Thai Journal of Pharmaceutical Sciences (TJPS)

34th International Annual Meeting in Pharmaceutical Sciences and
2nd CU FPhS -RIKEN CDB Symposium
(IAMPS34 and 2nd CU FPhS - RIKEN CDB)

Cardiovascular Effects of the Ethanolic Extract of *Ipomoea Aquatica* Forsk. in Rat

Amonrat Khayungarnnawee[1], Tuanta Sematong[1], Chuleratana Banchonglikitkul[1] Sirinan Thubthimthed[1]

[1]*Pharmaceutical and Natural Products Department, Thailand Institute of Scientific and Technological Research, Technopolis, Klong 5, Klong Laung, Pathumthani 12120, Thailand*

* Corresponding author: Tel. +66(0)25779230; E-mail address: amonrat@tistr.or.th

Keywords: *Ipomoea Aquatica* Forsk., cardiovascular effect, vascular contraction

Ipomoea Aquatica Forsk. ("Phug-boong" in Thai) belongs to the family of Convolvulaceae, which grows wild and is cultivated throughout Southeast Asia. Previous studies have revealed that *Ipomoea Aquatica* Forsk. causes an array of pharmacological effects including antihyperlipidemia, antihyperglycemic and antioxidant. In this study, *Ipomoea Aquatica* Forsk. was extracted by 95% ethanol with percolation. The hypotensive effect of the *Ipomoea Aquatica Forsk*. ethanolic crude extract (IAE) in anesthetized rats was investigated using pressure transducer. The vasodilation effect of IAE was also investigated using isolated rat aorta. The data showed that IAE had no effect on blood pressure and heart rate in anesthetized rats after injected the extract solution. However, IAE showed suppression of the NA-mediated aortic contraction in a dose dependent manner. These results may suggest that the ethanolic extract of *Ipomoea Aquatica* Forsk. acts via adrenergic receptors in vascular smooth muscle, with the potential to be developed into a future herbal medicine for cardiovascular diseases.

Introduction

Heart disease remains the leading cause of death in most parts of the world. Herbal medicine has been used to treat heart disease throughout history. *Ipomoea Aquatica* Forsk. ("Phug-boong" in Thai) is a tropical region plant often used in Thai culinary. *Ipomoea Aquatica* Forsk belongs to the family Convolvulaceae which grows wild and is cultivated throughout Southeast Asia[(1).] Previous studies showed the common biologically active compunds from *Ipomoea species*. including alkaloids, phenolics compounds and glycolipids[(2)]. Known pharmacological properties of this plant include antihyperlipidemia, antihyperglycemic, antihypertensive effect and antioxidant[(1, 3, 4).]

In this study, the hypotensive effect of *Ipomoea Aquatica* Forsk. ethanolic crude extract (IAE) in anesthetized rats was investigated using pressure transducer. The results will potentially support the mechanisms and cardiovascular effect of the plant.

Methods

Plant materials

The *Ipomoea Aquatica* Forsk. fresh leaves and stems were collected from Nakhon Pathom province and identified. Voucher specimen (TISTR No.577I) is kept in the laboratory, Thailand Institute of Scientific and Technological Research (TISTR).

Preparation of extract (IAE)

Fresh leaves and stems of *Ipomoea Aquatica* Forsk. were dried at 50 °C. They were pulverized into powder. The powder was extracted with 95% ethanol by mean of percolation. The rotary dried-viscous dark green extract was obtained with a yield of 20% (w/w).

Animals

A total of 30 Male Wistar rats (250-300g) were obtained from National Laboratory Animal Center, Mahidol University, Salaya, Nakornpathom. All rats were housed at 24 ± 2°C in 12 h light/dark cycle and feed with standard diet and RO water ad libitum in the animal care facility building at TISTR. All rats were acclimatized for 7 days prior to the experiments. The animals used in this study were cared according to guidelines of animal experiment. The study was approved by the TISTR Animal Ethical Committee.

Effect IAE on blood pressure and heart rate

The Effect IAE on blood pressure and heart rate was modified from Dar, Behbahanian [(5)]. Male Wistar rats were anesthetized with xylazene 15 mg/kg ip for 15 min and followed with sodium pentobarbital (Nembutal sodium®, 30 mg/kg ip). A tube was canulated into the rat's trachea for the prevention of airway obstruction. Common carotid artery and femoral vein were exposed and canulated with polyethylene tube no. 90 and catheter needle no. 24 (Nipro®) for pressure transducer (BIOPAC System, California) connection and sample injection, respectively. A grass polygraph (Model TSD104A) was used to monitor animal blood pressure and heart rate.

An adrenaline injection (0.2 µg/animal, 0.2 ml) was used to stimulate blood pressure for 5 min and then flushed with 0.9% normal saline solution (NSS) 0.5ml. The 1% Tween (v/v) was injected to rat as vehicle control. The IAE 5g% (w/v) in 1% Tween at concentrations of 2.5, 5 and 10 mg/kg were injected into femoral vein for 5 min per each concentration record. Sodium pentobarbital overdose was then given for euthanasia
or animals.

Contraction Study

The Contraction Study was modified from Gisbert, Noguera [(6)]. IAE dissolved in 1% (v/w) Tween 80 which used as control group had no observable effects. The effect of IAE at concentration 100, 250 and 500µg/ml on denude endothelium smooth muscle contraction was determined in the bathing solution for 5 min prior to addition of Noradrenaline (NA) 100 µM. Prazosin 1 µM (α-adrenergic blocker) was used as positive control or vasodilatation agent.

Statistics

Data are reported as mean ± sem. with values obtained from n different preparations. Prism was also used to determine any differences between groups with one-way analysis of variance (ANOVA) followed by Tukey's post-hoc.

Results

Blood pressure and heart rate

As shown in Figure 1, IAE at concentrations of 2.5, 5 and 10 mg/kg bw slightly decreased blood pressure in anesthetized rats when compared with the control group; however there was not a statistically significant difference between groups. Moreover, the IAE had no effect on the heart rate in anesthetized rats after injected the extract solution for 5 minutes as seen in figure 2.

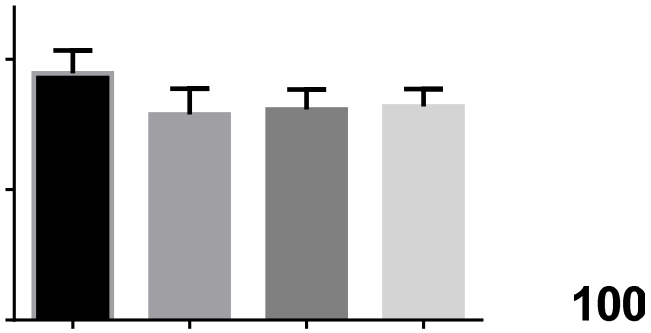


Figure 1. Effect of *Ipomoea Aquatica* Forsk. ethanolic extract on mean blood pressure (MBP) in anesthetized rats. The data are presented as mean ± s.e.m., and n=3.

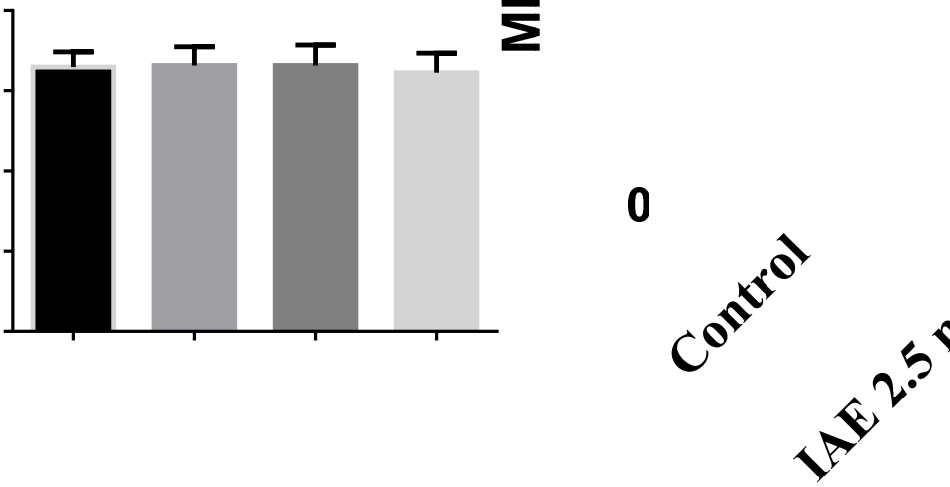
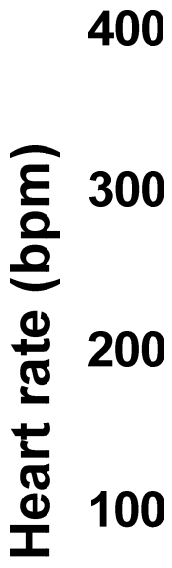


Figure 2. Effect of *Ipomoea Aquatica* Forsk. ethanolic extract on heart rate (MBP) in anesthetized rats. The data are presented as mean ± s.e.m., and n=3.

Contraction Study

Prazosin; an α-adrenoceptor antagonist (1μM) inhibited the contraction of vascular smooth in rat aorta induced by NA. IAE produced suppression of the NA-mediated aortic contraction in a concentration dependent manner, as seen in Figure 3.



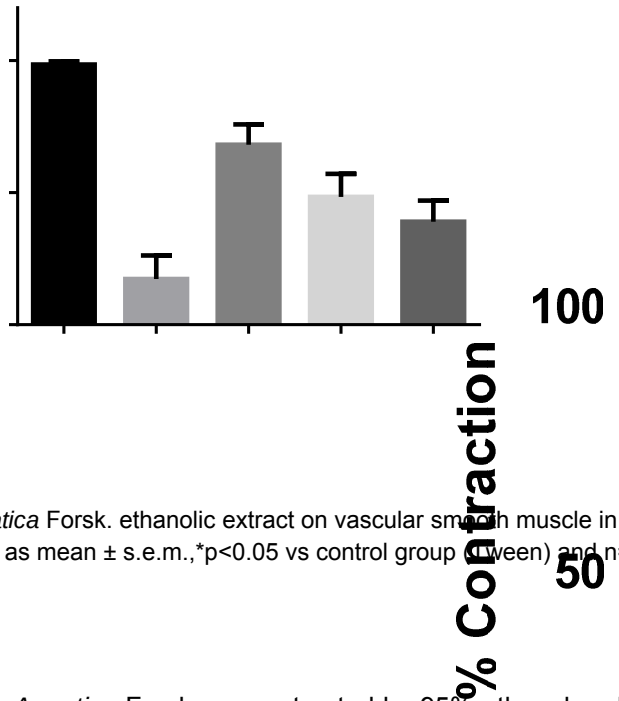


Figure 3. Effect of *Ipomoea Aquatica* Forsk. ethanolic extract on vascular smooth muscle in the rat aorta. The data are presented as mean ± s.e.m.,*p<0.05 vs control group (Tween) and n=3.

Discussion and Conclusion

In the present study, *Ipomoea Aquatica* Forsk. was extracted by 95% ethanol and the yield was 20% (w/w). Blood pressure and heart rate were monitored using the pressure transducer in anesthetized rats exposed to different concentrations of IAE; however, the extract has no significant effect on blood pressure or heart rate. Moreover, the present study illustrated that NA-induced contraction in rat aorta was decreased by IAE in a concentration-dependent manner. These results may suggest that the ethanolic extract of *Ipomoea Aquatica* Forsk. acts via adrenergic receptors in vascular smooth muscle, with the potential to be developed into a future herbal medicine for cardiovascular disease.

Acknowledgements

The author would like to gratitude thanks to the National Research Council of Thailand and Thailand Institute of Scientific and Technological Research for their financial support and Dr. Chuleratana Banchonglikitkul for her suggestion.

References

1. Sivaraman D. Hypolipidemic activity of Ipomoea aquatica Forsk. Leaf extracts on lipid profile in hyperlipidemic rats. International Journal of Pharmaceutical & Biological Archive. 2010;1(2).
2. Meira M, Silva EPd, David JM, David JP. Review of the genus Ipomoea: traditional uses, chemistry and biological activities. Revista Brasileira de Farmacognosia. 2012;22(3):682-713.
3. Malakar C, Choudhury PPN. Pharmacological Potentiality and medicinal uses of Ipomoea Aquatica Forsk: A Review. Asian J Pharm Clin Res. 2015;8(2):60-3.
4. Khatun CS, Islam MA, Azad MA, Ali MA, Hassan MF, Wahidunnobi M, et al. Antibacterial, Antidiabetic and Lipid Lowering Effects of Ethanolic Extract of Ipomoea aquatica. Bangladesh Journal of Microbiology. 2016;29(2):50-4.
5. Dar A, Behbahanian S, Malik A, Jahan N. Hypotensive effect of the methanolic extract of Mimusops elengi in normotensive rats. Phytomedicine. 1999;6(5):373-8.
6. Gisbert R, Noguera MA, Ivorra MD, D'Ocon P. Functional Evidence of a Constitutively Active Population of α_{1D}-Adrenoceptors in Rat Aorta. Journal of Pharmacology and Experimental Therapeutics. 2000;295(2):810-7.