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Effects of *Malva parviflora* Extract on Retention Memory in Mice

A. Miri[1], A. Shahraki[2], J. Mehrzad[3], A. Shahraki-Mojahed[2] and J. Afshar[3*]

[1]*Department of Pharmacognosy, Faculty of Pharmacy, Zabol University of Medical Sciences, Zabol, Iran*
[2]*Department of Biology, Faculty of Science, University of Sistan and Baluchestan, Zahedan, Iran*
[3]*Department of Biochemistry, Neyshabur Medical Sciences Branch, Islamic Azad University, Neyshabur, Iran*

ABSTRACT

In this study, effects of Malva parviflora hydroalcoholic extract was evaluated on memory alternation avoidance by step-through experiments on mice. The hydroalcoholic extract was prepared by maceration method in various doses (50, 100, and 200 mg/kg) then administered by gavage to mice. The groups were including control and three doses of the plant extract. After memory retention test in mice, results showed that the best memory improvement was observed in doses 100 and 200 mg/kg of the extract. Based on our results, it can be useful for improving the human memory, but it needs to make more researches on the plant at future.

Keywords: hydroalcoholic extract, retention memory, Step-through experiments

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INTRODUCTION

The power to change behaviour based on experience is one of the most useful abilities that arise during the evolution of living. Memory is a significant function in the brain, and is the power of an individual to record information, retain and recall them whenever needed and moreover, use of this information to adapt the responses to environment therefore it is vital for survival [1]. Several evidences of epidemiological researches are shown a significant correlation between dietary intake of vegetables and cognitive function improvement in elderly people [1].

The aromatic and medicinal plants have played a significant role as therapeutic agents of both pharmacological and economic relevance [2-12]. In recent years, medicinal plant therapy has been shown to be useful for treatment of many human and animal diseases [13-16]. The most important advantage of them is their low price and availability worldwide beside their safety [17].

Malva Parviflora (cheese weedor, little mallow, Egyptian mallow or small-flowered) belong to *Malvaceae*. *M. Parviflora* as a weed in crops such as rice and beans on the side of the farm. It is native to Europe, Asia, and North Africa. In the Mediterranean region, some species of *Malvaceae* has been used as feed. However, due to its therapeutic some parts of this plant have been used in traditional medicine. In addition, anti-inflammatory, antioxidant, and anticancer activities of the leaves in some species of *Malvaceae* have been reported [18,19]. The aim of this study was to determine effects of *M. parviflora* extract on retention memory in mice by step-through method.

MATERIALS AND METHODS

Plant samples and extract preparation

M. Parviflora aerial parts (leaves, twigs, and flowers) were collected in April, 2013 from the area of Medicinal Plants Research Center, Zabol University of Medical Sciences, Iran. The plant was identified at herbarium Mashhad University of Medical Sciences for a number Herbarium of the Institute of Medicinal Plants was allocated to the plant, where a voucher specimen (No. 27,101) was deposited. The plants shaded at room temperature, dried and then

ground. Then 25 grams of powdered plant sample with 250 ml of 80% ethanol (1:10 v/w) during 24 hours at room temperature (25 °C), mixed with the shaker with fresh solvent. The extract was concentrated by rotary evaporator. It stored at 4 °C for future test.

Retentional memory assay in mice

In this study, all animal manipulations were carried out according to the Helsinki Convention. A total of 32 male mice in appropriate weight range were selected and randomly were allocated to 4 groups equally. Three groups received the extract at different doses (50, 100, and 200 mg/kg) orally gavaged for three week. One group received only distilled water during this period. Twenty–one days after gavage, animals were trained electric shock (2 mA for 2s). The shock was given to the animals by the time delay for the passage of light to dark chamber was recorded. Then retentional memory of animals were evaluated by step-through method at different times (24, 48, 96 and 168 h). Retentional memory animals were evaluated and the results were recorded.

Statistical analysis

Data statistical analyses were performed using prism version 5 software. The One-way ANOVA used in this study as statistical test. In cases where a significant difference was shown between the data comparison Newman-Kules Multiple Comparison Test.

P-Value < 0.05 was considered as significant difference. Results are expressed mean ± standard deviation (Mean ± SEM).

RESULTS

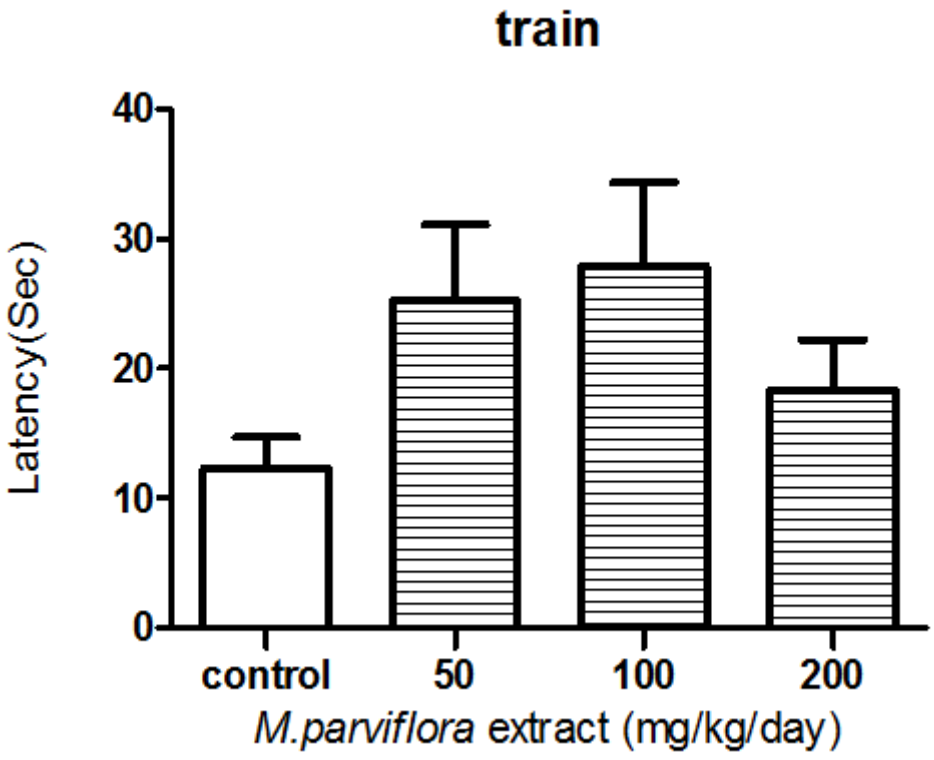

Figure 1. Effect of training on animal in step-through model at different doses of *M. parviflora* extract

Results of Effect of training on animal in step-through model at different doses of *M. parviflora* extracts are shown in Figure 1. Animals were evaluated 24 hours after training through the crossing light chamber to dark chamber (without the electric shock). Results showed that the plant extracts in doses of 50, 100, and 200 mg/kg were no significant difference compared with control group ($p < 0.05$*) (Figure 2). The animals that were investigated 48 hours after training showed that the plant extracts at doses of 100 and 200 mg/kg significantly increased latency memory ($p < 0.05$*) (Figure 3). Effects of different doses of *M. parviflora* extracts on retention memory 96 h after training are shown in Figure 4. Results showed that the plant extracts doses of 100 and 200 mg/kg increased memory in treated mice ($p < 0.05$*). There was no significant difference between dose of 50 mg/kg and control

group (Figure 4). Results of evaluated the animal after 168 hours (a week) showed a significant difference among control and dose of 100 mg/kg ($p<0.01$**) and 200 mg/kg ($p <0.001$***). Also between dose of 50 and 100 mg/kg observed a significant difference ($p <0.05$*). Results also showed a significant difference between doses of 50 and 200 mg/kg at $p <0.01$**. However there was no significant difference between doses 100 and 200 mg/kg of the extract (Figure 5).

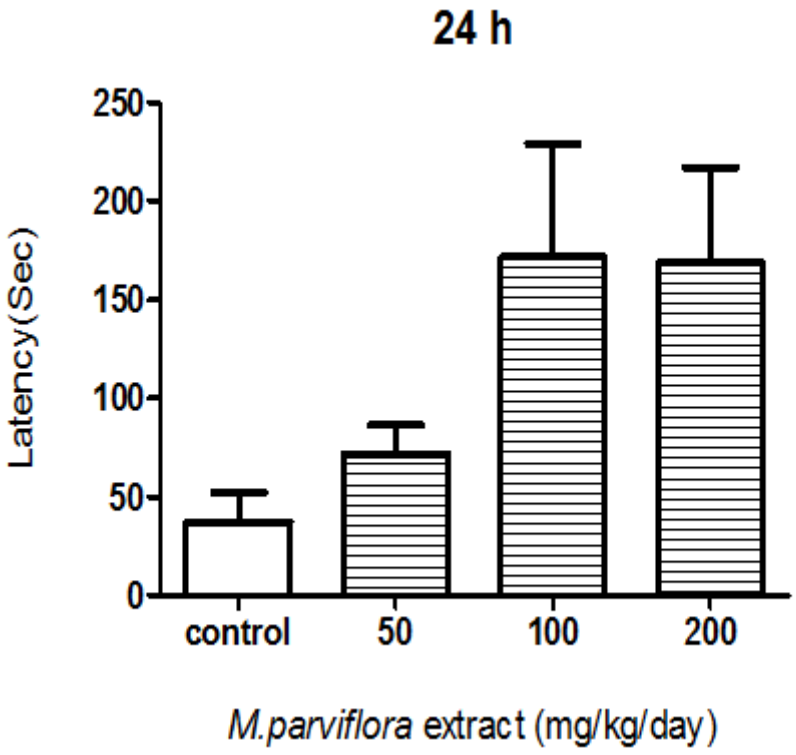

Figure 2. Eeffect of different doses of *M. parviflora* extract on the retention memory 24 h after training

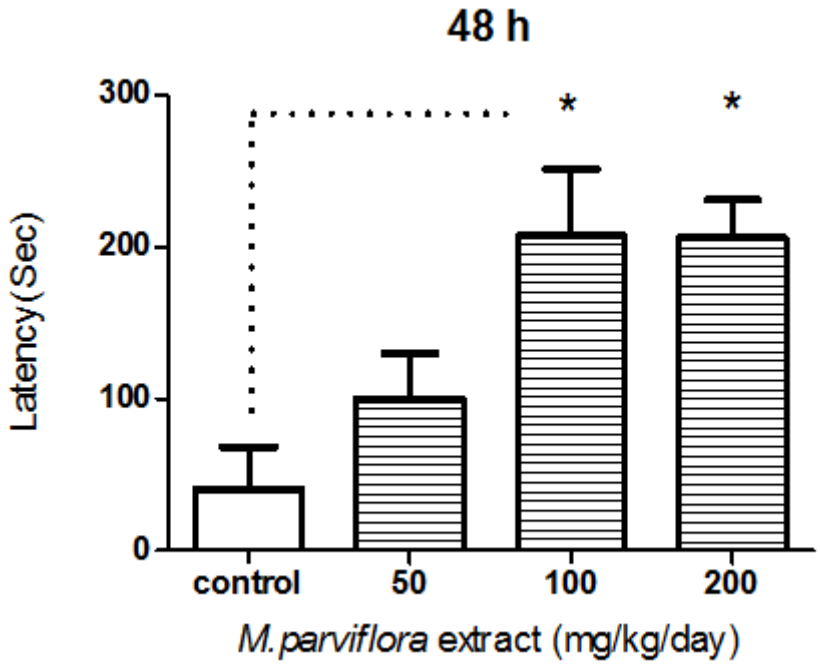

Figure 3. Effect of different doses of *M. parviflora* extract on the retention memory 48 h after training

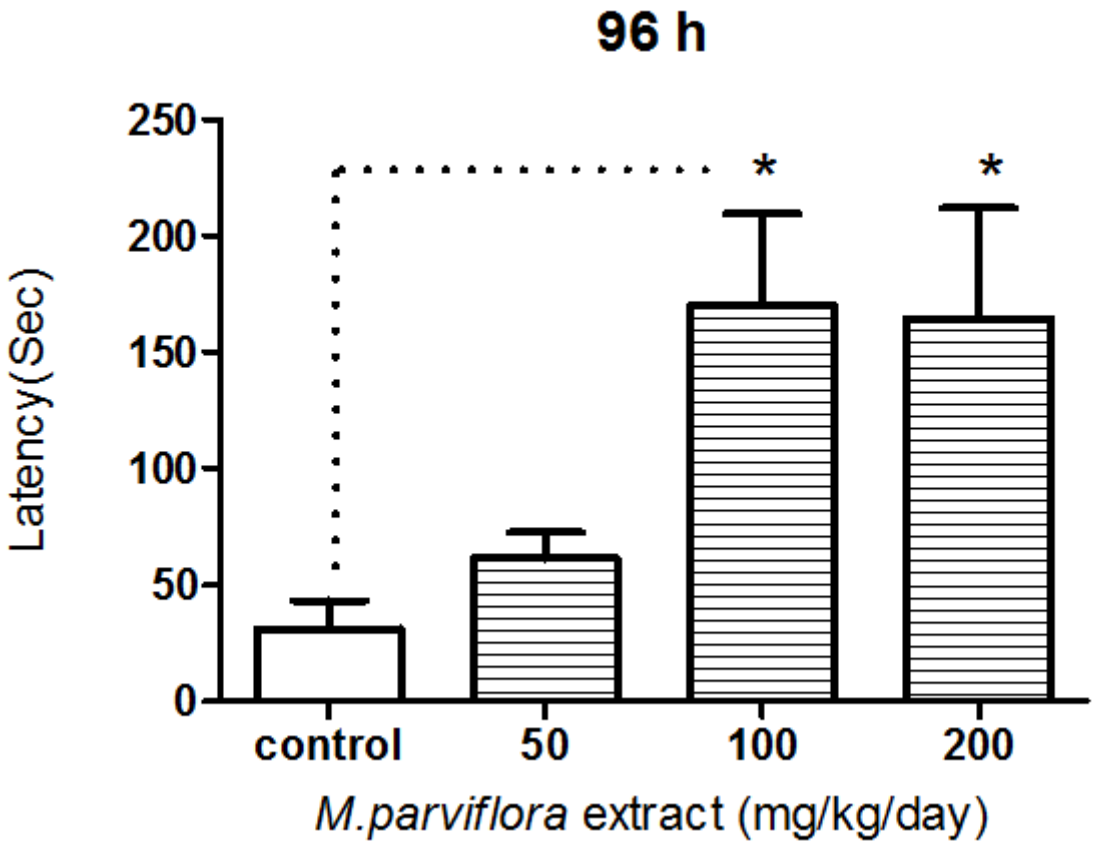

Figure 4. Effect of different doses of *M. parviflora* extract on the retention memory 96 h after training

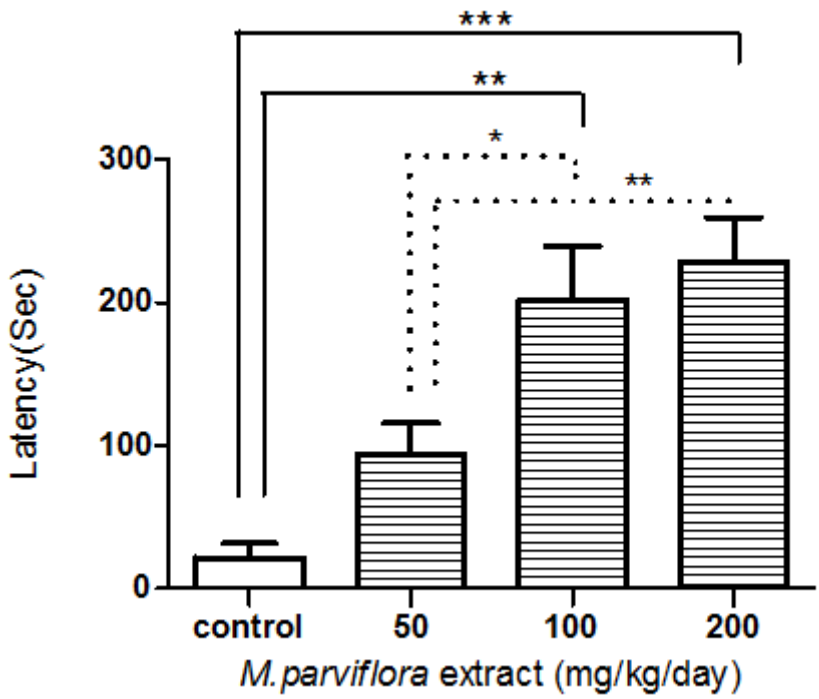

Figure 5. Effect of different doses of *M. parviflora* extract on the retention memory 168 h after training

DISCUSSION

The behavior animal treated in our study, suggested that the plant extract in some doses (100 and 200 mg/kg) during period of study (21 days), resulted in the increasing on retention memory. Alzheimer's disease (AD) is one of the most common forms of dementia among the elderly. According to research in Alzheimer's patients with different biochemical pathways in neuronal synapses are impaired. In these patients, by reducing levels of acetylcholine in various regions of the brain, cause decreasing in learning. The reduction of acetylcholine in the synaptic space can occur at levels of acetylcholine synthesis (impaired enzyme acetylcholine transferase) [20]. Memory and synaptic changes are the most complex systems in the brain. Detection mechanisms involved in memory is considered one of the most important issues in neuroscience. Basically every part of the brain does not serve as a warehouse for storage. Parts of the brain, including the hippocampus, cortex, amygdala, and cerebellum are involved in memory [21-25]. To assess learning and memory in the excitement the step-through apparatus is used [26-28]. Orbit frontal area and amygdala in memory plays emotion and motivation role. Previous studies showed that the memory in the fear condition (such as shock) is completely dependent on protein kinase A (an intracellular cascade) [29]. Disruption of protein kinase and protein kinase A can create mutations impaired learning and reduced L-LTP (long-term memory latency) in the CA1 region of the hippocampus, which expresses well the important role of protein kinase A and pathways that are involved in learning and memory functions [30,31].

In conclusion, according to the abandant of *Malva parviflora* in Iran and the effects on memory were observed in this study, it can to be used to improve the treatment of diseases that are associated with the weakness of the nervous system and memory (Alzheimer's, Parkinson's, etc.).

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