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NUTRITIONAL COMPOSITION OF CARICA PAPAYA LEAVES AND ANTITHROMBOCYTOPENIC EFFECT OF ITS LEAVES EXTRACTS.

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ABSTRACT

*Carica papaya leaves were collected and screened for the presence of nutritional and antinutritional components. The leave extract revealed the presence of alkaloids, flavonoids, saponins, terpenoids tannins and phenols. Nutritional analysis of the leave showed high amount of moisture and carbohydrate contents in the range of 59.80 ± 0.20% and 28.69 ± 0.016% respectively. The % composition of protein, and fat of the leave were 4.90 ± 0.30% and 1.5 ± 0.04% respectively. Quantitative anti-nutritional analysis revealed 8.98 ± 0.06mg/100g of saponin, 3.58 ± 0.03 mg/100g of oxalate and 0.68 ± 0.10 mg/100g of phytic acid. To ascertain the extract antithrombocytopenic properties, albino rats were used as experimental animals to study how aspirin induced thrombocytopenia can be cured using the leaves extract. It was found that the leave extract at 25%, 50% and 75% concentrations are all able to cure the aspirin induced thrombocytopenia by increasing the platelet counts from <150*10^9/L to a range of 180 – 350 *10^9/L.*

***Keywords**: Carica papaya, Thrombocytopenia, platelet count, Nutritional value, Extract.*

Introduction

Thrombocytopenia is a condition associated with a low production of platelets or low platelets count (<150*10^9/L) which could result to a serious disease or even death [1]. The low platelet count can destroy the immune system, causes headache, inflammations and other serious health conditions. Symptoms of thrombocytopenia include; clotting inability, spleen enlargement, fatigue, purpura and prolong unusual menstrual flow [1].The available methods for treating thrombocytopenia mainly depend on the disease severity. However plant potentiality in treating blood related diseases are known for decades [2]. In the year 2011, Ahmad and his co-researchers reported that Papaya leaves can cure dengue and has a high tendency of

increasing the platelet count and hepatoprotection against other diseases [3].

Carica papaya leave have been in used for centuries in folk medicine for the treatment of blood related disorders, jaundice, malaria, tumors, warts, eczema and for wound healing [4].Other report showed the plant potency as anti-inflammatory, antibacterial, antifungal, hypoglycemic, anti-oxidant among others[5&6]. Its efficacy in folk medicine resulted from its active chemical components in the leaves and other part of the plant. The leaves were reported to contain ȁ-tocopherol, phenolic acids (trans-ferulic acid, para-coumaric acid), flavonoids, cyanogenic glycosides, glucosinolates, alkaloids, carpain, vitamin C and E etc [7&6]. The seeds, roots, and the bark of the plant were reported to contain fatty acids, crude fibre, carposide, glutamine etc.[5]. An increase in platelet and white blood cells (WBC) count within 24 h has been proven clinically with papaya leaf juice [3&8].

Other reports showed that among the common fruits; banana, apple, orange, and water melon, papaya possessed the highest concentrations of vitamin C (61.8 mg·100 g^{-1}), vitamin A (328 mg·100g^{-1}), riboflavin (0.05 mg·100g^{-1}), folate (38 mg·100g^{-1}), thiamine (0.04 mg·100g^{-1}), niacin (0.34 mg·100g^{-1}), calcium (24 mg·100g^{-1}), iron (0.1 g100g^{-1}), potassium (257 mg·100g^{-1}), and fiber (0.8 g100g^{-1}), as well as presenting a low caloric value (32 kcal100 g^{-1} ripe fruit) and being one of the preferred fruits for weight loss. In addition, it has high carotene content when compared with other fruits [6]

Similar to the ripe papaya pulp, the consumption of papayas seeds and leaves is appropriate since they also possessed some nutritional values; fibers and high caloric values (seeds with 212.7 kcal and leaves with 348.6 kcal). Compared with the seeds and the pulp, the concentrations of vitamins and minerals are different in the leaves, because they play an important role in fruit development [9&10].

Carica papaya possessed similar nutritional and medicinal compositions. Hence, it can be considered as a nutritive dense food than can provide many more nutrients per calorie when compared to other foods. In the current work, we aim to investigate more on the medicinal, nutritional and antinutritional components of the *papaya's leaves* and its efficacy to inhibit drug (aspirin) induced thrombocytopenia.

Methodology

Commercially available chemicals were used without further purification.

Sample Collection and Nutritional analysis

Fresh Papaya leaves were obtained from Katsina Metropolis, Nigeria. The leaves were then air dried under shade, pulverized and stored for further analysis.

The nutritional analysis was conducted to determine the crude protein, crude lipid, moisture, crude fibre, ash and carbohydrate content of the leaves respectively. The quantitative anti-nutrient analysis was conducted for the phytic acid, oxalate and saponins contents of the leaves respectively [11].

Solvent Extraction and Phytochemical screening

30g of the plant sample was measured, transferred into a thimble and then inserted into the soxhlet extractor. 300mL of chloroform was added to the bottom chamber of the extractor and the solvent was refluxed for 6 hours. After the extraction, the solvent was evaporated leaving behind the plant extract, and the percentage yield of the extract was calculated.

The marc from the chloroform extraction (27g) was re extracted using 300mL of ethanol.

For the aqueous extract, 100g of the sample was measured and extracted by the maceration technique using 500mL of distilled water. The mixture was allowed to stand a 48hrs period after which the extract was filtered. The percentage yield of the extract was determined using equation 3.1.

$$Percentage yield = \frac{Weight of the Extract}{Weight of the Sample} X\ 100 - 3.1$$

The phytochemical screening of the different extract of the leave was carried out to determine the presence of alkaloid, flavonoids, saponins, terpenoids, tannins and phenols [12].

Experimental Design and Induction of thrombocytopenia

A total of 20 albino rats were bought at Aminu Kano teaching Hospital Kano weighing between (150-250g). The rats were divided into four groups of five and the same food was given to them regularly for five days. Their body weight was measured on daily bases for 5days.

Blood samples were taken by inserting the rat head in a round pipe and allowing the tail out. The tail was warmed using hot water, sterilized using alcohol and 0.5mL of blood

was drawn using 2mL syringe and transferred into EDTA bottle.

To induce the thrombocytopenia, 300mg of aspirin was orally introduced to each albino rats using quarrel administration method.

Preparation and administration of the extract

Different concentrations of ethanol extract (25, 50 and 75%) were prepared and administered to group A,B and C respectively using feeding tube and 2mL syringe. While the control group was fed with normal feed and water for 14 days.

Oral administration of extract (2mL per albino) was conducted after the induction of the thrombocytopenia to study the efficacy of the extract in inhibiting the drug induced thrombocytopenia. Each group receives a different dosage/concentration of the extract; group A receives 25% of the extract, group B 50%, group C 75% and the control group receives 0% of the extract respectively. The administration of the extract was conducted for 14 consecutive days while carefully observing the behaviors of the albinos. On the 1^{st} and the 14^{th} day of the extract administration, the blood sampling was conducted to study the platelet count over the period of the extract administration.

RESULTS

The percentage yield of the papaya leave extracts and the results of its qualitative phytochemical screening, and anti-nutritional compositions are presented in Table 1, 2, and 3. While Figures 1,2,3&4 gives the animals platelets counts before induction of thrombocytopenia, after induction of thrombocytopenia and after administration of different concentrations of ethanol extracts of papaya leaves.

Table: 1 Percentage yields of the different extracts

Extract	Yield %
Ethanol	40.94
Chloroform	21.58
Aqueous	79.3

Table2: Qualitative phytochemical screening of the leaves.

Phytochemicals	Ethanol Extract	Chloroform Extract	Aqueous Extract
Alkaloids	++	-	+
Flavonoids	+	+	-
Saponins	++	-	++
Terpenoids	+	+	+
Tannins	+	+	+
Phenols	+++	-	++

Key = + present, - not detected

Table3: Anti-Nutritional Composition of *Carica papaya*leaves

Components	Amount (mg/100g)
Oxalate	3.58 ± 0.03
Phytic	0.68 ± 0.10
Saponin	8.98 ± 0.06

Mean ± S.D

Figure 1 and 2gives the values of the platelets counts of the albinos under study before and after inducing the thrombocytopenia. **Figure 3** on the other hand presents the platelets of the extract administered albinos. Figure 4 shows the proximate composition of the C. papaya leaves.

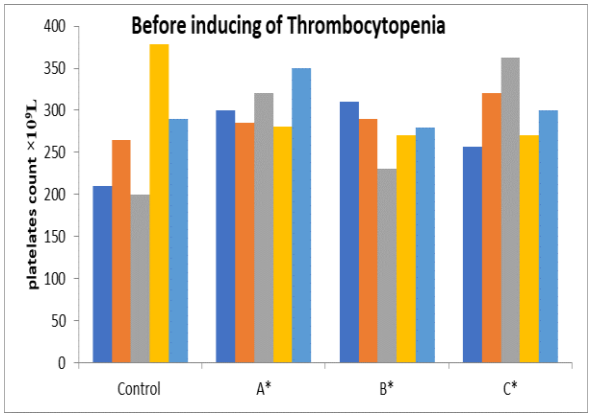

Figure 1: Platelets counts before asprin induced thrombocytopenia

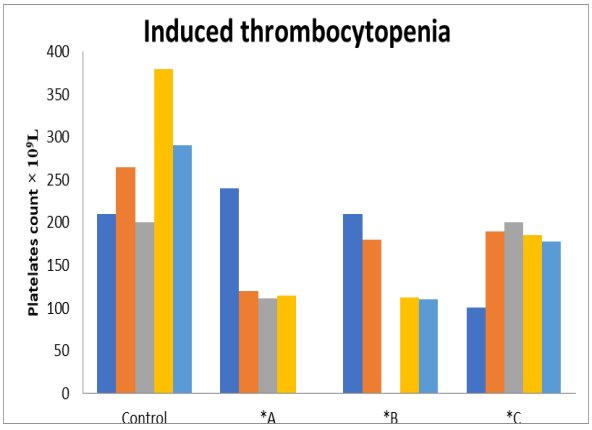

Figure 2: Platelets counts after asprin induced thrombocytopenia

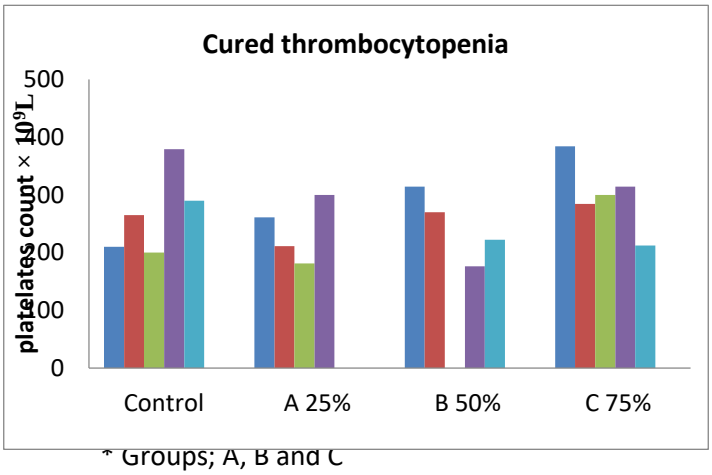

Figure 3: Platelets counts of the albinos after extract administration

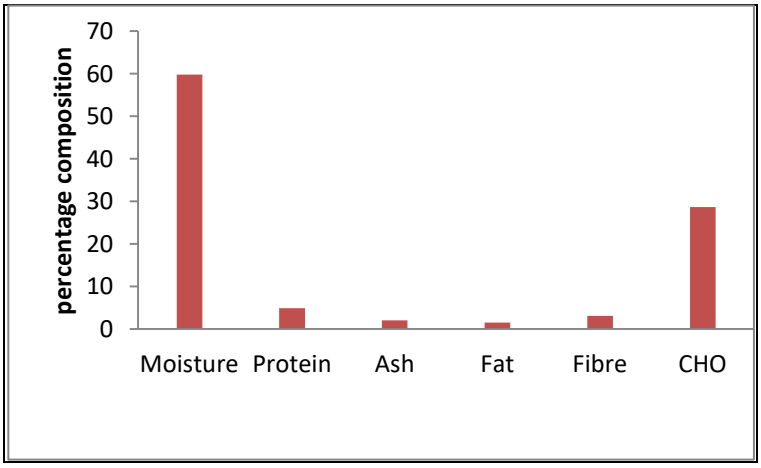

Figure 4: Proximate Composition C. papaya leaves

Discussion

The percentage yield of the three extract are 40.94, 21.58 and 79.3% for ethanol, chloroform and aqueous extracts respectively (Table 1). This revealed an appreciable amount of primary and secondary metabolite in the papayas leave. Phytochemical screening of the leave extract revealed the presence of the presence of alkaloids, flavonoids, saponins, terpenoids, tannins and phenols in the ethanol extract (Table 2). The presence of alkaloids, flavonoids, saponins, terpenoids, tannins and phenols in the ethanol extract agreed with the result obtained by[13-16]. Like the ethanol extract, the aqueous extract revealed also the presence of all the extract except for the flavonoid which wasn't detected (Table

2). Alkaloids, saponins and phenols were not detected in the chloroform extract. The qualitative screening of the leave extract using different solvent showed that the papaya leave contain a good amount of secondary metabolites. The presence of the secondary metabolites could be the reason for the Carica papayas efficacy in treating different ailments.

Anti-nutritional composition of the leaves showed a saponin concentration of 8.98±0.06 mg/100g and 3.58±0.03 mg/100g for the oxalates. On the other hand, the phytic concentration of the leaves was found to be very low 0.68±0.10 mg/100g when compared to the concentration of the oxalates and saponin in the leaves (Table 3)**.** Oxalate concentration obtained in current research, is higher than that of its pulp but significantly lower than skin and seeds as reported by [17]. While phytate content was lower than that of skin, pulp and seeds of same plant.

The proximate analysis of the leave showed a high percentage composition of moisture and carbohydrate i.e 59.80 ± 0.20 for moisture and 28.69 ± 0.016 carbohydrate. In addition, the leave possesses a moderate protein content of 4.90± 0.30. The ash, fat and crude fibre contents of the leave are all less than 5% as shown in Table 2. This agreed closely with the findings of [13&14]. The results from the proximate analysis (Figure 4) illustrated that the Carica papaya leave is very good for nutrition and that if properly harnessed, it can be helpful to a body suffering from malnutrition or other disease conditions.

To ascertain its nutritional efficacy, different concentration of the extract was prepared and used to cure an aspirin induced thrombocytopenia. The platelets and white blood counts before and after the thrombocytopenia was taken, the counts were also taken after the extract induction.

The platelets count of the albinos before the induction of thrombocytopenia (Figure 1) showed no significance difference counts. All the albino's groups showed platelet count in the range of 200- 380*10^9/L which indicated a normal platelet count, no presence of thrombocytosis >400*10^9/L or thrombocytopenia < 150*10^9/L. The white blood cell counts (WBC) corroborated the results from the platelet counts indicating that the abinos are in good health.

The low platelet count showed by some of the albinos <150*10^9/L after aspirin administration confirm the presence of thrombocytopenia (Figure 2). Features observed after 24hrs of the aspirin induction include; weakness, weight loss, and rashes.

Two albinos (one from group A and one group B) died a day after the aspirin administration.

Different concentration of the extract was administered on group basis to study the efficacy of the extract in curing the aspirin induced thrombocytopenia. The results from the blood analysis after extract administration showed an increase in the platelets count in a range of 180-384*10^9/L (Figure 3). This indicated no sign of thrombocytopenia (platelet count < 150*10^9/L) or thrombocytosis (platelet count >400*10^9/L). In addition, the result also indicated that the extract is effective in curing the induced thrombocytopenia even at low concentration of 25% (Figure 3). Increase in platelets count due extract administration was also reported by [18], working on busulfan induced thrombocytopenia. Similarly, Anjum et al [19] observed increase in platelet count on animals fed with aqueous extract of same plant. Some features observed after 24hrs of the extract administration includes; energetic, overeating, weight increase.

The effectiveness of the plant in curing the thrombocytopenia, in addition to its anti-diabetic property [20], may arise from its metabolite and nutritional composition.

Conclusion

It can be concluded that *carica papaya* leave extract can halt or cure thrombocytopenia by increasing the platelet and white blood counts. The anti-thrombocytonic activity increased with increase in concentration of the ethanolic extract. It efficacy in treating thrombocytopenia may results from its nutritional and metabolites contents that were found present.

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