

Antidepressant effects of Aloe vera hydroalcoholic extract on Mice Model

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ABSTRACT

The antidepressant effects of aloe vera hydroalcoholic extract at different concentrations were compared with the fluoxetine-treated and the control groups of mice using forced-swimming, FST and open box, OFT tests. The mice were evaluated in five groups (control, taking aloe vera at the dosage levels of 150 mg/kg, 300 mg/kg, and 450 mg/kg, and finally fluoxetine at a dose of 10 mg/kg) by the FST and OFT tests on 1st, 7th, and 14th days. The results of the OFT test showed no significant differences between these five groups. The results of FST test indicate the antidepressant effects of aloe vera even at low doses and it was found that the effect of fluoxetine at a dose of 10 mg/kg was equivalent to the effect of aloe vera at a dose of 150 mg/kg for the reduction in immobility time in mice in FST test. According to the results obtained from FST test, the antidepressant effects on mice treated with the 450 mg/kg dose of aloe vera showed better recovery as compared with other groups on 1st, 7th, and 14th days. With regard to the experiments performed at different times, all the evidence pointed to the conclusion that the antidepressant effect of aloe vera was more than the control group. Based on the results of the OFT and FST tests, aloe vera extract at different doses, has favorable antidepressant effects on mice as compared to the fluoxetine-treated and the control groups and the better effects were seen by increasing the dose and duration of drug use.

Keywords: Antidepressant; effects; Aloe vera; Fluoxetine; OFT; FST

INTRODUCTION

Major depressive disorder is one of the most common psychiatric diagnoses and is characterized by feeling of depression, low self-confidence, and being indifference to any kind of daily activity and enjoy. The dysfunction of brain neurotransmitters is an important mechanism in depressed patients [1-4]. These neurotransmitters include dopamine, epinephrine, norepinephrine, and serotonin. Neurotransmitter disorder in synapses has been observed in depressed patients [3]. The antidepressant treatment can be divided into two categories: medical and non-medical. The medical treatment is one of the above mentioned options, which is the best in cases of antidepressant diseases. However, these medicines have numerous side effects such as heart disease, sudden increase in blood pressure, sexual dysfunction, and sleep disorders [5-6].

According to physicians, different herbal extracts show antidepressant effects on depressed patients. Various studies have paid attention to the assessment of the antidepressant effects of medicinal plants [7-10]. Mishra et al. showed significant improvement in symptoms such as joint pain, joint stiffness, and limited range of motion in patients with osteoarthritis by taking guggul extract [11]. Aloe vera is containing anthracene derivatives such as aloeins A2 and B (25-40% of compounds) and common derivatives, including aloe resin A2, B, and C. Other important components of aloe vera are sugars such as glucose, mannose, and cellulose, some enzymes, including oxidase, amylase, and catalase, some vitamins such as B1, B2, B6, C, E, folic acid, and also some minerals such as calcium, sodium, Magnesium, zinc, copper, and chromium [12]. To be a strong laxative is the main property of this plant and has other properties are

antimicrobial [13], wound healing, sunscreen, anti-burn [14], anti-cancer, and spermicidal[18]. Aloe vera gel has shown beneficial effects on ordinary burns, the burns resulting from radiation[15-16], skin wounds, and other injuries[14-17]. The current research has shown its positive effects on diabetic patients and has confirmed the results of the experiments on mice. This study investigated the antidepressant effects of hydroalcoholic extract of aloe vera at different concentrations and compared it with fluoxetine (the selective serotonin reuptake inhibitors) in 50 male mice by the OFT and FST tests.

MATERIAL AND METHODS

Fifty mice were purchased from the Pasteur Institute. Their body weight ranging from approximately 20-25 g and they were kept under environmental temperature and also in a 12-h light-dark cycle within the plastic boxes with metal mesh lids. The mice were fasted for 24 h before injecting the extract and medicine. The animals were divided into 5 groups of 10 each. Distilled water in group A (control), hydroalcoholic extract of Aloe vera at the 150 mg/kg dosage in B group, at 300 mg/kg in group C, at 450 mg/kg in group D, and fluoxetine at 10 mg/kg dosage in group E were orally given to the mice. The drugs were administered once daily for 2 weeks and 20 min before the tests. In every 5 groups, the mice were evaluated after injection (medicine) on 1st, 7th and 14th days

by OFT (open box) and FST (forced-swimming test). The results were compared in different groups and times. The data were compared by SPSS 16 statistical software and using statistical tests such as ANOVA and T-test.

RESULTS

figure1 showing the results of OFT test for the effect of hydroalcoholic extract of aloe vera at 150, 300, and 450 mg/kg dosage levels, and also the results obtained from the control and fluoxetine-treated groups on 1st, 7th, and 14th days. The results of the present study showed that three mice died in the aloe vera-treated groups (one mouse because of gavage error and two others of an unknown factor on 4th day). The mice were individually evaluated on 14th day. The results of OFT showed the following average numbers of passing lines by the animals: 132.6 in group A, 144.7 in group B (150 mg/kg), 139.1 in group C (300 mg/kg), 155.4 in group D (450 mg/kg), and 151.8 in group E on 1st day. Moreover, the above average numbers of OFT were 101.3 in group A, 146 in B group (150 mg/kg), 98 in group C (300 mg/kg), 120.5 in group D (450 mg/kg), and 84.8 in group E on 7th day. On 14th day, the average numbers were as follows: 123.8 in group A, 154.6 in group B (150 mg/kg), 129.8 in group C (300 mg/kg), 125.5 in group D (450 mg/kg), and 123.4 in group E.

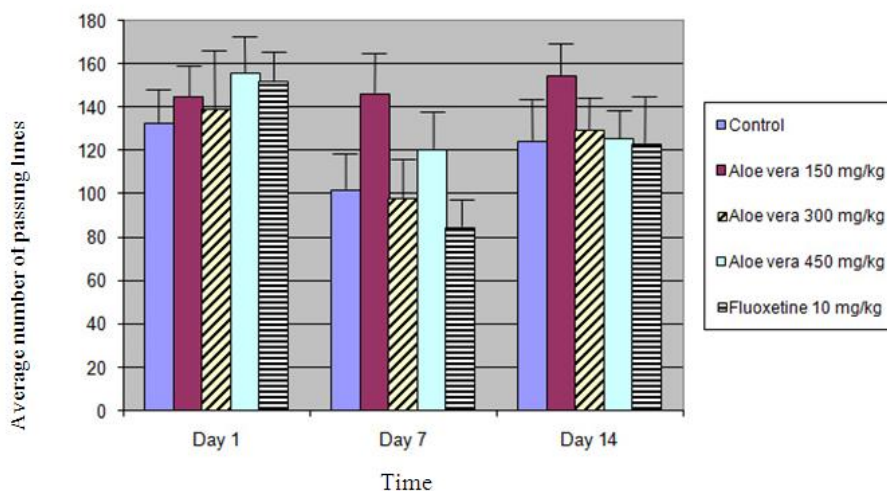


Figure 1. OFT test ; the effect of hydroalcoholic extract of aloe vera at the dosage levels of 150, 300, and 450 mg/kg and The results obtained from the control and fluoxetine- treated groups on 1st, 7th, and 14th days

The results of OFT test showed more antidepressant effects of the aloe vera (at the dose of 450 mg/kg) and fluoxetine than other groups on 1st day, but the highest antidepressant effects observed in aloe vera-treated groups with dose of 150 mg/kg as compared to the fluoxetine-treated groups and aloe vera-treated groups with other doses on 7th and 14th days. However, there were no significant differences between the groups at different times.

The results of FST test for the effect of hydroalcoholic extract of aloe vera at the dosage levels of 150, 300, and 450 mg/kg and the control and fluoxetine-treated groups on 1st, 7th, and 14th days shown in Figure 2. The results of this study did not indicate significant differences ($P = 0.1$) (in group A:

97.2, in group B (150 mg / kg): 81.8, in group C (300 mg / kg): 68.2, in group D (450 mg / kg): 57.4, and in group E: 76.5 on 1st day). The results of this study also showed the average length of immobility time as follows: 125.8 for group A, 84.7 for group B, 50.8 for group C, 48.1 for group D, and 86.3 for group E on 7th day, which has a statistically significant difference ($P = 0.001$) between the groups under investigation. In addition, the results represented that the immobility time average was 109.7 in group A, 61.1 in group B, 31.5 in group C, 29.8 in group D, and finally 163.6 in group E on 14th day that has a statistically significant difference ($P < 0.001$) between the above mentioned groups.

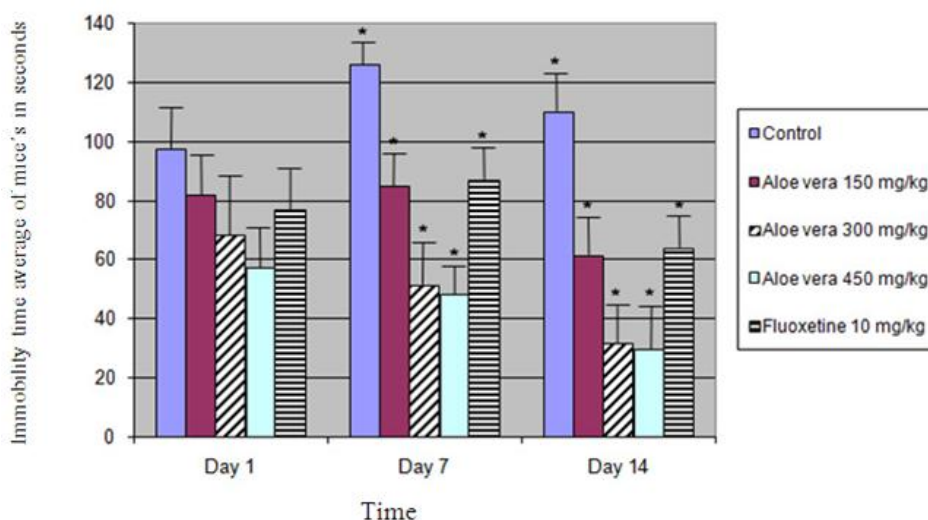


Figure 2. FST test ; the effect of hydroalcoholic extract of aloe vera at the dosage levels of 150, 300 and 450 mg/kg and also the results obtained from the control and fluoxetine-treated groups on 1st, 7th, and 14th days

Accordingly, it was found that the antidepressant effects of hydroalcoholic extract of aloe vera increased with increasing the dose and duration of drug use. Also, the above mentioned effects were close to 150 mg/kg dose of aloe vera in comparison to the fluoxetine's effect at all times.

CONCLUSION

In this study, antidepressant effects of different doses of aloe vera hydroalcoholic extract were compared with the fluoxetine-treated and the control samples by FST and OFT tests on the animal model (mouse) for the first time. The results demonstrate the anti-depressant effects of aloe vera at low doses as its long-term use was increased during the second week. The FST test

revealed that fluoxetine (at a dose of 10 mg/kg) effects were equivalent to the effects of aloe vera (at a dose of 150 mg/kg). According to the FST results, most antidepressant effects were obtained from 450 mg/kg dose of aloe vera as compared with other groups on 1st, 7th, 14th days. Also, antidepressant effects of aloe vera at different doses were more than the control groups.

Mood disorders such as depression can be treated with changing the function of neurotransmitters because the slightest change in the function of brain neurotransmitters can be effective in its function. Based on our study, the hydroalcoholic extract of aloe vera at

different doses has given rise to some changes in the function of neurotransmitters and symptoms of depression in mice. Although the antidepressant effects of aloe vera extract were observed in mice in this study, any direct clinical reports have not been surveyed between animal findings and the function of human neurotransmitters and its relationship with depression. Regarding the results obtained from the present study, the antidepressant

effects of aloe vera extract were observed at different doses in comparison with the fluoxetine-treated and the control groups of animal model using OFT and FST tests. Also, it was found that the antidepressant effects of aloe vera hydroalcoholic extract increased with increasing the dose and duration of drug use. Subsequent studies will be on more animals and samples with the clinical approach.

REFERENCES

1. Jon Nash, David Nutt . Antidepressants . *Psychiatry*. 2004; 3(7): 22-26.
2. Laurence R Meyerson, Helen H Ong, Lawrence L Martin and Daniel B Ellis . Effect of antidepressant agents on β -adrenergic receptor and neurotransmitter regulatory systems. *Pharmacology Biochemistry and Behavior*. 1980 ; 12(6):943-948.
3. Ivan N. Mefford, Kevin A. Roth, Sheila M. Jurik, Vicki Collman, Steve McIntire, Lori Tolbert and Jack D. Barchas . Epinephrine accumulation in rat brain after chronic administration of pargyline and LY 51641 comparison with other brain amines. *Brain Research*. 1985; 339(2):342-345.
4. Lynette C. Daws . Unfaithful neurotransmitter transporters: Focus on serotonin uptake and implications for antidepressant efficacy .*Pharmacology & Therapeutics*. 2009;121(1): 89-99.
5. R. W. Horton, F. De Paermentier, S. Lowther, K. M. Lawrence, M. R. Crompton, I. F. Tulloch . The interaction of antidepressant drugs with neurotransmitter receptor binding sites and 5-HT uptake sites in human brain in vitro. *European Neuropsychopharmacology*. 1993; 3(3): 344-345.
6. Håkan Hall, Sven-Ove Ögren. Effects of antidepressant drugs on different receptors in the brain . *European Journal of Pharmacology*. 1981;70(3):393-407.
7. R. N. Almeida, D. S. Navarro, T. S. de Assis, I. A de Medeiros, G. Thomas . Antidepressant effect of an ethanolic extract of the leaves of *Cissampelos sympodioides* in rats and mice . *Journal of Ethnopharmacology*. 1998;63 (3):247-252.
8. P.M. Galdino, M.V.M. Nascimento, B.L. Sampaio, R.N. Ferreira, J.R. Paula, E.A. Costa. Antidepressant-like effect of *Lafroesia pacari* A. St.-Hil. ethanolic extract and fractions in mice. *Journal of Ethnopharmacology* .2009; 124(3): 581-585.
9. M. Herrera-Ruiz, J.E. Jiménez-Ferrer, T.C.M De Lima, D. Avilés-Montes, D. Pérez-García, M. González-Cortazar, J. Tortoriello. Anxiolytic and antidepressant-like activity of a standardized extract from *Galphimia glauca* .*Phytomedicine* .2006; 13(1-2): 23-28.
10. Andriara E. Freitas, Josiane Budni, Kelly R. Lobato, Ricardo W. Binfaré, Daniele G. Machado, Jardel Jacinto, Patrícia O. Veronezi, Moacir G. Pizzolatti, Ana Lúcia S. Rodrigues . Antidepressant-like action of the ethanolic extract from *Tabebuia avellanedae* in mice: Evidence for the involvement of the monoaminergic system .*progress in Neuro-Psychopharmacology and Biological Psychiatry*. 2010;34(2): 335-343.
11. Mishra L, Aquilina N, Kohlbeck F. Usefulness of guggul (*Commiphora mukul*) for osteoarthritis of the knee: An experimental case study. *Altern Ther Health Med*. 2001;7:120112-4.
12. Grindlay D, Reynolds T. The Aloe Vera phenomenon: a review of the properties and modern uses of the leaf parenchyma gel. *Journal of ethnopharmacology*. 1986;16:17151.
13. D. Jasso de Rodríguez, D. Hernández-Castillo, R. Rodríguez-García, J. L. Angulo-Sánchez . Antifungal activity in vitro of Aloe vera pulp and liquid fraction against plant pathogenic fungi .*Industrial Crops and Products*. 2005;21(1):81-87.
14. Rattree Maenthaisong, Nathorn Chaiyakunapruk, Surachet Niruntraporn,

- Chuenjid Kongkaew . The efficacy of aloe vera used for burn wound healing: A systematic review .*Burns*. 2007;33(6): 713-718.
15. Fernanda Aparecida Sampaio MendonçaI, José Roberto Passarini JuniorII, Marcelo Augusto Marretto EsquisattoIII, Josué Sampaio MendonçaIV, Cristina Cruz FranchiniV, Glaucia Maria .. Effects of the application of Aloe vera (L.) and microcurrent on the healing of wounds surgically induced in Wistar rats .*Tech dos SantosVI Acta Cirúrgica Brasileira*.2009; 24 (2):150.
16. Chong Kil Lee, Seong Sun Han, Young Keun Mo, Ro SaKim, Myung Hee Chung, Young In Park, Seung Ki Lee, Yeong Shik Kim . Prevention of ultraviolet radiation-induced suppression of accessory cell function of Langerhans cells by Aloe vera gel components .*Immunopharmacology*. 1997;37(2-3):153-162.
17. P. Chithra, G. B. Sajithlal, Gowri Chandrakasan. Influence of aloe vera on the healing of dermal wounds in diabetic rats .*Journal of Ethnopharmacology* .1998;59(3):195-201.
18. Sikarwar Mukesh, Patil M. B., Sharma Shalini, Bhat Vishnu. Aloe vera: Plant of Immortality .*International Journal of Pharma Sciences and Research (IJPSR)*.2010;1(1): 7-10.