Clinical Investigation of the Effects of 
Musanga cecropioides on the Glycemia of Diabetics

Jesse V. Vanucchi*, Dr. Webe, C. Kadima, Amanda Shedd, Yvaine Dorce, Jaydon Kiernan

SUNY Oswego, University of Kinshasa

Contact Information: vanucchi@oswego.edu, webe.kadima@oswego.edu

Abstract

Based on a Diabetes Screening Campaign from 2011-2013 with 1,009 participants it was shown that 9% of the population is diabetic and 18% have impaired glucose tolerance in Kinshasa, Democratic Republic of Congo (DRC). In DRC, 80% of the population resort to traditional medicine for diabetes and other healthcare needs due to reliability and low costs. The problem with traditional medicine is that there has not been much scientific evidence in testing the efficacy, safety, and quality of products used. In past research findings, it was shown that an aqueous extract of the bark of Musanga cecropioides—aka Umbrella tree—inhibits the activity of Glucose-6-Phosphatase, the enzyme that catalyzes the last step in the production of glucose via gluconeogenesis. The aim of my research was investigating whether this plant can decrease the production of glucose in a small sample of diabetics patients at the Medical Center of Mwinda. Results obtained indicate that Musanga cecropioides prevents high glycemia excursion after; and, it is effective in returning blood glucose to normal basal levels.

Introduction

Diabetes is a defect in the ability of the human body to convert glucose to energy. There are several enzymes involved in the production of glucose via gluconeogenesis and glycogenesis as shown in scheme 1. If a compound can inhibit one of these enzymes, production of glucose will be blocked, thus preventing high blood-glucose levels—a.k.a hyperglycemia. (Wu, 2010)

It was determined using a spectrophotometric method that the aqueous plant extract of Musanga cecropioides (African corkwood tree or umbrella tree in Moraceae family) originated from the Democratic Republic of Congo (DRC) inhibits glucose-6-phosphate in the concentration range from 0.5 to 5.0 µg/mL. Compared to the well known inhibitor Metformin, used in the treatment of diabetes, 5.0 µg/mL of Musanga cecropioides has an inhibitory effect comparable to 805 µM of Metformin. The method entailed reacting the phosphate released from Glucose-6-phosphate with ammonium molybdate to form a complex that absorbs between 250 and 400 nm (Vanucchi, 2013; Baginski, et al. 1974; Bergmeyer & Harper, 1968). It will be interesting to determine whether concentrations that are effective for the inhibition of Glucose-6-phosphatase in vitro are similar to those required to elicit anti-hyperglycemic effects in clinical studies.

Methods: Extraction of plant

Location: Pharmacist D. Mungaza’s laboratory in the INRB (National Institute of Biomedical Research) in Centre Ville, Commune of Gorima, Kinshasa, DRC & plant market

1. Plant bark was washed with cold water
2. Incubated in freezer at -20°C for 24 hours
3. Freeze dried in lyophilizer at -47°C vacuuming at 0.7 mbar for duration of 48 hours (image 2)
4. Dried bark was grinded into a powered substance at the plant market (image 3)
5. Powdered bark was sifted to filter off solid (image 4)
6. Sifted powder was decocted in warm water and the aqueous layer was extracted.
7. Aqueous layer was incubated and then freeze-dried using the same prior settings (image 5)
8. Produced a product with 10% yield

Methods: Human Subjects study

Location: Medical Center of Mwinda, Commune of Mwinda, Kinshasa, DRC

Human Subjects: Patients with diabetes under care of doctor at the Medical Center of Mwinda

Preparation: Fast 12 hours/Fast of regular medication for 3 days

Experiment: Monitored each patients’ blood glucose level by blood drawn finger pricking technique and measuring with an Accu-check Aviva blood-glucose meter.

Duration: Every 30-60 minutes for up to 4 hours

Blood-glucose ranging 101-229 mg/dL were given treatment
1. Control of 250 ml Orange juice
2. 250 ml Orange juice containing 293 mg plant extract
3. 250 ml Orange juice containing 600 mg plant extract

Results

Normal Fasting Blood Glucose: ≤100 mg/dL
Impaired Fasting Glucose: 101-125 mg/dL
Hyperglycemia: ≥126 mg/dL

Discussion and Conclusion

Effective type 2 diabetes treatment prevent excessive blood glucose increase after food intake and decrease the basal blood glucose to a normal/healthy level. According to table 1, an average %increase of 3.7 was obtained when patients consumed 600 mg of the extract of Musanga cecropioides. This increase is significantly lower than the increase obtained (68%) under control conditions, indicating the effectiveness of Musanga cecropioides in curbing excessive glycemia excursion after a meal. The increase of glycemia obtained at 600 mg Musanga cecropioides is, however, comparable to that obtained with 293 mg (37%).

With respect to the basal glucose levels, 73 % of the patients experienced a decrease to below 200 mg/dL, and 46 % of the patients experienced a decrease to below 140 mg/dL.

Regarding the dosage, it is interesting to note that the effective dosage of 293 mg per subject of 61 kg average weight translates to 4.8 µg/kg, which is similar to the effective concentration of Musanga cecropioides for the inhibition of Glucos-6-phosphatase (5µg/mL).

References