Journal of Agriculture and Sustainability
ISSN 2201-4357
Volume 3, Number 2, 2013, 216-222

Chemical composition of a standard sugarcane wine of *Saccharum officinarum* Linn from Woleu-Ntem, Gabon

ABOGO MEBALE Aimé-Jhustelin[1]*, SUEBANG François Constant[1], ONDO AZI Alain Serge[2], YEMELONG Jean Norbert[1], ONDO Jean Aubin[2], Nsi Emvo Edouard[3], EBA François[1]

[1]Laboratoire Pluridisciplinaire des Sciences (LAPLUS), Ecole Normale Supérieure, B.P. 17009 Libreville, Gabon

[2]Institut National d'Agronomie et de Biotechnologies (INSAB), Université des Sciences et Techniques de Masuku (USTM), B.P. 905 Franceville, Gabon

[3]Département de Biochimie, Faculté des Sciences, Université des Sciences et Techniques de Masuku (USTM), B.P. 905 Franceville, Gabon.

Corresponding author: ABOGO MEBALE Aimé-Jhustelin, Laboratoire Pluridisciplinaire des Sciences (LAPLUS), Ecole Normale Supérieure, B.P. 17009 Libreville, Gabon

Abstract

The alcohol level and phytochemical screening of sugarcane wine of *Saccharum officinarum* Linn were studied. The proof of sugarcane wine was evaluated at more than **14% (v/v)**. Studies of phytochemical constituents showed the presence of **alkaloids**, **polyphenols**, **tannins**, **reductor compounds** and **flavonoids**. Many of these compounds are benefit for the human health. Presence of polyphenols and flavonoids allow the wine to get antioxidant properties.

Keywords: *Saccharum officinarum* Linn, sugarcane wine, alcohol level, phytochemical constituents.

Introduction

Sugarcane plant is widespread in tropical regions. It is used for many purposes including the manufacture of alcoholic drinks (Sanchez, 1982; Luzietoso et al 2000). In Central Africa, the juice of sugar cane is used to make several types of drinks with or without additives (Mura et al, 2003; Luzietoso et al 2000). Many drinks of these are commonly considered as wines. A standard sugarcane wine from Woleu-Ntem (Malamba) is traditionally-made from the fermentation of sugarcane juice of *Saccharum officianurum* in the presence of many species of barks of *Garcinia* commonly called "bitter wood" (Raponda-Walker et al, 1995).

The consumption of wine is increasing since many years, but informations about its chemical composition and its alcohol content are not described. Moreover, in the food domain, it is essential to know the main families of organic compounds present in the wine. Indeed, despite the abuse of alcohol is dangerous for health, some molecules may be beneficial for the well-being of consumers (Birt et al, 2001; Bounatirou et al, 2007). This study consists, not only to determine the alcohol level of a standard sugarcane wine, but also to identify its major phytochemical constituents.

Materials and Methods

Sugarcane wine preparation

Mature *Saccharum officinarum* Linn was collected in village Centreville (north of Gabon) in January 2013. The juice was extracted using a manually sugarcane press. To be fermented to become sugarcane wine, the juice was put in the plastic container and stem bark of *Garcinia kola* was added. The mixture is left for two weeks at room temperature in the presence of the air.

Evaluation of total alcohol level

500 mL of sugarcane wine was distilled for 3 h. The distillate was introduced in a flask and distilled water was completed to 500 mL. To 1 mL of the resulting alcoholic solution, were added 20 mL of aqueous solution of $K_2Cr_2O_7$ at 0.1 $mol.L^{-1}$ (2.10^{-3} mol) and 10 mL of concentrated sulphuric acid in an erlenmeyer which has been sealed. The mixture was stirred for 30 minutes at 30°C to oxidize all alcohol of the wine. The excess of $K_2Cr_2O_7$ was then measured out with aqueous solution of $(NH_4)_2Fe(SO_4)_2,6H_2O$ at 0.5 $mol.L^{-1}$ using a potentiometer (pH-Meter CG 817).

Phytochemical analysis

Chemical constituents were determined using the methods described by Harborne (1973), Hegnauer (1973) and Wagner (1983).

Sterols and **terpenoids** were analysed by the Liebermann reaction. Tests of **flavonoids** were realised using the aqueous solution of NaOH at 10%. **Polyphenols** were characterized by iron chloride ($FeCl_3$). Test of **alkaloids** was done with the marketing Dragendorf reagent. **Tannins** were analysed by aqueous solution of lead acetate at 10%. Test of **reductor compounds** was done with the marketing Fehling reagent. Test of **saponins** was realised by observation of persistent foam (up to1cm) during 15 min. after shaking the wine in a test tube.

Results and discussion

After oxidation of alcohol, the excess of $K_2Cr_2O_7$ was measured out with aqueous solution of $(NH_4)_2Fe(SO_4)_2,6H_2O$ (Mohr salt) at 0.5 $mol.L^{-1}$ to determinate initial quantity of alcohol (table 1). The equivalent point was obtained using the tangent method (figure 1). The equivalent volume of Mohr salt obtained is 4.8 mL. The initial quantity of alcohol is obtained on the basis of the following equations:

$$2Cr_2O_7^{2-} + 16H_3O^+ + 3CH_3CH_2OH = 4Cr^{3+} + 27H_2O + 3CH_3COOH \quad (1)$$

$$Cr_2O_7^{2-} + 14H_3O^+ \ 6Fe^{2+} = 2Cr^{3+} + 21H_2O + 6Fe^{3+} \quad (2)$$

The two equations allow to (1.5 x 0.02 x 0.1) – (0.25 x 0.5 x 4.8. 10^{-3}) = 2.4.10^{-3} mol of alcohol in 1 mL of wine. 100 mL of sugarcane wine contain therefore 0.24 mol so 0.24 x 46 = 11.04 g of alcohol. The corresponding volume of alcohol in 100 mL of wine is calculated using the density of ethyl alcohol at 30 °C (0.78 $Kg.m^{-3}$). The result is 14.15 mL. In comparison with the marketing wine used as etalon, the rate of ethyl alcohol shall not be less than 14.5% (v/v).

Phytochemical screening of sugarcane wine of *Saccharum officinarum* Linn showed the presence of alkaloids, polyphenols, tannins, reductor compounds and flavonoids (Table 2). However, sterols, terpenoids and saponins were not found. Results were qualitatively expressed as negative (-) or positive (+).

Many alkaloids are known to have effect on the central nervous system and analgesic properties (Jeruto et al, 2011; Frantisek et al, 1973). Other alkaloids may be useful against HIV infection (Cowan, 1999) as well as intestinal infections (Nacoulma, 1996) and malaria (N'guessan Koffi et al, 2009). They can be responsible of the bitterness of the sugarcane wine (Bruneton, 1999).

Polyphenols can be used as purgatives (Harborne, 1973), against hypertension (N'guessan koffi et al, 2009) and bacteriostatic against fungi and bacteria (Duke, 1985; Cowan, 1999; A.C.C.T., 1989). They have antioxidant properties (Bounatirou et al, 2007).

Tannins are polyphenolic compounds. They have received a great deal of attention in recent year. Tannins are frequently present in the wines and can cure or prevent a variety of ills (Serafini et al, 1994). Tannins found in the sugarcane wine are probably the condensed tannins. They have been determined to bind cell walls of ruminal bacteria, prevented growth and protease activity (Jones et al, 1994). Mota et al (1985) have showed that tannins can exhibit anti-inflammatory activity (Nkeh-Chungag et al, 2009).

Flavonoids are a very important group of compounds. They can reduce bleeding (Nacoulma, 1996) and have hypotensive and anti-cancer properties (Birt et al, 2001; Ramos, 2007). Flavonoids contribute to strengthening of blood vessel, help to eliminate varicose vein and prevent circulatory problem (N'guessan Koffi, 2009). In the food domain, flavonoids have antioxidant properties (Havsteen, 2002). These properties allow their to play essential role for the prevention of many health risk such as cancer, cardiovascular and ageing (Perry et al, 2000).

Conclusion

This paper reported alcohol level and phytochemical screening of sugarcane wine of *Saccharum officinarum* Linn. The determination of alcohol level was done using the dosage of the excess of $K_2Cr_2O_7$ after oxidation of alcohol. The results showed that sugarcane wine contents more than 14% (v/v) of alcohol.

Phytochemical screening of sugarcane wine showed the presence of alkaloids, polyphenols, tannins, reductor compounds and flavonoids. Presence of flavonoids can allow the wine to have antioxidant properties.

References

A.C.C.T. Vers une pharmacopée caraïbe. Edition de l'Agence de Coopération Cuturelle et Technique (A.C.C.T). 1989 ; 476.

Birt DF, Hendrich S, Wang W. Dietary agents in cancer prevention: Flavonoids and isoflavonoids. *Pharmacol. Therapeutics*. 2001; 90 (3), 157-177.

Bounatirou S, Smiti S, Miguel MG, Faleiro L, Rejeb MN, Neffati M, Costa MM, Fiueiredo AC, Barroso JG, Pedro LG. Chemical composition, antioxidant and antibacterial activities of the essential oils isolated from Tunisian *Thymus capitatus* Hoff. Et Link. *Food chemistry*. 2007; 105, 146-155.

Duke JA. Handbook of medicinal herbs. CRC Press, Inc., Boca Raton, Fla. 1985.

Frantisek S, Stary F & Jirasek V. Plantes médicinales. Edition Lidis. 1976; 247.

Harborne JB. Phytochemical Methods ; A guide to modern techniques of plant analysis 2nd Edition, London New York. 1973.

Havsteen BH. The biochemistry and medical significance of the flavonoids. *Pharmacol. Therapeutics*. 2002; 96, 67-202.

Hegnauer R. Chemotaxonomie der Pflanzen, Bikhaäuser Verlag, Basel, Suttgart, 6. 1973; 761.

Jeruto P, Mutai C, Lukhoba C And Ouma G. Phytochemical constituents of some medicinal plants used by the Nandis of South Nandi district, Kenya. *Journal of Animal & Plant Sciences*. 2011; Vol 9, issue 3: 1201-1210.

Jones SB Jr and Luchsingger AE. Plant systematics. McGraw-Hill Book Co., New York, N.Y. 1986.

Luzietoso N, Bom Khonde PC, Bazabana JJM. Utilisation, transmission et amélioration d'un savoir-faire traditionel: le cas du vin de canne à sucre. *Notes CA*. 2000 ; 24, 1-4.

Mota R, Thomas G, Barbosa Filho JM. Anti-inflammatory actions of tannins isoled from the bark of *Anacardium occidentale* L. *Journal of ethnopharmacology*. 1985; Vol 13, 289-300.

Nacoulma-Ouédraogo O. Plantes médicinales et pratiques médicinales traditionnelles au Burkina Faso : cas du Plateau central. Thèse de Doctorat ès Sciences Naturelles, Université de Ouagadougou (Burkina Faso). 1996 ; 605.

N'guessan Koffi, Kadja B, Zihiri GN, Traoré D & Aké-Assi L. Screening phytochimique de quelques plantes médicinales ivoiriennes utilisées en pays Krobou (Agboville, Côte-d'Ivoire). *Sci. Nat*. 2009 ; Vol 6 N°1: 1-15.

Nkeh-Chungag BN, Temdie JR, Sewani-Rusike C, Fodjo YM, Mbafor JT and Iputo JE. Analgesic, anti-inflammatory and antiulcer properties of the extract of *Uapaca guineensis* (Euphorbiaceae). *Journal of Medicinal Plants Research*. 2009 ; Vol.3(9), 635-640.

Perry RJ, Watson P, Hodges JR. the nature and staging of attention dysfunction in early (minimal and mil) alzeimer's desease relationship to episodic and semantic memory impairment. *Neuropsychologia*. 2000; 38: 252-271.

Ramos S. Effects of dietary flavonoids on apoptic pathways to cancer chemoprevention. *J. Nutr. Biochem*. 2007; 18(7), 427-442.

Raponda-Walker A and Sillans R. Les plantes utiles du Gabon. Fondation Raponda-Walker. Edition Sépia. 1995; 197-198.

Sanchez PC. Studies on sugarcane wine (Basi) in the Philipines. PhD Dissertation. Tokyo, Japan: Tokyo University of Agriculture. 1982.

Serafini MA, Ghiselli A and Ferro-Luzzi A. Red wine, tea and anti-oxidants. *Lancet* . 1994, 344:626.

Wagner H. Drogen analyse, Dünschicht chromatographische Analyse von Arzneidrogen. Springer Verlag Berlin Heidelberg New York. 1983; 522.

Table 1. Results of dosage of the excess of $K_2Cr_2O_7$ by aqueous solution of Mohr salt at 0.5 mol.L^{-1}

V(Mohr salt)/mL	0	1	2	3	4	4.5	5	5.5	6	7	8	9	10
E/mV	1195	1194	1192	1190	1185	1162	692	658	645	629	619	611	605

Table 2. Chemical constituents of sugarcane wine.

Chemical compounds	Alkaloids	Polyphenols	Flavonoids	Tannins	Reductor componds	Saponins	Setrols and terpenoids
Results	+	+	+	+	+	-	-

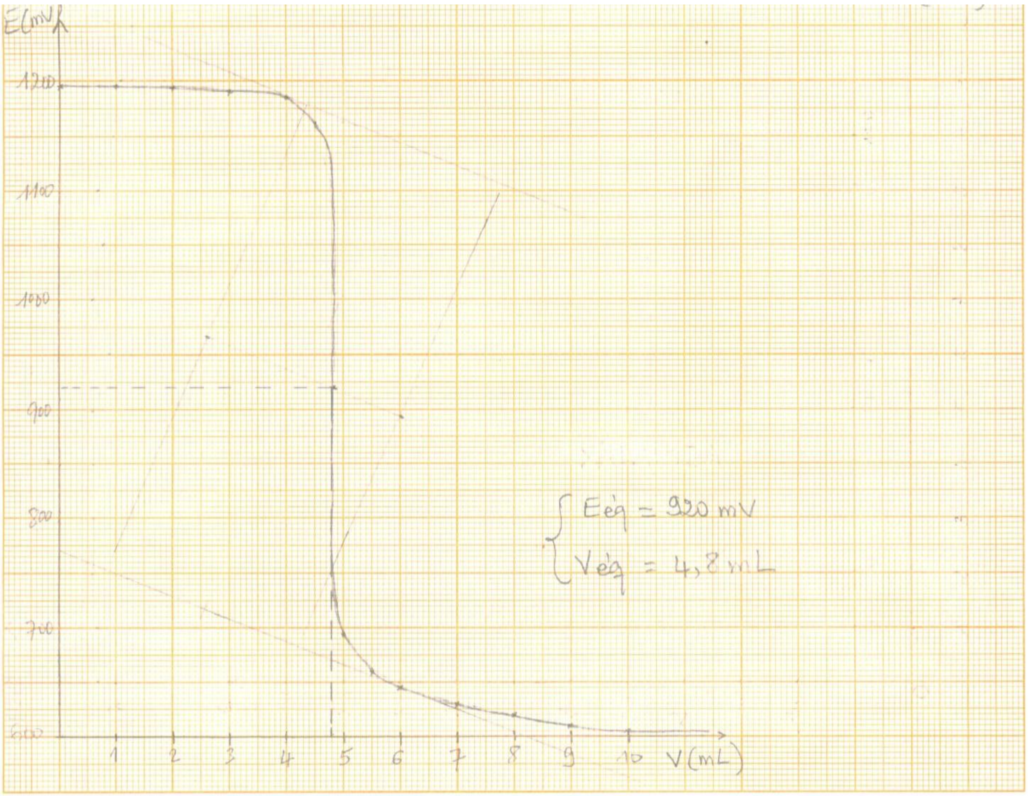

Figure 1. Graph of the dosage of $K_2Cr_2O_7$ by aqueous solution of Mohr salt.