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TOXICOLOGICAL STUDY OF CYMBOPOGON CITRATUS LEAVES

M. Noa Puig, M. Friman, I. Fernández, M. Toledo, R.A. de la Torre Melis*, F. Hernández Rosales, D. Carbajal and A. Casacó

*National Center for Scientific Research and *Biology Faculty, University of Havana, Cuba*

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ABSTRACT. **Cymbopogon citratus** decoction is a very popular infusion. People has attributed medicinal properties to his plant, one of them have been confirmed (hypotensive property). The aim of this work was to evaluate the possible toxicological effects of this plant. Sub-acute study was made, including haematological, biochemical and histopathological tests in Wistar rats. Teratogenic and genotoxic studies were also performed. We did not find toxic effects, so, the conclusion is that the decoction of this plant can be drunk by the population.

RESUMEN. La decocción de **Cymbopogon citratus** (Caña Santa) es una infusión muy popular. A esta planta se le han atribuido propiedades medicinales, una de ellas ha sido confirmada (efecto hipotensor). El proposito de este trabajo fue el de evaluar los posibles efectos toxicológicos de esta planta. Se realizó un estudio sub-agudo, incluyendo pruebas hematológicas, bioquímicas e histopatológicas, en ratas Wistar. También se realizaron estudios teratológicos y genotóxicos. No se encontraron efectos tóxicos producidos por la decocción de esta planta, por lo que se concluye que su decocción puede ser ingerida por la población.

INTRODUCTION

Cymbopogon citratus is a very common plant in Cuba with important hypotensive property.[1] Ethnobotanical and pharmacological studies have often resulted in the discovery of important drug plants, and even today, many natural products, for example, reserpine, morphine, vinblastine, digitoxin, are of paramount importance, but all these drugs have adverse effects.

As it is impossible to discuss drugs, without discussion of their toxic properties, it was decidec to dilucidate wether or not **C. citratus** decoction, in a similar manner as our people prepare it for medicinal purposes, has important toxicological properties.

MATERIALS AND METHODS

Decoction of **C. citratus** leaves was prepared as follows: 10 g of dry leaves were boiled in 100 mL of distilled water (10 %) during 5 min and filtered.

Sub-acute study

Thirty nine male Wistar rats, weighing 180 to 200 g were divided into 3 groups.

The first group (n = 11) received 28 applications p.o. of 1,5 mL of 0,9 % NaCl/100 g of body weight, 5 d/week, and was considered as control group. The second one (n = 17) received 1,5 mL of **C. citratus** decoction, and the third one (n = 11) 0,5 mL of **C. citratus** decoction. In both treated groups, the volume of decoction was administered in the same manner as in the control one. Food and water were available **ad libitum.**

Animals were weighted at the bigining and at the end of the experiment.

The day 28 of the experiment, animals were anaesthetized with ether and blood was taken for haematological and biochemical studies (hemoglobin, hematocrit, urea, cholesterol, total lipids, high density lipoprotein; glucose, glutamic pyruvic transaminase and glutamic oxalacetic transaminase).

Histopathological examination Macroscopical observation of all organs was made. From each rat, one random slice of the liver, spleen, heart, small intestine, stomach, lungs, both adrenals, and from each kidney one cross section through the hilus, were fixed in 10 % neutral formaldehyde. Sections were stained with hematoxylin and eosin, and examined without knowledge of the treatment of the rats.

Teratogenic study

Sixty virgin female Wistar rats of mean weight of 220 g were bred one male and two female overnight. The presence of spermatozoa in vaginal smear was labeled day 0 of pregnancy. Rats received commercial chow diet and tap water **at libitum.** One group of 30 pregnant rats were treated from days 0 to 19, by oral route with 2,5 mL/kg of body weight of **C. citratus** decoction. Control group was treated with equal volume of normal saline solution.

On day 20 the foetuses were removed by cesarean section under ether anesthesia. The number, the intrauterine position of the foetuses, as well as the resorptions were recorded. After gross examination for external abnormalities, the foetuses were weighted, measured the height. Fifty per cent of each litter were preserved in bouin's fluid for visceral study[2] and the remainder in 95 % ethanol for skeletal study.[9]

Tests for genotoxic activity

System utilizing eukaryotic microorganism. Two strains of **Aspergillus nidulans** UH-214 and UH-222[4] were used to score mitotic crossing over and point mutations respectively.

The growth medium contained **C. citratus** decoction at 10 and at 5 % (diluting with distillated water) instead of water.

Test for gene mutation using mammalian cells. Micronucleus test. Fifteen female Wistar rats weighting 180 to 220 g were divided into 3 groups of 5 animals.

Control group was treated orally once day during ten days with 1,5 mL of 0,9 % NaCl/100 g of body weight and treated groups respectively received by oral route 0,5 and 1,5 mL/100 g of body weight of **C. citratus** decoction.

Animals were killed 6 h after the last treatment and bone marrow from right femur was processed according to Ledebur and Schmid.[5]

For each rat 3 slides were prepared. Two hundred red cells (normo and polychromatic erythrocytes) were counted to calculated the percentage of polychromatic erythrocytes (PE), as indicator of possible toxicity. The results expressed the average number of micronucleate PE per 1 000 PE (%).

RESULTS

Sub-acute study

Table I show that **C. citratus** decoction at the administered dose did not alter the studied biochemical and haematological

blood variables. macro and microscopical observations were of normal appearance in all animals.

There was not statistical differences in the increase of body weight of the three groups.

TABLA I

Blood parameters in rate treated with Cymbopogon citratus decoction

	Urea (mg/dL)	Cholesterol (mg%)	Total lipids (mg/dL)	HDL-C (mg %)	Glucose (mg/dL)	GPT (μ/L)	GOT (μ/L)	Hemoglobin (g %)	Hematocrit (%)
Cymbopogon citratus 15mL/kg	27,8 ± 1,8	104,9 ± 6,7	578,3 ± 39,4	94,1	35,16 ± 5,9	28,2 ± 3,3	17,8 ± 1,6	14,1 ± 1,3	44,3 ± 2,8
Cymbopogon citratus 5 mL/kg	25,3 ± 3,8	95,8 ± 5,4	584,0 ± 62,9	84,1	34,8 ± 2,2	28,0 ± 5,5	13,8 ± 3,8	13,9 ± 1,1	44,8 ± 1,9
Controles	31,9 ± 3,0	98,8 ± 5,5	706,0 ± 57,9	95,1	40,8 ± 5,0	28,0 ± 2,8	13,0 ± 1,9	14,1 ± 1,2	42,5 ± 2,5

HDL-C High density lipoprotein-cholesterol; GPT Glutamic pyruvic transaminase; GOT Glutamic oxalacetic transaminase

Teratogenic study

No statistical differences were obtained between control and treated groups in the number of live foetuses and in its weight or the number of resorption sites. Visceral or skeletal abnormalities were not observed.

Test for genotoxic activity

Cymbopogen citratus decoction at the studied doses did not increase the spontaneous level of mitotic crossing over or point mutation in **Aspergillus nidulas** strains. No toxicity was observed in rats and there was not clastogenic activity in rodent bone marrow (Table II).

TABLE II

Micronucleus test in rats treated with Cymbopogon citratus decoction

Dose (mL/100 g b . w)	Animal	Polychromatic erithrocytes	Normochromatic erythrocytes	Polychromatic erythrocytes (%)	Micronucleated PE	Micronucleated PE (%)
	1	537	463	53,7	7	0,7
	2	114	86	57,0	5	0,5
Saline solution (1,5)	3	166	34	83,00	3	0,3
	4	164	36	82,0	2	0,2
	5	169	31	84,5	3	0,3
	X ± DS			72,0 ± 15,3		0,4 ± 0,2
	1	110	90	55,0	4	0,4
	2	112	88	56,0	4	0,4
Cymbopogon citratus (0,5)	3	134	66	67,0	4	0,4
	4	128	72	64,0	3	0,3
	5	150	50	75,0	3	0,3
	X ± SD			63,4 ± 8,3		0,3 ± 0,2
	1	170	30	85,0	2	0,2
	2	122	78	61,0	2	0,2
Cymbopogon citratus (1,5)	3	155	45	77,5	2	0,2
	4	123	77	61,5	3	0,3
	X ± SD			70,7 ± 10,4		0,26 ± 0,09

DISCUSSION

Cymbopogon citratus decoction is a very popular infusion in Cuba, it has a very good taste and our population has attributed medicinal properties to this plant, some of them have been confirmed[1].

Now a day people across the world are looking back traditional healing plants but in authors opinion only few efforts have been done for detecting its possible toxicological effects.

The chronic administration of preparation obtained from several plants can induced a clear deterioration in the health of adult rats and mice[6-9].

It is known only one report about some aspects of the toxicology of this plant, and all the results showed to be completely atoxic to rats in their experimental conditions,[10] but they did not study genotoxicity and biochemical values.

Many plants are known to have genotoxic properties, so the tests for genotoxic activity are very important.

In this work the authors studied some possible toxicological properties of **Cymbopogon citratus** decoction prepared in a similar manner as people drink it and their could not find any adverse effect.

It can be concluded that at present,there is not reason for stoping to drink C.C. decoction.

BIBLIOGRAPHY

1. Carbajal D., Casacó A., Arruzazabala L., González R. y Tolón Z. Primer Activo Nacional Plantas Medicinales, 1985.
2. Wilson J.G. Int. Teratology: Principles and Techniques, J.G. Wilson and J. Warkany, 262-277, ed. Chicago Press, Chicago.
3. Dawson A.B. **Stain Tech. 1,** 123, 1962.
4. Wood S. and Kafer E. **Nature 216,** 63, 1967.
5. Ledebur M. and Von Schmid A. **Mutation Research, 19,** 109, 1973.
6. Goeger D.E., Cheeke P.R., Råmsdell H.S., Nicholson S.S. and Buhler D.R. **Toxicology letters 15,** 19, 1983.
7. Gordon W.P., Forte A.J., MacMurtry R.J., Gal J. and Nelson S.D. **Toxicology and Applied Pharmacology 65,** 413, 1982.
8. Schoental R. **Toxicology letters 10,** 322, 1982.
9. Swick R.A., Cheeke P.R., Goeger D.E. and Buhler D.R. **Journal of Animal Science, 55,** 1411, 1982.
10. Souza Formigoni M.L.O., Lodder H.M., Gianotti Filho O., Ferreira T.M.S. and Carlini E.A. **Journal of Ethnopharmacology 17,** 65, 1986.