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In vitro antioxidants, membrane stability, thrombolytic and erythrocytes protective activities of *Piper guineense* seed extract

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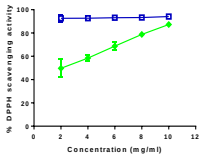
In vitro antioxidants, membrane stability, thrombolytic and erythrocytes protective activities of *Piper guineense* seed extract

Graphical Abstract

Piper guineense
(Piperaceae)

Piper guineense
seed



***In vitro* antioxidants**

IC_{50} (mg/mL)
DPPH = 2.83
TAC = 2.63
H_2O_2 = 2.13
FRAP = 2.06
-OH = 3.15
NO = 7.37

Erythrocytes protective effects

Whole blood; Plasma; Serum

Erythrocyte Lysis
38.94%
Erythrocyte Protection
36.24%
Thrombolytic Activity
11.08%
Membrane Stability
29.58%

Abstract:
Piper guineese (*Piperaceae*) seed are locally used after childbirth to facilitate the removal of clotted blood. The present study evaluated the *in vitro* antioxidants, membrane stability, thrombolytic and erythrocytes protective activities of *piper guineense* (Ashanti) seed extract. 100 g of *Piper guineese* seed was pulverized and dissolved in 500 ml of distilled water for 24 hours. The extract obtained was concentrated using a rotary evaporator. The IC_{50} for 2,2-diphenyl-1-picrylhydrazyl scavenging activities of the seed and utylated hydroxytoluene (BHT) were 2.82 and 1.39 mg/ml. Furthermore, IC_{50} for total antioxidant capacity and hydrogen peroxide scavenging activities of the seed and BHT were 2.63, 1.28 mg/ml and 2.13 and 1.61 mg/ml respectively. The IC_{50} values for hydroxyl radical scavenging activities and nitric oxide reducing power were 3.145, 1.75 mg/ml and 7.37, 2.32 mg/ml respectively. However, no significant difference were found in ferric ion reducing properties of the extract and BHT with IC_{50} values of 2.06 and 2.53 mg/ml respectively. The extract expresses 38.94±4.89% erythrocyte lysis activities at a concentration of 100 µg/ml. Thrombolytic activity of the seed (10.08%) was comparable to BHT (11.43%) and lower compared with acetylsalicylic acid (94.05%) and streptokinase (67.10%). The extract significantly ($p<0.05$) inhibited (29.58%) hypotonic solution-induced erythrocyte membrane lysis when compared to BHT (38.859%) and NaCl control (100%) respectively. The highest erythrocytes protection of the extract was 36.24% compared with Phosphate Buffer Saline (66.94%) and BHT (47.76%). The study demonstrated the i*n vitro* antioxidant properties and erythrocyte protective activities of aqueous extracts of *Piper guineese* seeds.
Keywords: Antioxidants; Ashanti; Black pepper; Erythrocytes; *Piper guineese*; Seed

Introduction

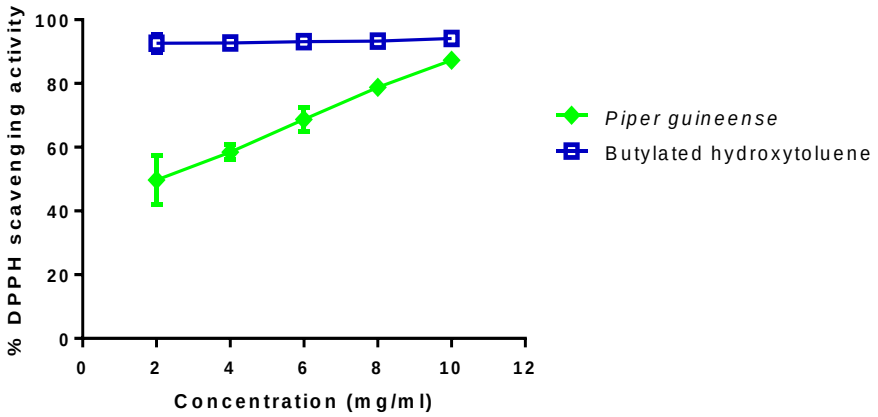
- *Piper guineese* (African black pepper, Ashanti, *Piperaceae*) is a West African spice plant with medicinal property and widely used traditionally in the treatment of various ailments.

- *Piper guineese* seed are locally used after childbirth to facilitate the removal of clotted blood.

- The seed are used in the treatment of boils, bronchitis, chest pains, dyspepsia, impotence, insect repellant, lumbago and rheumatism. It is also used for treating uterine fibroid and wounds (Busia, 2007).

- The present study evaluated the *in vitro* antioxidants, membrane stability, thrombolytic and erythrocytes protective activities of *piper guineense* seed extract.

Results and discussion



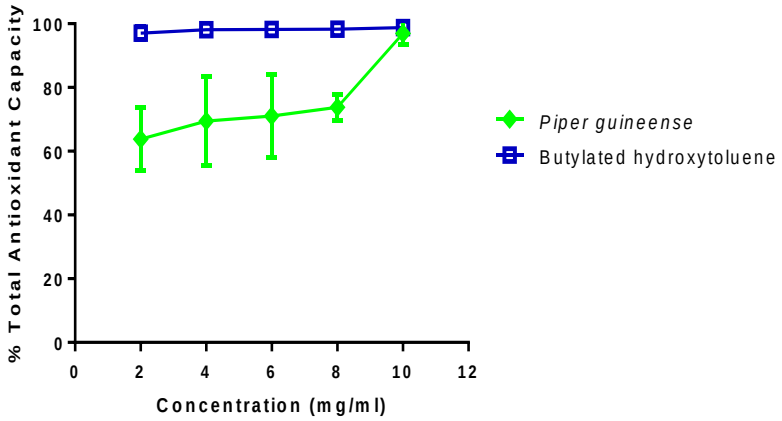
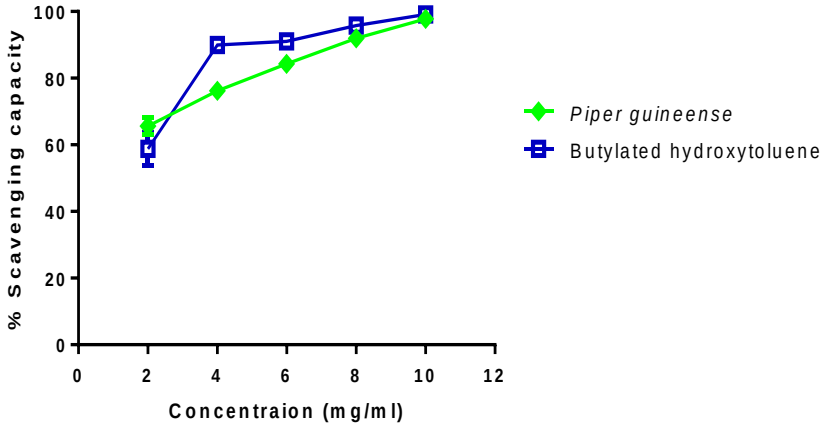


Figure 1: % DPPH scavenging and total antioxidant capacity of aqueous seed extract of *Piper guineense* Schumach. & Thonn. Values are mean ± SD of triplicated determinations

Results and discussion



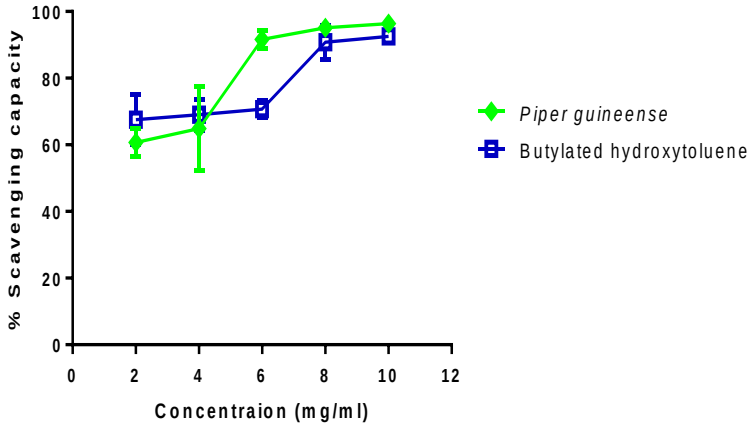


Figure 2: % Hydrogen peroxide scavenging and Ferric ion reducing properties of aqueous seed extract of *Piper guineense* Schumach. & Thonn. Values are mean ± SD of triplicated determinations

Results and discussion

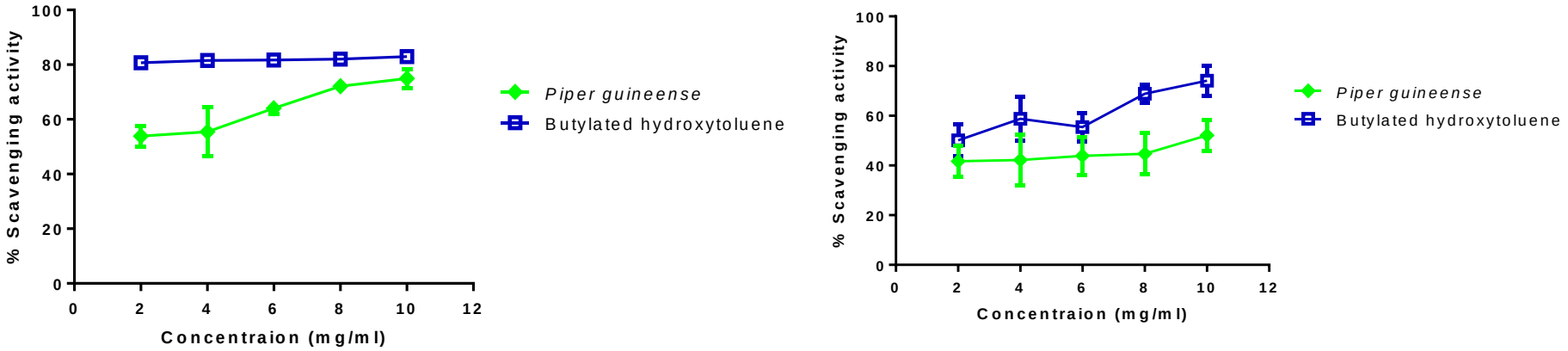


Figure 3: % Hydroxyl radical scavenging and Nitric oxide reducing power property of aqueous seed extract of *Piper guineense* Schumach. & Thonn. Values are mean ± SD of triplicated determinations

Results and discussion

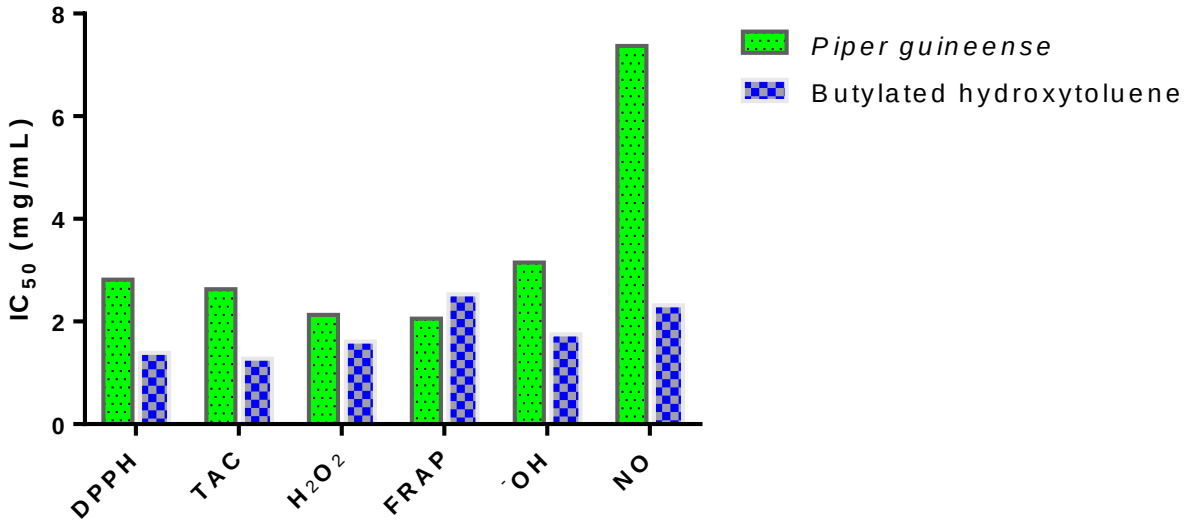


Figure 4: IC_{50} values for various *in vitro* antioxidant activity of aqueous seed extract of *Piper guineense* Schumach. & Thonn. Values are means of triplicate determinations. **DPPH** = 2,2-diphenyl-1-picrylhydrazyl scavenging activities, **TAC =** Total antioxidant capacity, **H_2O_2 =** Hydrogen peroxide scavenging activities, **FRAP** = Ferric ion reducing antioxidant properties, **$^{\cdot}$OH** = Hydroxyl radical scavenging activities, **NO** = Nitric oxide reducing power. **IC_{50}**= Half maximal inhibitory concentration.

Results and discussion

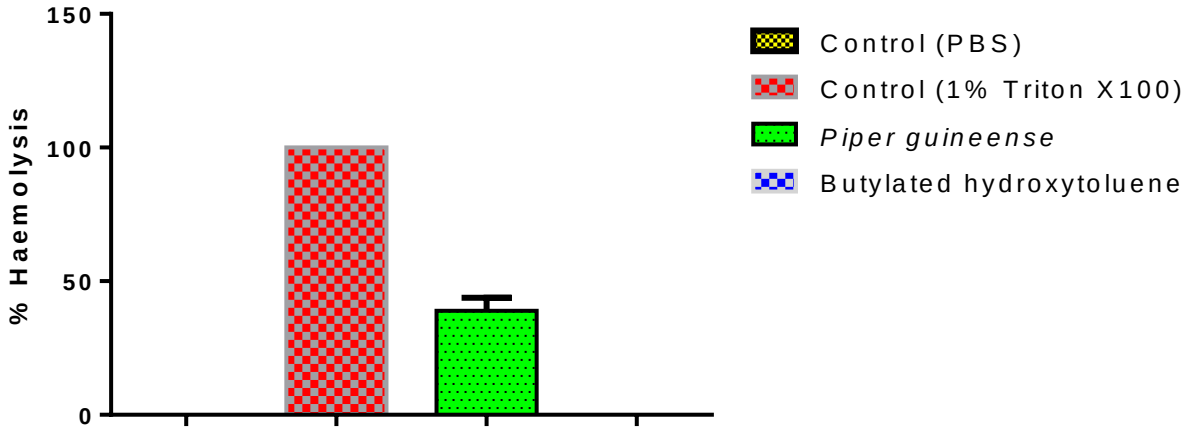


Figure 5: Effects of aqueous seed extracts of *Piper guineense* Schumach. & Thonn. on erythrocyte lysis. PBS = Phosphate Buffer Saline. Values are mean ± SD of triplicated determinations

Results and discussion

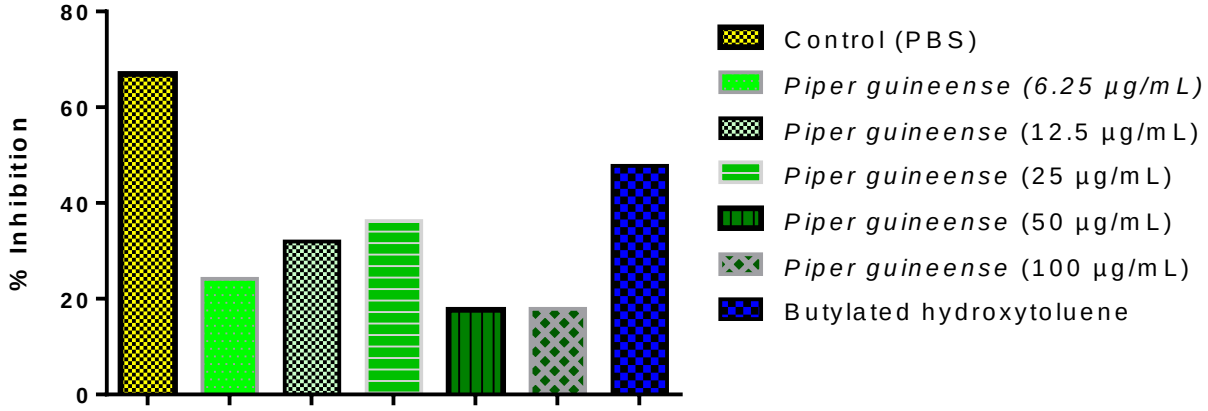


Figure 6: Erythrocytes protection effects of aqueous seed extracts of *Piper guineense* Schumach. & Thonn. Values are mean of triplicated determinations

Results and discussion

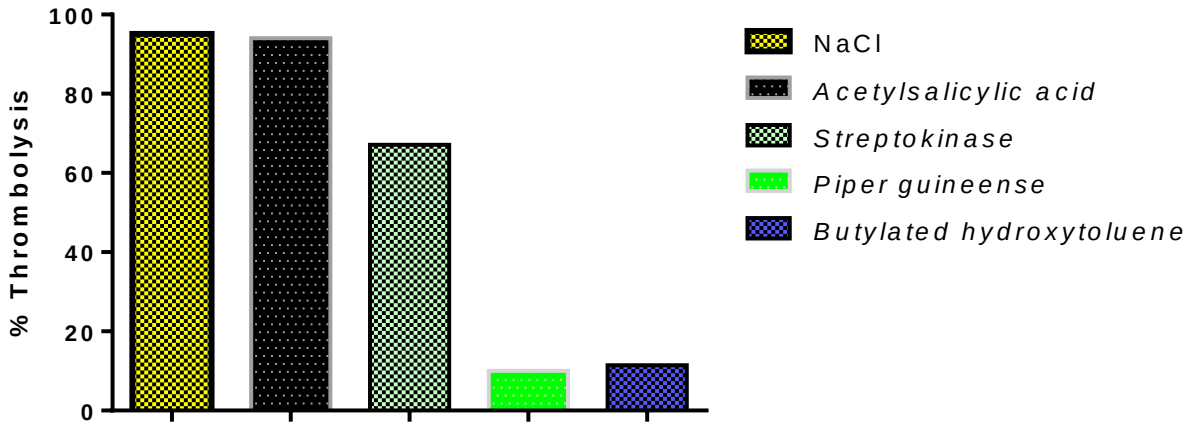


Figure 7: Thrombolytic activity of aqueous seed extract of *Piper guineense* Schumach. & Thonn. Values are mean of triplicated determinations

Results and discussion

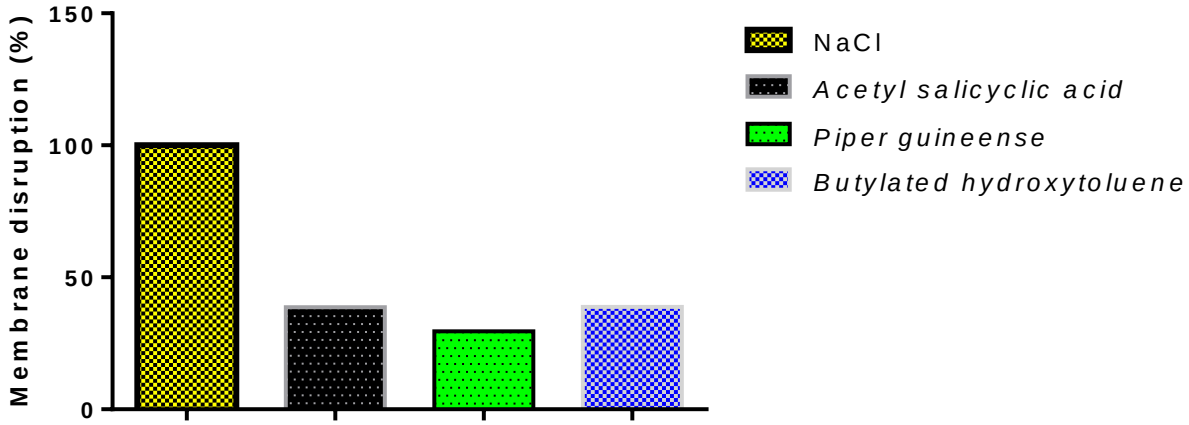


Figure 8: Membrane stability effects of aqueous seed extract of *Piper guineense* Schumach. & Thonn. Values are mean of triplicated determinations

Conclusions

The results indicated that aqueous extract of *piper guineense* seed;

1. possess potent *in vitro* antioxidant properties
2. did not cause significant lysis of red blood cells at concentrations of 6.25 – 100 µg/mL.
3. protects red blood cells through protection of the cell membrane and thrombolytic activities.

The study demonstrated the *in vitro* antioxidant properties and erythrocyte protective activities of aqueous extracts of *Piper guineese* seeds.

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Acknowledgments

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