii* aqueous leaves extract on red blood cell (RBC) counts of Wistar rats.

Groups	RBC ($\times 10^6$)
Normal saline 10 ml/kg	5.66 ± 0.36
<i>C. nucifera</i> water + <i>A. vogelii</i> 200 mg/kg	7.04 ± 0.23*
<i>C. nucifera</i> water + <i>A. vogelii</i> 400 mg/kg	7.72 ± 0.37*

All values are expressed as Mean ± SEM (where n=7). * $P<0.05$ was taken to be statistically significant.

combination of *C. nucifera* water and *A. vogelii* extract on packed cell volume (PCV) level at both doses showed that there was an increase

in the PCV level of animals in the treated group unlike the control group (Table 3).

There was an increase in the PCV level

Table 3. Effect of the combination of *C. nucifera* water and *A. vogelii* aqueous leaves extract on packed cell volume (PCV) of Wistar rats.

Groups	PCV (%)
Normal saline 10 ml/kg	41.80 ± 3.31
<i>C. nucifera</i> water + <i>A. vogelii</i> 200 mg/kg	55.20 ± 1.88 *
<i>C. nucifera</i> water + <i>A. vogelii</i> 400 mg/kg	59.60 ± 3.36 *

All values are expressed as Mean ± SEM (where n=7). * $P<0.05$ was taken to be statistically significant.

of animals in the treated group when compared to the control group. The significant ($P<0.05$)

increase in RBC count and PCV level exerted by the combination extract in this present study

supports the investigations carried out by Sunday et al. (2016) and Akinjayeju and Adebolu (2019). Reports by Lima and colleagues on the effect of *C. nucifera* on haematological indices revealed a significant ($P < 0.05$) increase in white blood cell, neutrophil, red blood cell, haematocrit, and platelet counts (Lima et al., 2015). The results of this study surmise that *C. nucifera* water, in combination with *A. vogelii* aqueous leaf extract will promote the level of erythropoiesis, thus maintaining the normal density of the blood, enhancing the nutrient and oxygen availability for normal body cell/tissue function. Hence, the combination can be very useful in the traditional management of anaemia (Moke, 2017; Apiamu et al., 2019).

Conclusion

C. nucifera water, in combination with the aqueous leaves extract of *A. vogelii* is non-haematotoxic and has positive effects on the level of red blood cell synthesis in experimental rats.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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