Acorus calamus Decrease Voluntary Alcohol Intake in Wistar Rat

Araya Supawat, Jintana Sattayasai
[1]*Department of Pharmacology, Faculty of Medicine, Khon Kaen University*
E-mail: porlynana@hotmail.com

Background and Objective: Alcohol dependence is one of major health problems in worldwide and being a risk factor of morbidity and mortality. Today, based on mechanism of action, certain anticonvulsants such as topiramate, oxcarbazepine and sodium valproate are used for the treatment of alcohol dependence and alcohol intake. As many medicinal plants, including *Acorus calamus* (AC), have anticonvulsant effect, it might be possible to use for treatment of alcohol dependence and reduce alcohol intake.

Methods: Wistar rats were given free access to ethanol–sucrose solutions during 2-hour sessions for 8 weeks. On treatment phase (Days 1–10), animals received pre-treatment of 3% tween 20 (control) or AC 200, 400 mg/kg (1 h before alcohol). After that, the animals continued to be given free access to a 10% ethanol–5% sucrose solution during 2-hour sessions. Volume of alcohol intake (ml/d), water intake (ml/d) food intake (g) and body weight were recorded.

Results: The results showed that AC 200 and 400 mg/kg could significantly decrease alcohol, water and food intake. For monitored drug-induced weight changes, AC 400 mg/kg treated groups were significant decreased body weight of rats.

Conclusion: The results suggested that *Acorus calamus* decreased alcohol intake. So, *Acorus calamus* might be one of medicinal plant for treatment alcohol dependence.

Key words: Alcohol dependence, alcohol intake, *Acorus calamus*

ศรีนครินทร์เวชสาร 2557; 29 (suppl):126-28. ♦ Srinagarind Med J 2014 ;29 (suppl):126-28.

Proceeding

Introduction

Chronic and excessive alcohol consumption is a major cause of developing neurologic impairment and psychiatric conditions including alcohol dependence or alcohol abuse. Alcohol dependence is major problem in worldwide and is risk factor to morbidity and mortality[1]. Developments in neuroscience have today increased understanding of the pharmacology and neurotransmitter of alcohol dependence. Today, anticonvulsant drugs such as topiramate, oxcarbazepine and sodium valproate have been used for the treatment of alcohol dependence and reduce alcohol intake[2].

Acorus calamus or sweet flag is medicinal plant and has various properties. Several pharmacological studies were reported that *Acorus calamus* have traditionally been used in the treatment of seizure, insomnia and other mental disorders[3,4]. Its might be useful for treatment of alcohol dependence and reduce alcohol intake.

Objective

The aim of this experiment is to *investigate the effect of Acorus calamus* on alcohol intake in Wistar rat.

Methods

Rats were given free access to ethanol–sucrose solutions during 2-hour sessions for 8 weeks. On Days 1–11, the animals were given access to a 2% ethanol–10%sucrose solution, on Days 12–24 to a 5% ethanol–5% sucrose solution, on Days 25 to 38 to a 8% ethanol–5% sucrose solution, and then to a 10% ethanol–5% sucrose solution, which was continued for 18 days prior to the start of the treatment phase. The drug treatment phase began after animals had completed 8 weeks of drinking sessions. On Days 1–10 of drug treatment phase, animals received pre-treatment of 3% tween 20 (control) or AC 200, 400 mg/kg (before given alcohol 1 h). After that, the animals continued to be given free access to a 10% ethanol–5% sucrose solution during test sessions for 2-hour sessions[5]. Volume of alcohol intake (ml/d), water intake (ml) and food intake (g) were recorded and monitored drug-induced weight changes.

Data were analyzed by one-way analysis of variance followed by Tukey, as a post-hoc test. Results were considered significant at p-value less than 0.05.

Result

Body weight of the rats

Table 1 shows the body weight changes of the animals in each group at the beginning and the end of the treatment phase. The percentage changes of body weight during the treatment phase of the control, AC 200- and AC 400- treated were 0.83, 0.10 and 1.81 %, respectively. The decrease of body weight of rats received 400 mg/kg AC was significant different (Student's t test, $p < 0.05$) when compare to the control group.

Alcohol, water and food consumption of rats

As shown in Fig. 1A, during treatment phase (Days 1–10), rats received AC at either 200 or 400 mg/kg showed a significant decrease of alcohol intake when compared with control group. In rats treated with 400 mg/kg AC, the decrease of alcohol intake could be clearly seen from the second day of treatment until the end of treatment period.

Fig. 1B and 1C showed food and water intake of the rats during treatment period. AC (200 mg/kg, 400 mg/kg)-treated groups showed significant decrease in water and food intake (Student's t test, $p < 0.05$).

Conclusion

The results in this study suggested that *Acorus calamus* could reduce alcohol intake in chronic alcohol consumption model of rats. The *Acorus calamus* contains 2 active principles α–asarone and β– asarone. Recent evidence indicates that asarone block NMDA (N-methyl-D-aspartate) receptors and thus has neuroprotective activity against NMDA- or glutamate-induced excitotoxicity. Chronic alcohol intake causes an increase in glutamate level and NMDA activity[6], thus asarone in AC might decrease glutamatergic activity and reduce the alcohol intake. This study then suggests that *Acorus calamus* might be one of medicinal plant for treatment alcohol dependence.

Acknowledgments

This study was partly supported by a Postgraduate Study Support Grant and granted by invitation research grant of Faculty of Medicine, Khon Kaen University, Thailand (Grant Number I56221).

Table 1 Changes in body weight of the rats fed by ethanol–sucrose solution

Groups	Body weight (g)		
	Beginning of the treatment phase	End of the treatment phase	Changes during the treatment phase (%)
Control	456.33 ± 13.49	460.17 ± 13.61	+ 0.83%
AC 200	497.5 ± 8.12	497 ± 6.52	-0.10%
AC 400	469.6 7 ± 10.56	461.33 ± 9.47	-1.81%*

Values are means±S.E.M.; * $p < 0.05$ when compare to the control group

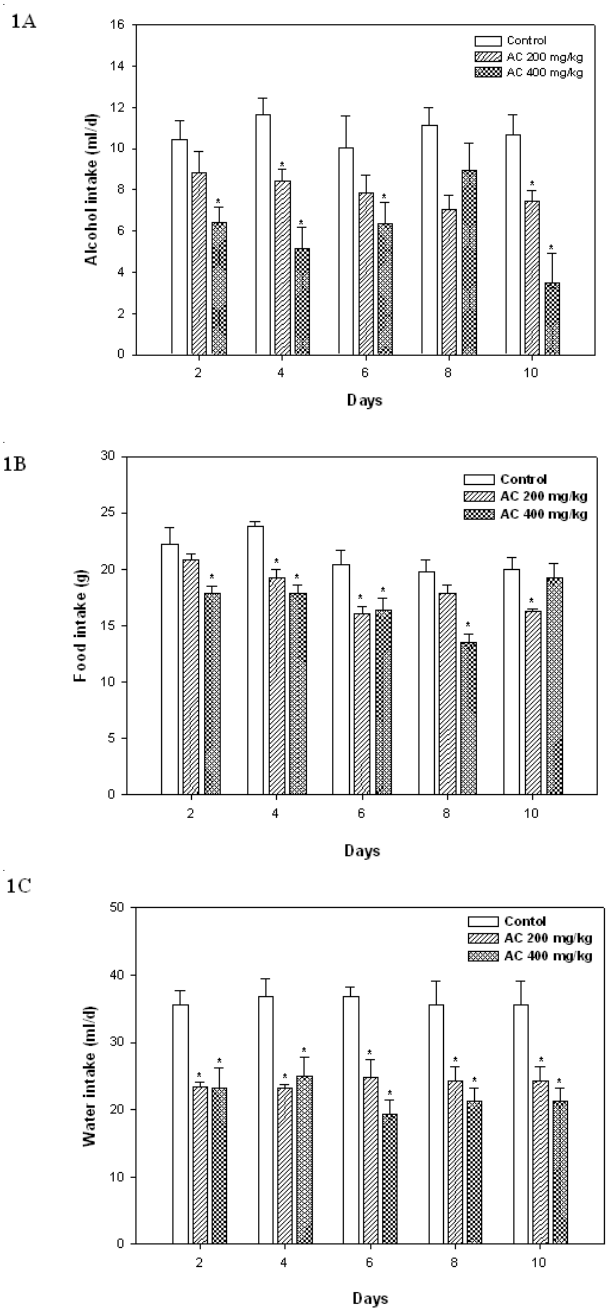

Fig.1 The effect of *Acorus calamus* on alcohol (1A), water (1B) and food intake(1C). AC (200, 400 mg/kg., p.o.) was administered to rats 2 h before given free access to a 10% ethanol–5% sucrose solution for 2-hour sessions; alcohol intake (ml/d) was measured and daily water intake (ml/d.) and food intake (g) were recorded. The data are expressed as means ± S.E.M. (n = 6/group). * p< 0.05 when compare to the control group on the same day.

References

1. Cargiulo T. Understanding the health impact of alcohol dependence, Am J Health-Syst Pharm 2007;64:s5-11.
2. Sousa AD. The role of topiramate and other anticonvulsants in the treatment of alcohol dependence: A clinical review. CNS Neurol Disord Drug Targets 2010;9: 45-9.
3. Bhat SD, Ashok BK, Acharya RN, Ravishankar B. Anticonvulsant activity of raw and classically processed *Vacha* (*Acorus calamus* Linn.) rhizomes. AYU 2012; 33 :119-22.
4. R C, Adake P. Anticonvulsant activity of ethanolic extract of *Acorus calamus* rhizome in swiss albino mice. JSIR 2013;2: 846-51.
5. Knapp CM, Mercado M, Markley TL, Crosby S, Ciraulo DA, Kornetsky C. Zonisamide decreases ethanol intake in rats and mice. Pharmacol Biochem Behav. 2007;87:65–72.
6. Clapp P, Bhave SV, Hoffman PL. How adaptation of the brain to alcohol leads to dependence:a pharmacological perspective. Alcohol Res Health 2008;31: 310-39.