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# Haemostatic Effect of the Stem Juice of *Musa paradisiaca* L. (Musaceae) in Guinea Pigs

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**Abstract:** The stem juice of *Musa paradisiaca* L. is used in traditional medical practice in Ghana to arrest bleeding from wound. However, scientific report on its haemostatic effects in controlled experiments is relatively scanty. This experiment was therefore conducted to scientifically investigate the possible haemostatic effect of *Musa paradisiaca* stem juice in guinea pigs using bleeding and clotting times. It was observed that blood clotting and bleeding times were both significantly reduced ($P<0.05$) when the stem juice was introduced. These results are important to present, since it is the first report on haemostatic effects of *Musa paradisiaca* L stem juice in animals. These results suggested that the stem juice of *Musa paradisiaca* possesses haemostatic properties, justifying its folklore use.

**Key words:** Haemostasis · Bleeding time · Clotting time · *Musa paradisiaca* · Stem juice

## INTRODUCTION

The use of plants as medicine by people date as far back as the beginning of civilization. Plants are important sources of many biologically active compounds. Plants used in traditional medicine provide an interesting and still largely unexplored source for the development of new drugs [1]. Globally, about 85% of all medications for health care are derived from plants [2]. The researches carried out over the last few decades have shown that plants and plant based therapies have high potential to arrest bleeding. A search for a safe and more effective agent from plants has continued to be an important area of active research since they can be selected on the basis of the ethno medicinal uses.

*Musa paradisiaca* (*M. paradisiaca*) L. (Family: Musaceae), commonly known as "plantain" is a perennial tree-like herb widely distributed in the Tropics. Due to the enriched food value and versatile medicinal value, it is one of the most important fruits and vegetable crops of several countries. Fruits, leaves, peels, root and stalks from plantain plants have been used orally or topically as a medicine for treating diarrhoea and dysentery [3] in the healing of intestinal lesions in colitis [4] antilithic [5] inflammation, pains and snakebite [6], antiulcerogenic activity [7], hypoglycemic effect [8] and hypolipidemic and antioxidant actions [9]. A constituent hydroxyanigorufone obtained from *M. paradisiaca* showed to be a potential cancer chemo-preventive agent [10]. The stem juice of *M. paradisiaca* is also used in traditional medicine for immediate arrest of bleeding and in wound management in Ghana, but this pharmacological activity has not been tested in controlled experiments. Hence, the aim of the present preliminary study was to investigate the effect of *Musa paradisiaca* stem juice on bleeding and clotting times in guinea pigs.

## MATERIALS AND METHODS

**Preparation of Stem Juice Extract:** The stem of *M. paradisiaca* was collected and identified at the Herbarium Unit of the University of Cape Coast, Ghana. The outer green part of the stem was peeled off and its white inner portion was cut into small pieces (500g). The pieces were crushed mechanically and the juice about 300mL was extracted. The juice was immediately used or stored at 4°C for later use.

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**Experimental Animals:** Sixteen healthy guinea pigs of either sex, weighing between 200-250g were used for the study. The animals were housed under standard conditions and were provided food and water *ad libitum* during the whole period of the experiment. The experimental protocol followed the Principles of Laboratory Animal Care (US NH publication no. 83-85, revised 1985) and was approved by the Local Ethical Committee for Animal Experimentation of the University of Cape coast, Ghana.

**Determination of Bleeding Time:** This was determined as described by Ochei and Kolhatkar [11]. Three skin punctures were made on the forearm of the animals using lancet and a stopwatch was started as soon as bleeding started. The puncture was dabbed with filter paper every 15s until the paper no longer stained red with blood. The time taken for bleeding to stop was recorded. This was repeated using other rats and the average was taken as bleeding time. The procedure was repeated on the second arm. However after puncturing the skin and blood had started coming out, a drop of stem juice was dropped on each of the puncture sites and the time taken for bleeding to stop was recorded. This was repeated for three other rats and the average time was taken as the bleeding time.

**Determination of Clotting Time:** Eight test tubes were arranged in a water bath at 37°C and into four tubes was added 0.1 mL each of the extracted juice while nothing was added to the remaining four tubes. Blood was taken directly from the heart to avoid contamination with tissue thromboplastin. A 0.4 mL of blood was then delivered into each tube. The stopwatch was started immediately the blood started flowing into the syringe and the tubes were continually tilted at 40s intervals until blood in them stopped flowing when tilted at an angle of 90°. The average of the clotting time of the four tubes with stem juice and the four tubes without stem juice were taken as the clotting time respectively.

**Statistic Analysis:** All results were expressed as mean ± SEM and the results were compared statistically by t - test using SPSS version 16. A *P* value < 0.05 was considered statistically significant.

## RESULTS

The stem juice significantly ($p < 0.05$) decreased bleeding time in guinea pigs in comparison with the control. The mean bleeding time for group without stem juice (control) was 182.8 ± 21.3s while that for the group with stem juice was 16.0 ± 0.7s. The mean clotting time for the group without stem juice was 464.6 ± 24.9s and that for the group with stem juice added was 33.6 ± 2.2s. Generally there was also significant reduction ($p < 0.05$) of clotting time in the presence of stem juice compared with the group without stem juice. This pattern was also observed for bleeding time (Table 1).

## DISCUSSION

Haemostasis involves the spontaneous arrest of bleeding from damaged blood vessels which is important for initiation of tissue repair processes and prevention of tissue death through haemorrhage [12]. It occurs in three stages: vasoconstriction, platelet response and blood coagulation. A fourth stage occurs when the clot is dissolved following repair of the blood vessel [13]. Haemostasis is a life saving process and therefore exploration of compounds that facilitate the process is of medicinal importance.

This study was conducted to evaluate haemostatic potentials of the stem juice of *Musa paradisiaca*. The stem juice of *M. paradisiaca* exhibited haemostatic activity by reducing both bleeding and clotting times. These parameters are measures of blood coagulation. Whereas the clotting time measures the intrinsic clotting factors (I, II, V, VIII, IX, X, XI and XII), bleeding time evaluates the vascular and platelet responses associated with haemostasis [14].

The significant decrease in clotting time in this study may be indicative of the fact that there was an increase in one or more of the clotting factors involved in the intrinsic pathway. Also the marked reduction in bleeding time suggest that the stem juice of *Musa paradisiaca* has positive effect on haemostasis possibly by acting on the integrity of the blood vessel or involvement of platelets forming the haemostatic plug or both. Another possible explanation may be the inhibition the formation of

Table 1: Haemostatic effects of *Musa paradisiaca* stem juice in Guinea pigs

| Parameter | Control group (without stem juice) | Treatment group (with stem juice) |
|---|---|---|
| Clotting time (sec) | 464.6±14.9 | 33.6±2.2* |
| Bleeding time (sec) | 182.8±11.3 | 16.0±0.7* |

Values are expressed as mean ± S.E.M. *p < 0.05

prostaglandin by the vessel walls during injury. Prostaglandins released during injury are responsible for vessel relaxation, which leads to increase in bleeding of blood [15].

## CONCLUSION

The stem juice of *M. paradisiaca* possessed haemostatic property as evidenced by its significant reduction in bleeding and clotting time. These findings could justify at least partially the involvement of this plant in the management of bleeding from wound. These findings are important to present since it has shown for the first time the haemostatic effect of stem juice of *M. paradisiacal* in animals supporting its use in folk medicine.

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