Arabian Journal of Chemistry (2010) 3, 39–42

King Saud University

Arabian Journal of Chemistry

www.ksu.edu.sa
www.sciencedirect.com

ORIGINAL ARTICLE

# Pharmacological activity of ethanolic extract of *Alhagi maurorum* roots

**M.S. Marashdah *, H.M. AL-Hazimi**

*Department of Chemistry, Faculty of Science, King Saud University, Riyadh, Saudi Arabia*

Received 24 October 2009; accepted 22 December 2009
Available online 23 December 2009

**KEYWORDS**

Alhagi Maurorum;
Camel thorn

**Abstract** The ethanolic extract (EE) of *Ahagi maurorum* powdered roots was examined for its pharmacological activity and showed the following results: (1) Administration of EE intraperitoneally into mice decreased the body temperature in a dose-dependent manner. The decreases ranged from 0.2 to 3.3 °C. (2) Treatment of the frog tissue with EE blocked the action of the neurotransmitter, acetyl choline (Ach). Thus, EE seemed to act as a skeletal muscle relaxant. (3) Intraperitoneal administration of EE into the anaesthetized rats decreased heart rate by 22.5%, thus, EE seemed to be a bradycardiogenic drug. (4) The extract induced relaxations to the guinea-pig ureter and suppressed histamine-induced spasms. It seemed to possess a spasmolytic action and a ureter relaxing action that can enhance getting rid of renal stones and relieve of the accompanying pain (contraction of the ureter). (5) The extract did not possess the property of enhancing dissolution of oxalate calculi.



## 1. Introduction

*Alhagi maurorum* (Marashdah et al., 2006a,b, 2008; Mudawi et al., 2007) is used in folk medicine as a purgative, laxative, diaphoretic, expectorant and diuretic (Uphof, 1959; Chakravarty, 1976). Its flowers are used to treat piles, migraine, and warts. Oil from the leaves is used in the treatment of rheumatism (Brown, 1995). Locally, water extracts of its roots are used to enlarge the ureter and to remove kidney stones.

### 1.1. Instrumentation

The plant roots were powdered on Retsch GmbH mill model 5657 HAAN.

Filtrations were done using Spectrum quantitative laboratory filter papers from Curtin Scientific Company, Huston, USA.

Centrifugations of the aqueous solutions were done on ECCD centrifugation machine.

Freeze dryings were done on Freeze-dryer Mobile 12 SL (The Virtis Company Gardiner, NY, USA.

* Corresponding author.
E-mail address: ms_marashdah@yahoo.com (M.S. Marashdah).

1878-5352 © 2009 King Saud University. All rights reserved. Peer-review under responsibility of King Saud University.
doi:10.1016/j.arabjc.2009.12.007

Production and hosting by Elsevier

## 2. Experimental

### 2.1. Plant material

The plant was collected from Riyadh region in Saudi Arabia in December 2008, and identified by Department of Botany and Microbiology, Faculty of Science; King Saud University, Riyadh. The roots were taken out, cleaned and dried in the shade for 2 weeks and then powdered.

### 2.2. Preparation of the extracts for biological activity tests

Of 100 g powdered roots were extracted with 500 ml of absolute ethanol under reflux for 2 h. The solution was filtered and the solvent was removed under vacuum distillation to give 3 g (3%) of reddish precipitate.

### 2.3. Standard procedures for biological activity tests of the extracts

The effects of the extract on mice rectal temperature were studied following the method described by Gray et al. (1987).

The effects of the extract on the rectus abdominis muscle were studied following the method described by Fleisher et al. (1960).

The effects of the extract on the heart using the ECG (electro-cardio gram) were studied following the method described by Bakheet et al. (1999). The effects of the extract on the guinea-pig ureter were studied using the method described by Washizn (1968).

### 2.4. Preparation of test samples

The extract was used in form of suspension in 0.25% aqueous sodium carboxy methyl cellulose. After suspension, the mixture was emulsified by vortexing (shaking). A glass rode is usually inserted inside a tube containing the suspension to facilitate emulsification during vortexing in the vortex mixer.

### 2.5. Biological activity tests

1. *Effect on rectal temperature:* Rectal temperature of mice was measured using an Aplex rectal thermometer (Haly) fitted with thermistor probes. The probe was inserted to a depth of 2.5 cm into the rectum of each mouse and temperature reading was allowed to stabilize, recorded and the probe then removed. The temperature was taken first after 15 min, then at intervals of 30 min.
2. *Effect on the rectus abdominis muscle of the frog:* Initially, each frog was decapitated and then pithed by inserting a needle into the spinal cord. The frog was then fixed to a wooden board with its abdomen facing upwards. The outer skin of the frog was cut longitudinally and horizontally to expose the abdominal wall. The two rectus abdominis muscles were located and the two muscles were cut and removed completely from the animal and placed in Krebs' solution. Then each muscle was suspended vertically in the chamber of an organ bath containing Krebs' solution and aerated using (95% $O_2$ + 5% $CO_2$). The temperature of the bathing fluid was adjusted to 37 °C. Each tissue was allowed to equilibrate with the bathing fluid for 30 min. Each dose of the drug was allowed to contact the tissue for a time to obtain the maximum response. The extract was allowed to contact the tissue for 5 min before addition of the nicotine agonist. The percentage inhibition induced by the extract on the agonist submaxional dose was then calculated.
3. *Effect on the electro-cardio gram (ECG) of rats:* Male Wister rats (250 g) were anesthetized with urethane and prepared for measurement of the ECG waves. The limbs of the animal were fastened to a dissection board with the animal lying on its back. The ECG lead II was recorded by the aid of subcutaneous needle electrodes and the record was displayed in chart of the instrument. The recording speed was adjusted to 25 mm/s. The extract was injected intraperitoneally and the effect was then followed for 20 min to observe any disturbances in the cardiac rhythm. The heart rate before and after the extract injection was recorded and the percentage changes were then calculated.
4. *Effect on the ureter:* Guinea-pigs were killed by blows on the neck, and the abdominal cavity of each animal was opened. The kidney and the ureters were located and the whole length of the ureter (from the kidney to the urinary bladder) was cut and placed in Krebs' solution. The ureter was then prepared for the study of the effect of the extract. Of 2 cm length of each ureter was suspended in an organ bath containing oxygenated (95% $O_2$ + 5% $CO_2$) Krebs' solution. Each tissue was connected to an isometric transducer connected to a physiograph (Narco Biosystems, USA). Each tissue was allowed to equilibrate with the bathing fluid for 30 min. Initially the effects of different doses of the extract were determined. The effect of the extract on the standard agonists (histamine, acetyl choline (ACh) were then determined. The extract was allowed to contact the tissue for 5 min before the addition of the agonist. The percentage inhibition induced by the extract on the selected dose of the agonist was then calculated.

## 3. Results

### 3.1. General screening of the extract in conscious mice

Intraperitoneal administration of the extract into conscious mice in doses of 1.6 g/kg produced mild sedation. The extract also decreased the locomotion activity of the animals and skeletal muscle relaxation suggesting an action at the skeletal muscles neuromuscular junctions. The extract also decreased the rectal temperature of the animals 3.2 °C. These results directed the attention to study the effects of the extract on the rectal body temperature of the mice and on the skeletal muscle of the frog. The extract produced noticeable changes in the heart rate and this directed the attention to study its effects of the heart rate via registering the electro-cardio gram (ECG).

### 3.2. Effect on mice rectal temperature

Administration of the extract in doses of 0.25 and 0.5 g/kg (I.P.) into mice did not induce any changes in the rectal temperature. However, administration of the extract in doses of 1 g/kg (I.P.) decreased the body temperature with a maximum of 3.3 °C 60 min after administration of the extract. Thereafter the temperature started to rise again. The cumulative results are shown in Table 1.

**Table 1** Effect of the extract on mice rectal temperature.

| Dose (mg/kg) | Before injection | Temperature after injection (minimum) | | | | |
|---|---|---|---|---|---|---|
| | 0 | 15 | 30 | 60 | 90 | 120 |
| 250 | 39.0 ± 0.3 | 39.3 ± 0.4 | 39.2 ± 0.1 | 39.0 ± 0.3 | 38.7 ± 0.4 | 38.8 ± 0.4 |
| 500 | 38.7 ± 0.2 | 38.9 ± 0.3 | 38.2 ± 0.6 | 38.1 ± 0.5 | 38.5 ± 0.3 | 38.4 ± 0.5 |
| 1000 | 38.6 ± 0.5 | 38.1 ± 0.3 | 36.8 ± 0.4* | 35.3 ± 0.2* | 35.9 ± 0.1 | 36.2 ± 0.6 |

* $p < 0.05$, $p$ = statistic factor.

**Table 2** Effect of the extract on the rat's heart.

| Extract + dose | Normal heart rate | Percentage change in heart rate after 20 min | Percentage of force of contraction after 20 min | Remarks |
|---|---|---|---|---|
| The extract 1 g/kg (I.P.) | 465/min | ↓ 22.5% (360/min) | No effect | Bradycardiac drug |

### *3.3. Effect on the frogs rectus abdominis muscle (skeletal muscle)*

Exposure of the muscle to the extract in concentration of 1, 2, 4, 10 or 25 mg/ml of bathing fluid did not induce any contraction.

### *3.4. Effect on ACh-induced contraction of the frogs rectus abdominis muscle*

1. Exposure of the frog's rectus abdominis muscle to the nicotinic receptor stimulant acetyl choline (ACh) in concentration of 1–4 μg/ml induced concentration-dependent contractions.
2. Exposure of the tissue to the extract in a concentration of 4 μg/ml bathing fluid for 5 min antagonise ACh (3 μg/ml)-induced contraction by 70 ± 2.1% ($N = 4$). When the dose of ACh was increased up to 8 μg/ml in presence of the extract blockade, it did not reverse completely the blockade. The maximum reversal of antagonism was 27.7, suggesting that the extract blocked the action of ACh in a non-competitive manner.

### *3.5. Effect on the rat heart*

When rats were anaesthetized with urethane and the ECG was monitored to investigate the effects of the extract on the heart rate and force of contraction, the results revealed that the extract at a dose of 1 g/kg induced bradycardia only and not myocardial depressant. The results are shown in Table 2.

### *3.6. Effect on calcium oxalate solubility*

When 1 g calcium oxalate was added to 5 ml of 20% solution of the extract and the mixture was mixed and left to stand for 3 days, there was no solubilization of the calcium oxalate crystal. The weight of undissolved calcium oxalate was not changed compared with the initial weight.

### *3.7. Effect on the guinea-pig ureter*

Addition of histamine in doses of 3 μg/ml bathing fluid to the isolated guinea-pig ureter induced continuous contractions. Addition of the extract in doses of 5 mg/ml bathing fluid completely suppressed histamine induced contractions. Addition of another dose of histamine did not reverse the inhibition.

## Acknowledgment

We are indebted to the Research Center, Faculty of Science, King Saud University, Riyadh, Saudi Arabia, for their support. We also are indebted to the staff of the Research Center, Faculty of Pharmacy, King Saud University, Riyadh, Saudi Arabia, for their contribution helping in carrying out the biological tests.

*Note:* This research is supported by College of Science – Research Center, Project No. (Chem/2009/05).

## References

Bakheet, D.M., El Tahir, K.E.H., AL-Sayed, M.I., EL-Obeid, H.A., Al-Rashood, K.A., 1999. Studies on the cardiovascular depressant effects of *N*-ethyl- and *N*-benzyl-diphenyl ethanolamine. Elucidation of the mechanisms of action. Pharmacol. Res. 37, 463.

Brown, D., 1995. Encyclopaedia of Herbs and Their Uses. Dorling Kindersley, London. ISBN: 0-7513-020-31.

Chakravarty, A., 1976. The Plant Wealth of Iraq (A Dictionary of Economic Plants). Botany Directorate, Ministry of Agriculture & Agrarian Reform, England.

Fleisher, J.H., Corrigan, L.P., Howard, J.W., 1960. Reciprocal potentiating action of depolarizing drugs on the isolated frog rectus abdominis muscle. Br. J. Pharmacol. Chemother. 15, 23.

Gray, J.A., Goodwin, G.M., Hcal, D.J., Green, A.R., 1987. Hypothermia induced by baclofen, a possible index of GABAB receptor function in mice, is enhanced by antidepressant drugs and ECS. Br. J. Pharmacol. 92, 863.

Marashdah, M.S., Mudawi, B.M., Al-Hazimi, H.M., Abdallah, M.A., 2006a. New triglyceride and new aliphatic ester from the roots of *Alhagi maurorum* medik. J. Saudi Chem. Soc. 10 (2), 367.

Marashdah, M.S., Mudawi, B.M., Al-Hazimi, H.M., Abdallah, M.A., 2006b. New aliphatic ketone and new aliphatic ester from the roots of *Alhagi maurorum* medik. J. Saudi Chem. Soc. 10 (3), 509.

Marashdah, M.S., AL-Hazimi, H.M., Abdallah, M.A., Mudawi, B.M., 2008. Pharmacological activity of the new compound {5,5‴-dipropyl-2,2′:5′,2″:5″,2‴:5‴,2⁗-pentathienyl (**1**) and octa-

cosanoic acid, 28-hydroxy-2′,3′-dihydroxy propylysate (**2**)} isolated from *Alhgi maurorum* roots. Arab. J. Chem. 1 (1), 61.

Mudawi, B.M., AL-Hazimi, H.M., Abdallah, M.A., Marashdah, M.S., 2007. New aliphatic ester and new thiophene derivative from the roots of *Alhagi maurorum* medik. J. Saudi Chem. Soc. 11 (1), 87.

J.C.Th. Uphof, 1959. Dictionary of Economic Plants, Weinheim.

Washizn, Y., 1968. Epinephrine on potential, tension and ionic content of guinea-pig ureter. Eur. J. Pharmacol. 4, 411–415.