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Aloe sp effects on the intestinal motility of Wistar rats

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Abstract
Aloe sp is a perennial shrub that grows in any type of soil and is native to Asia and East Africa and South America, but is acclimated in the world, preferring hot and humid climate. It may exhibit laxative effects due to the presence of anthraquinones. Considering this laxative effect, *Aloe* may be used in cases of constipation. The present study aimed to evaluate the effects of *Aloe* sp on the intestinal motility in Wistar rats. Male rats were fasted for 12 hours and then they were divided in three experimental groups. The Control group 1 (G1) was treated with 1 mL of water by gavage route (n=7); Group 2 (G2) was treated with Senne tea at the ratio of 1:1 in water by gavage route (n=07), and Group 3 (G3), was treated with *Aloe* tea at the ratio of 1:1 in water by gavage route (n = 8). Senne tea was used for comparison of the intestinal motility. After 45 minutes, the groups received 1 mL of activated charcoal suspension. After 4 hours the animals were submitted to euthanasia and the abdominal cavity was opened and the intestine was removed and fixed with pins on a Styrofoam board. The intestinal length and the distance covered by the activated charcoal was measured in all groups. Our results showed that the animals of the three experimental groups were similar ($p>\alpha$) in the weight, in the intestinal length and the in distance traveled by the activated charcoal. Comparing the intestinal motility between G1, G2 and G3, the better results were obtained in G2 (Senne group) when comparing to control ($p = 0.001$). Our results show that *Aloe* did not promote increase in the intestinal motility in Wistar rats contradicting its effects in folk medicine and in some studies found in the literature.

Keywords: Medicinal plants; *Aloe* sp; *Cassia angustifolia*; Intestinal motility.

1. Introduction

Therapies based on the use of medicinal plants are known since ancient times and is very popular mainly in low-income populations around the world due the facilities of obtaining and low costs. They may be used in the prevention, treatment, or as an adjuvant to the allopathic approach for many diseases. Several studies in the literature identify plants with potential of promoting health or preventing risk factors for several diseases including obstipation [1, 3].

Aloe species are very known plants that belong to the *Aloe* genus in the Family Xanthorrhoeaceae. It is a perennial shrub native to Asia and East Africa and South America, but is acclimated in the world, preferring hot and humid climate [4, 6].

The popularity of this plant in traditional medicine extends for several ailments such as antitumor, immunomodulatory, anti-inflammatory, antiulcer, antimicrobial and antifungal properties. Many studies have shown the effectiveness of this plant in Alzheimer treatment and in various types of cancer such as liver, colon, duodenal, skin, pancreatic, intestinal, lung and kidney types. These multiple biological actions make *Aloe* an important resource for developing new natural therapies. Traditionally, the gel obtained from *Aloe* species are used as a cosmetic, healing and moisturizing, while the green part of the leaves can be used as laxative possibly due to the presence of anthraquinones. Considering this laxative effect, *Aloe* may also be used in cases of constipation when the evacuation becomes difficult or infrequent [7, 9].

Based on its popular use and on some studies, we aimed to evaluate the effect of *Aloe* sp on intestinal motility in Wistar rats.

2 Methods

2.1 Ethics

This study had the approval by the Animal Research Ethics Committee of the University of Marília (UNIMAR/ Marília, SP, Brazil) under protocol 90/2014. Male Wistar rats (*Rattus norvegicus)* weighing 200g to 250g were kept in the vivarium at UNIMAR University. The animals were maintained in cages under a dark/light cycle of 12 hours, room temperature of 22 ± 2°C, and relative air humidity of 60 ± 5%. Animals received food and water *ad libitum*. Recommendations from the Canadian Council's "Guide for the care and use of experimental animals" were used to the care of the animals.

All the animals used in this study presented no significant differences in the body weight.

2.2 Preparation of Senne and *Aloe* infusion

Senne (*Cassia angustifolia*) infusion was used in order to compare the results obtained with *Aloe* sp The Senne infusion was prepared according to manufacturer's instructions (Natural Life®): one tablespoon with dried leaves to 150 mL of boiling water for 5 minutes and then the tea was brewed.

Aloe sp leaves were collected in the morning at the Experimental Garden Dr. Silvio José Sarti – University of Marilia, São Paulo,

Brazil. *Aloe* infusion was prepared using 20g of *Aloe* sp leaves in 1 liter of boiling water.

2.3 Experimental Groups

Prior to the experimental protocol the animals were fasted for 12 hours, and were divided randomly in the following experimental groups (n=10 per group) and the intestinal motility test was evaluated according to the model described by Michelin, Salgado[10], with modifications.

After a 24-hour fast, the control group and treated groups (n=10 per group) were gavage-fed following the below division:

G1: Control group, treated with 1.0 mL of water by gavage route;

G2: Group treated with 1.0 mL of Senne solution by gavage route;

G3: Group treated with 1.0 mL of *Aloe* sp solution by gavage route.

After 45 minutes, the groups were gavage-fed 0.2mL of a 10% activated charcoal suspension in gum Arabic 5%. Four hours after this administration, the rats were euthanized with a lethal intraperitoneal injection of thiopental (200 mg/Kg). After confirmation of the death, the intestine was removed and the length and the distance traveled by the activated charcoal were evaluated.

2.4 Statistic

Statistical analysis of quantitative data was carried out with support from BioEstat 5.0. The descriptive analysis of the data is presented in tables. To the evaluation of variables, we used the ANOVA One-way, Kruskal-Wallis, t-test of independence, Mann-Whitney and Pearson correlation test. The significance level was 5 % ($p \leq 0.05$).

3 Results

Table 1 shows that the effects of *Aloe* and Senne in the intestinal motility (distance traveled by the activated charcoal) between the three groups (Table 1) and no significant differences were found for length and the distance traveled by the activated charcoal. Results in this table also show that animals did not differ in the body weight.

Table 1: Weight, intestinal length and distance traveled by the activated charcoal in the rats in G1 (control group), G2 (Senne group) and G3 (*Aloe* sp group).

	G1 n=7	G2 n=7	G3 n=8	p-value*
	Median			
Body weight (g)	259	280	253	p = 0.200*
Lenght (cm)	102	109	112	p = 0.588*
Distance traveled (cm)	22	59	27	p = 0.054**

*Anova One-Way test. ** Kruskal-Wallis test.

The Table 2 shows significant difference only when we compare the control group (G1) with the group treated with senne (G2) but no differences were seen in the group treated with *Aloe*.

Table 2: Comparison of intestinal motility based on the distance traveled by the activated charcoal among the groups.

Comparison	p-value
G1 x G2	0.001*
G1 x G3	0.127*
G2 x G3	0.148**

G1: Control Group. G2: Group treated with senne. G3: Group treated with *Aloe* sp. *T Test of Independency. **Mann-Whitney Test.

The Pearson test was used to evaluate the correlation between the intestinal length and the distance traveled by the activated charcoal. This test showed a negative correlation in G1 (Figure 2), indicating that the higher is the length of the intestine, the lower was the distance traveled by the activated charcoal, i.e., the lower was the intestinal motility. In G2 and G3 this correlation was positive (Figures 3 and 4), i.e. the greater the length of the intestine, higher was the distance traveled and thus the intestinal motility.

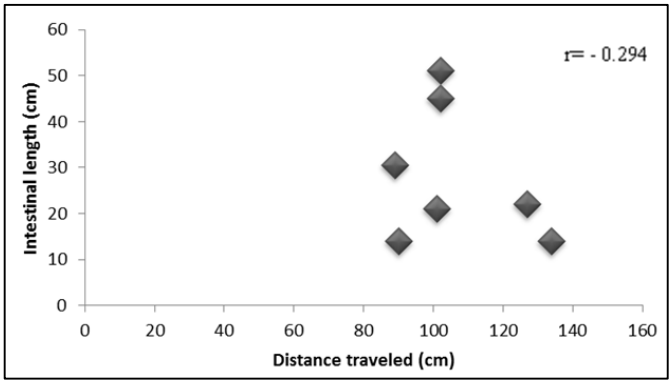

Fig 1: Correlation between intestinal length and the distance traveled by the activated charcoal in the control group (G1).

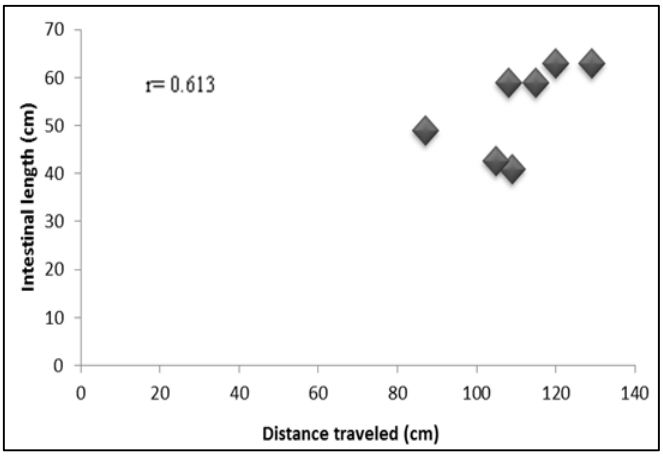

Fig 2: Correlation between intestinal length and the distance traveled by the activated charcoal in the Senne group (G2).

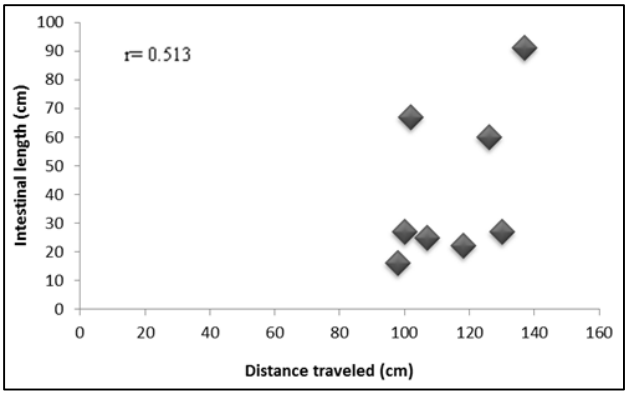

Fig 3: Correlation between intestinal length and the distance traveled by the activated charcoal in the *Aloe* group (G3).

4 Discussion

Chronic constipation is a very common health problem that affects about 12-17% of the world population mainly woman above 65 years of age. It is related to significant impact on the quality of life and represents a heavy economic burden. Authors believe that only in United States more than $800 million are spent on laxatives every year [11, 12].

Most people suffering from this problem look for alternative therapies for the treatment as the use of medicinal plants once that several allopathic therapies may promote side effects.[13, 14]

Several plants have been tested in the intestinal motility and many of them exhibit important results. Cassia angustifolia (senne) is used worldwide in the treatment of intestinal constipation. Substances as acetophenones, sennosides, flavonoids, anthraquinone, xanthones, and naphthalene are possibly responsible for the increase in the intestinal motility.[15, 16] in this work, we have used senne in order to compare with the control group and group treated with *Aloe* sp and our results corroborate many authors about the positive effects of using Senne in increasing intestinal motility.

After analyzing our results in the intestinal motility in Wistar rats after administration of *Aloe* sp and we may observe that this plant did not promote increase in the intestinal motility, contradicting the findings of many authors and popular descriptions [17].

Epifano [18]. found laxative substances in *Aloe vera* named madagascine and 3-geranyloxyemodin as well as typical anthranoids compounds such as emodin, physcione, *Aloe*-emodin, rhein and chrysophanol.

Wintola [19]. Used an aqueous solution of *Aloe ferox* in rats with induced constipation by Loperamide, and found that this substance had laxative activity equivalent to a standard drug. The effect of the extract of the herb improved intestinal motility, increased fecal mass and normalized to body weight in rats with chronic constipation.

In other study, Celestino [20]. Showed that *Aloe ferox* resin extract increased the gastrointestinal motility in mice and did not induce signs of toxicity or death.

Amoo [7]. performed an extensive review of the medical uses of *Aloe* species and linked its use to laxative properties as well as other medicinal applications.

Wamer, Vath, Falvey [21]. Attributes the laxative effects of *Aloe* to the presence of aloin A, *Aloe* emodin, and structurally related anthraquinones.

In a very interesting review about the properties and toxicological effects of *Aloe vera*, Boudreau, Beland [22]. Point that the Arabic word alloeh means shining and bitter, referring to the bitter-tasting of the latex that is a drug regulated by the Food and Drug Administration (FDA) as having a potent laxative and cathartic substance. These authors also say that the laxative effect of the *Aloe vera* latex is not related to the ingested form of the anthraquinone, but it is due to a common metabolite named Aloe-emodin-9-anthrone that is an active ingredient resulting from the activity of the Eubacterium. This microorganism is expressed in different ways in different species. Some species as rats are able to produce Aloe-emodin-9-anthrone but not guinea pigs.

Our results do not show positive effects after the use of *Aloe* sp but when comparing to the control group, aloe did not increase motility significantly but its effects not suffered interference related to the intestine length, whereas the correlation between motility and intestine length was positive in animals that received *Aloe* sp

5 Conclusions

Our results showed that *Aloe* did not exhibit significant effects on the intestinal motility of Wistar rats according to the methodology used in this work. Once some, but not many, authors show that this plant may exhibit laxative effects, we suggest that further studies are needed in order to clarify the effects of this plant in the intestinal tract of animal models and in humans.

6 References

1. Zhang JP, Tian XH, Yang YX, Liu QX, Wang Q, Chen LP, *et al.* Gleditsia species: An ethnomedical, phytochemical and pharmacological review. J Ethnopharmacol. 2016; 3;178:155-71. doi: 10.1016/j.jep.2015.11.044. Epub 2015 Nov 28. Review.
2. Araújo AC, Guiguer ÉL, Barbalho SM, Bueno PC, Lopes JA, da Silva BF, *et al.* Phytochemical Characteristics of Seeds and Its Effects on the Intestinal Motility and Toxicity of Joannesia princeps. J Med Food. 2016; 19(1):68-72. doi: 10.1089/jmf.2015.0071.
3. Azimi P, Ghiasvand R, Feizi A, Hosseinzadeh J, Bahreynian M, Hariri M, *et al.* Effect of cinnamon, cardamom, saffron and ginger consumption on blood pressure and a marker of endothelial function in patients with type 2 diabetes mellitus: A randomized controlled clinical trial. Blood Press. 2016. 12:1-8.
4. Kavitha S, John F, Indira M. Amelioration of inflammation by phenolic rich methanolic extract of Ocimum sanctum Linn. Leaves in isoproterenol induced myocardial infarction Indian. J Exp Biol. 2015; 53(10):632-40.
5. Singab AN1, El-Hefnawy HM2, Esmat A3, Gad HA1, Nazeam JA4. A Systemic Review on Aloe arborescens Pharmacological Profile: Biological Activities and Pilot Clinical Trials. Phytother Res. 2015; 29(12):1858-67. doi: 10.1002/ptr.5483. Epub.
6. Carter P1, Rahman SM1, Bhattarai N1.Facile Fabrication of Aloe Vera Containing PCL Nanofibers for Barrier Membrane Application. J Biomater Sci Polym Ed. 2016 Feb 15:1-31. [Epub ahead of print]
7. Amoo SO, Aremu AO, Van Staden J. Unraveling the medicinal potential of South African Aloe species. J Ethnopharmacology. 2014; 153(1):19-41. doi: 10.1016/j.jep.2014.01.036. Epub. Review.

8. Cock IE. The Genus Aloe: Phytochemistry and Therapeutic Uses Including Treatments for Gastrointestinal Conditions and Chronic Inflammation. Prog Drug Res. 2015; 70:179-235. Review
9. Clementi ME, Tringali G, Triggiani D, Giardina B. Aloe arborescens Extract Protects IMR-32 Cells against Alzheimer Amyloid Beta Peptide via Inhibition of Radical Peroxide Production. Nat Prod Commun. 2015; 10(11):1993-5.
10. Michelin DC, Salgado HRN. Avaliação da atividade laxante de Operculina macrocarpa L. Urban (Convolvulaceae). Rev. Bras. Farmacogn. 2004; 14(2):105-109.
11. Bassotti G, Gambaccini D, Bellini M. Prucalopride succinate for the treatment of constipation: an update. Expert Rev Gastroenterol Hepatol. 2016; 10(3):291-300. doi: 10.1586/17474124.2016.1129897. Epub.
12. Wald A. Constipation: Advances in Diagnosis and Treatment. JAMA. 2016; 315(2):185-91. doi: 10.1001/jama.2015.16994.
13. Mounsey A, Raleigh M, Wilson A. Management of Constipation in Older Adults. Am Fam Physician. 2015; 92(6):500-4.
14. Cirillo C, Capasso R. Constipation and Botanical Medicines: An Overview. Phytother Res. 2015; (10):1488-93. doi: 10.1002/ptr.5410.
15. Yamate Y, Hiramoto K, Yokoyama S, Ooi K. Immunological changes in the intestines and skin after senna administration. Pharm Biol. 2015; 53(6):913-20. doi: 10.3109/13880209.2014.948636. Epub.
16. Yenidogan E, Okan I, Kayaoglu HA, Akgul GG, Sansal M, Tali S, Ozsoy Z, Sahin M. Same-day colonoscopy preparation with Senna alkaloids and bisacodyl tablets: a pilot study. World J Gastroenterol. 2014; 20(41):15382-6. doi: 10.3748/wjg.v20.i41.15382.
17. Narayanan S, Jadhav AP, Kadam VJ. Forced Degradation Studies of Aloe Emodin by HPTLC. Indian J Pharm Sci. 2015; 77(6):795-8.
18. Epifano F, Fiorito S, Locatelli M, Taddeo VA, Genovese S. Screening for novel plant sources of prenyloxyanthraquinones: Senna alexandrina Mill. And Aloe vera (L.) Burm. F. Nat Prod Res. 2015; 29(2):180-4. doi: 10.1080/14786419.2014.971792. Epub 2014 Oct 24.
19. Wintola OA, Sunmonu TO, Afolayan AJ. The effect of Aloe ferox Mill. In the treatment of loperamide-induced constipation in Wistar rats. BMC Gastroenterol. v.10, [Internet]. 2010.
    Disponível em: http://www.biomedcentral.com/1471-230X/10/95.
20. Celestino VRL, Maranhão HML, Vasconcelos CFB, Lima CR, Medeiros GCR, *et al.* Acute toxicity and laxative activity of Aloe ferox resin. Rev. Bras. Farmacogn. 2013. 23.279-283.
21. Wamer WG1, Vath P, Falvey DE. In vitro studies on the photobiological properties of Aloe emodin and aloin A. Free Radic Biol Med. 2003; 34(2):233-42.
22. Boudreau MD, Beland FA. An Evaluation of the Biological and Toxicological Properties of Aloe Barbadensis (Miller), Aloe Vera. Journal of Environmental Science and Health Part C. 2006; 24:103-154.