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RESEARCH ARTICLE

EVALUATION OF *DACRYODES EDULIS* (G. DON) HJ LAMPULP OIL EFFECTS ON BIOCHEMICALS PARAMETERS IN MICE

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ABSTRACT

Background: The oil of *D. edulis* pulp fruits is known for its medicinal and nutritional potentialities. Evaluation of hepatic and renal function is a major step in the study of the pharmacological activities of plant extracts. ***Objective***: To evaluate the effects of *D. edulis* (DEO) oil on biochemical parameters in mice. ***Methods:*** Lipid (TG, CT, HDL-C), transaminases (ALT and AST) and creatinin levels were determined in the serum after oral administration of DEO (5 and 10 ml/kg), for 6 weeks. The LDL-C level was calculated according to the Friedwald formula. The biochemical parameters levels of DEO treated animals were compared to those of the control animals. ***Results:*** The results obtened in dicate that DEO administration did not cause any significant modification of the animals weight and the concentrations of TG, CT and HDL-C.A dose-dependent decrease in LDL-C, ALT, AST and CR was observed in animals treated with DEO, compared to control animals. ***Conclusion:*** The results of this study show that DEO does not significantly alter the lipid profile but provides protection for hepatocellular and renal function.

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INTRODUCTION

Dacryodes edulis (African pear) is a species of the family Burseraceae. Several studies have reported the important fruit pulp content of D. edulis in lipids, vitamins, proteins and antioxidants (Okwu *et al.,* 2008; Ajibesin 2011; Uhunmwangho *et al.,* 2018). Antibiotic, anti-inflammatory, hypoglycemic and hypolipidemic potentials are also attributed to D. edulis (Agbor *et al.,* 2007; Koudou *et al.,* 2008). The plant would help prevent in humans the consequences of lipid peroxidation associated with cancer or atherosclerosis. Phytochemical studies have revealed the presence of saponins, alkaloids, tannins, flavonoids and phenolic compounds (Okwu *et al.,* 2008; Koudou *et al.,* 2008; Kapseu *et al.,* 1998; Ajayi *et al.,* 2008). Evaluation of hepatic and renal function is a major step in the study of the pharmacological activities of plant extracts (Olorunnisola *et al.,* 2009).It allows to assess possible deleterious or protective effects of these extracts on the liver and kidneys, two organs involved in the metabolism of bioactive substances. The objective of this study was to evaluate the effects of prolonged treatment of *D. edulis* fruit oil on mice biochemical parameters.

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MATERIAL AND METHODS

Plant materials: African pear (*D. edulis*) fruits were purchased from Brazzaville market. The fruits were pitted and the pulp put to dry troom temperature until needed. Fractions of 250 g dried pulp fruit were submitted to hydrodistillation for approximatively 3 h. Oil extracting was dried in placing in etuve at 37°C until needed. The concentrated oil sample was used for experiments, in the dilution of 10 % in distillated water.

Animals and treatments : Fifteen apparently healthy Balb/c mice, male and female, aged between 6 to 8 weeks, from the Faculty of Health Sciences of the Marien Ngouabi University, Brazzaville, were used. They were housed in polypropylene cages. Animals were allowed free access to feed and drinkable water *ad libitum*, and subject to 12 h light/dark cycles.All experiments were conducted in compliance with Directive 2010/6106/EU, on the protection of laboratory animals (Hartung *et al.,* 2010).The animals were divided into 3 lots of five mice each ;distilled water, *D. edulis* oil (DEO) 5 and 10 ml/kg.The different products were administered daily orally, at the same time and for a periode of 6 weeks.

Blood collection: The blood was collected through retro-orbital sinus, 1h after the last treatment. Animals were previously anesthetized by chloroform. The blood was collected in tubes with coagulation accelerator gel.The sera samples were obtained as the supernatant after centrifuging the coagulated blood samles at 3,000 rpmfor 15 min.The serum obtained was decanted into 2 ml tubes and used for detrmination of biochemicals parameters.

Determination of weight change and biochemical parameters: The body weight of the animals was determined daily and at the same time, Serum biochemical parameters (total cholesterol, high density lipoprotein - cholesterol, alanine aminotransferase, Aspartate Aminotransferase and creatinine) were measured using the *Biomérieux* commercial kits, on the CYAN® analyzer. Total cholesterol (TC) was assayed by end-point enzymatic method (Richmond, 1973; Allain *et al.,* 1974). The method described by Fossati and Prencipe (Fossati and Prencipe, 1982) was used to determine the concentration of triglycerides (TG). The precipitation method of Low Density Lipoprotein (LDL) - cholesterol as described by Burstein *et al.* (1970) and Lopez-Virella *et al.* (1977) was used to determine High Density Lipoprotein (HDL) - cholesterol. Alanine aminotransferase (ALT), as partate aminotransferase (AST) and creatinin (CR) concentration were assayed by the two-point kinetic method (Richmond, 1973; Reitmans, 1957). LDL-C was calculated according to Friedwald's formula (Friedewald *et al.,* 1972; Duvillards, 2011):

LDL-C = CT - (C-HDL + TG / 5)

Statistical analysis: Results are expressed as mean ± standard error of mean of five determinations. Statistical comparisons between the control group and the DEO treated groups were performed using *Soudent test,* by *In Stat Plus v.3.06*. The significance was set atthe $p < 0.05$ level.

RESULTS

Body weight change: Prolonged administration of DEO does not significantly modify the body weight of animals, compared to controls, as shown in Table I.

Biochemical parameters: The effects of DEO on biochemical parameters are shown in Table II. Compared with the control group, DEO treated animals showed no significant changes in TG, TC and HDL-C concentrations. However, a significant decrease in LDL-C ($p < 0.05$), ALT (with DEO at 5 ml/kg, $p < 0.05$and 10 ml/kg, $p < 0.0001$), AST (with DEO at 5 ml/kg, $p < 0.05$and 10 ml/kg, $p < 0.0001$) and creatinine (with DEO at 10 ml / kg, $p<0.05$) was observed in animals treated with DEO, with the dose of 10 ml / kg ($p<0.05$).

Table I. Effects of DEO on mice body weight

Week	Group /body weight (g)		
	CTRL	DEO 5 ml/kg	DEO 10 ml/kg
S1	25.8 ± 3.11	25.8± 3.34	26.2± 4.08
S2	25.4 ± 3.05	25.2± 3.96	25.8± 3.11
S3	24.6 ± 3.91	24,8± 4.20	25.6± 3.13
S4	25.0 ± 3.74	24.00± 3.67	25.4± 3.20
S5	25.6 ± 3.50	25.00± 4.06	26.2± 2.28
S6	25.4 ± 3.43	25.4± 3.58	25.8± 2.16

The weights are expressed as mean ± standard error. CTRL: control; DEO: D. edulis oil; S: week. n = 5 animals.

Table II. Effects on biochemical parameters after DEO treatment

Parameters	Group		
	CTRL	DEO 5 ml/kg	DEO 10 ml/kg
TG (g/l)	1.25 ± 0.02	1.12 ± 0.06	0.98 ± 0.12
TC (g/l)	1.46 ± 0.22	1.45 ± 0.04	1.31 ± 0.09
HDL-C (g/l)	0.40 ± 0.05	0.31 ± 0.01	0.28 ± 0.01
LDL-C (g/l)	0.81 ± 0.39	0.74 ± 0.13	0.72 ± 0.15*
AST (U/L)	157.00 ± 6.91	128.22 ± 7.79*	107.94 ± 7.29**
ALT (U/L)	161.4 ± 5.41	146.58 ± 11.98*	103.72 ± 8.91**
CR (mg/dl)	9.62 ± 0.78	7.36 ± 1.14	5.02 ± 1.60*

(*): p <0.05; (**): p <0.001.CTRL: control group; DEO group: D. edulis oil; TG: Triglycerids; HDL-C: High Density Lipoprotein cholesterol; LDL-C: Low Density Lipoprotein cholesterol; CR: Creatinin; ALT: alanine aminotransferase; AST: Aspartate amino transferase.

DISCUSSION

The evaluation of weight and blood parameters can be used to determine the level of adverse effects of various products including medicinal extracts plants (Agbaje *et al.,* 2009). This investigation is necessary to evaluate a possible risk of damage related to the administration of any substance. In this study, we investigated the effects of prolonged administration of *D. edulis* oil on body weight and biochemical parameters in mice. The analysis of the results shows that DEO prolonged administration does not modify the body weight of the animals, as previousey reported by Ezekwesili and Eneh (Ezekwesili and Eneh, 2014). The analysis of the biochemical parameters was carried out with the aim of looking for possible alterations of the hepatic and renal functions. In fact, the evaluation of liver and renal function constitutes a major step in the study of the pharmacological activities of plant extracts (Olorunnisola *et al.,* 2012). Increased lipid levels are a risk factor for heart failure and atherosclerosis (Ejezie and Ikekpeazu, 2010). According to our results, no significant changes in triglycerids, total cholesterol and HDL-cholesterol levels were observed after DEO prolonged in mice, at 5 and 10 ml/kg. These results arein agreement with those of Ezekwesili *et al.,* (2010) and Okonkwo *et al.,* (2018). However, a significant decrease in LDL-C was observed in DEO treatedanimals, at 10 ml/kg. These results suggest a protective effect of DEO on risk factors for atherosclerosis. Indeed, studies have shown that elevated levels of total cholesterol, LDL-C, were associated with the risk of atherosclerosis (Ejezie and Ikekpeazu, 2010). Significant increases in transaminases are associated with liver diseases such as toxic hepatitis, acute hepatic necrosis or hepatic cirrhosis.Transaminases (ALT and AST) are markers of hepatocellular cytolysis.ALT is more common in the liver than in other tissues or organs.ALT however is also found in the heart, skeletal muscle and liver (Mayne, 1994; Wallach, 1991). ALT and alkaline phosphatase (ALP) are considered to be the most sensitive enzyms for screening for asymptomatic liver disease (Green and Flamm, 2002; Shivaraj *et al.,* 2006). Elevated AST levels are also found in haemolytic anemia, myocardial infarction and cholestatic liver disease (Mayne, 1994). In our study, a significant dose-dependent decrease of ALT and AST levels was observed with DEO.These results are in agreement with the observations reported by Uhunmwangho *et al.* (2018). Renal function can be assessed by measuring the concentrations of urea, uric acid and creatinin (Hozayen *et al.,* 2011). Prolonged administration of DEO causes a decrease in serum creatin in levels. However, the difference is significant only with the 10 ml/kg dose ($p < 0.05$).These results suggest that DEO has dose-dependent protective effects on renal tissue.

Conclusion

Dacryodes edulis oil of the pulp, administered to the mice, atthe5 and 10 ml/kg, for a periode of 6 weeks, did not cause any modification of the the animalsbody weight, serum levels of TG, CT, and HDL-C.A dose-dependent decrease in LDL-C, ALT, AST, and CR serum level was found in DEO treated group.DEO may therefore have protective properties on liver and kidney tissue.

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Conflict of interest*:* authors declare there is no conflict of interest.

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