Scientific Research and Essays Vol. 8(6), pp. 274-276, 11 February, 2013
Available online at http://www.academicjournals.org/SRE
DOI: 10.5897/SRE10.948
ISSN 1992-2248 ©2013 Academic Journals

Short Communication

Endogenous ethanol production in the larva of oil palm weevil (*Rhynchophorus palmarum,* coleoptera; curculionidae)

Kemka H. Ogbonda[1]* and David B. Kiin-Kabari[2]

[1]Department of Biology, Ignatius Ajuru University of Education, Rumuolumeni, PMB 5047, Port Harcourt, Nigeria.
[2]Department of Food Science and Technology, Faculty of Agriculture, Rivers State University of Science and Technology, Nkpolu, PMB 5080, Port Harcourt, Nigeria.

Accepted 17 October, 2012

This study investigated the larva of oil palm weevil for the presence of endogenous ethanol. The body tissue fluid of the larva was made and its alcoholic content determined using the specific gravity method. The alcohol content as percentage by volume was estimated from the laboratory alcoholometry. For comparison, the alcohol contents of lager beer and red wine were also estimated. Results showed that the larva contained about 6.52% ethanol, which compared favourably with the amounts contained in lager beer (5.05%) and red wine (11.35%). This confirmed the traditional belief with regard to the intoxicating quality of consuming a few of the raw larva.

Key words: Endogenous alcohol, oil palm weevil, larva, alcoholic beverage, intoxicating.

INTRODUCTION

In humans and other animals, ethanol is constantly formed endogenously from acetaldehyde. Acetaldehyde can be generated *in situ* from the metabolism of pyruvate, threonine, deoxyribose-5-phosphate, phosphoethanolamine, alanine, and presumably from other substrates (Ostrovsky, 1986). In Japan since the 1950s there have been dozens of published case reports of people feeling drunk after eating carbohydrates such as rice, a condition called auto-brewery syndrome. In almost all of the reported cases, intestinal overgrowth of candida or other yeasts was identified as the cause (DUI Library, 2007). In recent times, gastrointestinal production of ethanol from *Candida albicans* and *Saccharomyces cerevisiae* has been reported and, indeed, reports are legion which are evidence of endogenous ethanol production by bacteria and yeasts in humans and other animals (Mezey et al., 1975; Saavedra, 1999; Logan and Jones, 2000; Augusta, 2012).

Many insects are known to house microorganisms in their intestines, some of which are known ethanol producers. For instance, *Saccharomyces* species including *S. kluyveri* and *S. cerevisiae* have been isolated from the intestine of the insect *Drosophila* (Vaughan-Martini and Martini, 1993).

Oil palm weevil (*Rhynchophorus palmarum*) is common in virgin forests and agroecosystems exploiting oil palms (Hagley, 1965; Jaffe et al., 1993). The larvae need living plant tissue in order to survive. They suck the sugary tissue sap and so feed exclusively on live vegetative tissue. The larvae are food for various peoples of many nations. Among the Ikwerres of Rivers State, Nigeria, the group that relishes them most is hunters and oil palm fruit-cutters. During hunting or palm fruit harvesting outings, they deliberately look-out for and harvest the larvae from suspected dead palm stems. They derive much pleasure and satisfaction from eating the larvae. Part of what gives them pleasure is the fact that eating a few of the raw larva makes them feel tipsy as it, the larva, is thought to contain an intoxicating substance. In this

*Corresponding author. E-mail: kemkahumphreyogbonda@yahoo.com.

Table 1. Reported and estimated ethanol contents of oil palm weevil larva, lager beer, and red wine.

Parameter	Ethanol content (%,v/v)			Remarks
	Larva	[+]Lager beer	[#]Red wine	
Estimated	6.52	5.05	11.35	
Reported*	-	5.10	11.50	
Normal range	-	3.5 - 6.0	7.0 - 13.0	Frazier and Westhoff (1978)
	-	3.0 - 6.0	7.0 - 15.0	Talaro and Talaro (2002)

*As reported by the manufacturing company. [+]Star lager beer, brewed and bottled by Nigerian Breweries PLC, NAFDAC No. 01.0625; 60 cl. [#]Baron de Walls – 46370 Espana Vin Rouge Red Wine (Table wine), product of Spain; 75de.

study, therefore, the authors set out to examine the body tissue fluid of the larva of oil palm weevil for the presence of endogenous ethanol. Result will help to explain the observed intoxicating (auto-brewery syndrome) property of the larva.

MATERIALS AND METHODS

Sample (larva) collection

The oil palm weevil larva used in this study was harvested by a paid local hunter in Alakahia, Akpor, Rivers State, Nigeria.

Preparation of the body tissue fluid solution of the larva

Larvae numbering 20 to 25 were randomly picked. They were washed in distilled water and homogenized completely in a warring blender for 2 min with 200 ml distilled water. The homogenate was filtered using Whatman's No.1 filter paper and the solution (filtrate) used for alcohol estimation, which was done within 2 h after blending.

Estimation of alcoholic content of the larval solution

The alcoholic strength of the larval solution was determined by gravimetric method using double distillation. The specific gravity (S.G.) of the distillate was measured at 20°C/20°C using a 50 ml pycnometer bottle. The alcohol content as percentage by volume was estimated from the laboratory tables (alcoholometry).

Treatment and estimation of alcoholic contents of lager beer and red wine

For comparison, the alcoholic contents of lager beer and red wine were estimated. Wine was de-gased by shaking in a flask of about twice its volume. Ten milliliters (10 ml) of a 12% suspension of calcium oxide was added to 200 ml of the wine in the distillation flask to make it alkaline as shown by the use of phenolphthalein, as external indicator. The beer was de-gased and decarbonated by pouring it from one beaker to another several times. Two hundred milliliters (200 ml) of it was measured into the distillation flask. All samples (bear and wine) were distilled and the alcoholic contents estimated as in the case of the larval solution explained above.

RESULTS

This investigation was designed to find out whether or not the body tissue fluid of the larva of oil palm weevil contained alcohol (ethanol). Result showed that the body of the insect larva contained ethanol to the level of 6.52%. This percent alcohol was compared to what we have in common alcoholic beverages such as lager beer and red wine (Table 1).

DISCUSSION

The results of this investigation show clearly that the amount of alcohol contained in the insect larva is similar to what was obtained in lager beer and red wine as estimated and as reported (Table 1). The normal alcohol content of lager beer and red wine as reported by Frazier and Westhoff (1978) is 3.5 to 7.0% and 7.0 to 13.0% by volume respectively. Talaro and Talaro (2002) have reported a range of 3.0 to 6.0% for lager beer and 7.0 to 15.0% for red wine. By the results obtained in this study the insect larva, lager beer, and red wine have alcohol contents which fall within the ranges reported by the authors. This unequivocally explains why eating a few of the larva is slightly intoxicating. The large-scale growing of the larva in oil palm stems will be a welcome relief to wine and beer makers who could now extract the alcohol content of the larva to make more of these beverages. This new technology would be easy and cheap to adopt because of its cost-effectiveness: oil palm is a renewable resource and will eliminate the requirement for the expensive barley and grape fruits needed for the manufacture of these beverages.

Conclusion

Rhynchophorus palmarum larva is found in this study to contain about 6.52% ethanol, comparable to what is contained in a bottle of lager beer or red wine. This confirms the traditional belief that consuming a few of the

raw larva is slightly intoxicating.

REFERENCES

Augusta J (2012). Designated Drunk: Can you get intoxicated without actually drinking alcohol? Sun. Times Media, LLC.

DUI Library (2007). DUI Library: BAC – Endogenous ethanol production. http://www.s/weekly.com/.posted Friday, March 23, 2007. Retrieved August 02, 2012.

Frazier WC, Westhoff DC (1978). Food Microbiology. Tata McGraw-Hill, 3rd Edition.

Hagley E (1965). On the life history and habits of *Rhynchophorus palmarum.* Ann. Entomol. Soc. Ame. 58:22-28.

Jaffe KS, Cerda H, Hernandez JV (1993). Chemical Ecology of *Rhynchophorus palmarum:* Attraction to host plants and to a male-produced aggregation pheromone. J. Chem. Ecol. 19:1703-1720.

Logan BK, Jones AW (2000). Endogenous ethanol "auto-brewery syndrome" as a drunk-driving defence challenge. Med. Sci. Law 40(3):206-215.

Mezey E, Imbembo AL, Potter JJ, Rent KC, Lombardo R, Holt PR (1975). Endogenous ethanol production and hepatic disease following jejunoileal bypass for mobid obesity. Am. J. Clin. Nutr. 28(11):1277-1283.

Ostrovsky YM (1986). Endogenous ethanol production. Elsevier Sci. Inc. 3(4):239-244.

Saavedra J (1999). Probiotics and infectious diarrhea. Am. J. Gastroenterol. 95(1 Suppl.):S16-S18.

Talaro KA, Talaro A (2002). Foundations in Microbiology, 4th Edition. Mc Graw-Hill.

Vaughan-Martini A, Martini A (1993). A taxonomic key for the genus *Saccharomyces.* System. Appl. Microbiol. 16:113-119.