Attenuation of visceral pain in mice by the essential oil from Vanillosmopsis arborea bark*

O óleo essencial do caule de Vanillosmopsis arborea atenua a dor visceral em camundongos

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SUMMARY

BACKGROUND AND OBJECTIVES: Vanillosmopsis arborea Baker (Asteraceae) has high economic value and anti-inflammatory properties due the presence of α-bisabolol in its bark essential oil. Keeping in view the high content of α-bisabolol in Vanillosmopsis arborea (EOV A) bark essential oil, the aim of our study was to determine whether EOV A mitigates visceral nociception induced by different noxious agents.

METHOD: Mice (n = 8) were pretreated orally with EOV A (100, 200 e 400 mg/kg) or vehicle, and pain-related behavioral responses to intraperitoneal cyclophosphamide (CPM 400 mg/kg), intracolonic mustard oil (MO 0.75%) or capsaicin (CAP 0.3%) were analyzed.

RESULTS: Animals that received CFM, OM or CAP presented spontaneous nociceptive behaviors that were significantly suppressed by EOV A.

CONCLUSION: These findings point to visceral antinociceptive properties of EOV A suggesting the potential use of Vanillosmopsis arborea to treat pain associated to gastrointestinal disorders.

Keywords: Essential oil, Vanillosmopsis arborea, Visceral pain.

RESUMO

JUSTIFICATIV A E OBJETIVOS: Vanillosmopsis arborea Baker (Asteraceae) de reconhecido valor econômico que possui propriedades anti-inflamatórias provenientes do sesquiterpeno alfa-bisabolol, presente em teores elevados no óleo essencial de sua madeira. Considerando-se o alto teor de α-bisabolol no óleo essencial do caule de Vanillosmopsis arborea (OEVA). O objetivo deste estudo foi determinar o efeito do OEV A na nocicepção visceral induzida por diversos agentes irritantes.

MÉTODO: Camundongos (n = 8) foram pré-tratados por via oral com EOV A (100, 200 e 400 mg/kg) ou veículo e as respostas comportamentais devido a administração de ciclofosfamida (CFM 400 mg/kg; por via intraperitoneal), óleo de mostarda (OM 0,75%; intracolônico) ou capsicina (CAP 0,3%; intracolônica) foram registradas.

RESULTADOS: Os animais que receberam CFM, OM ou CAP apresentaram comportamentos nociceptivos espontâneos que foram significativamente suprimidos nos grupos tratados com EOV A.

CONCLUSÃO: Estes achados apontam a propriedade antinociceptiva visceral do óleo essencial do caule de Vanillosmopsis arborea indicando o uso potencial no alívio da dor associada às desordens gastrintestinais.

Descritores: Dor visceral, Óleo essencial, Vanillosmopsis arborea.
INTRODUCTION

Vanillosmopsis arborea Baker, popular known as “candeeiro”, is a small tree which grows in the Araripe National Forest, in the state of Ceará, Brazil. Its wood has a strong odor of chamomile and burns easily with a strong flame. Phytochemical studies of the essential oil revealed the presence of a high content of bisabolol and experimental investigations demonstrated the gastroprotective, larvicidal, antimicrobial, antifungal and anti-inflammatory activities and it is popularly used as a repellent. Earlier studies indicated that candeeiro is not potentially toxic.

Visceral pain is the most common form of pain for which the patients often seek medical care. Despite the considerable advances in knowledge regarding the basic mechanisms underlying the visceral pain and visceral hyperalgesia, no new effective therapies for abdominal pain have been discovered. So far, there is no experimental evidence indicating a visceral antinociceptive activity of Vanillosmopsis arborea essential oil. An analgesic effect of “candeeiro” using the acetic acid-induced writhing test has been described earlier, but not considered a valid model of visceral nociception since it affects unknown somatic and visceral structures. An alternative model of acute visceral pain in the mouse employs the intracolonic instillation of capsaicin, mustard oil or formalin or intraperitoneal cyclophosphamide, that produce visceral pain-related behaviors such as licking of the abdomen, stretching the abdomen, squashing of the lower abdomen against the floor and abdominal retractions, which can be quantified.

Keeping in view the high content of alpha-bisabolol in Vanillosmopsis arborea bark essential oil, the aim of our study was to determine whether Vanillosmopsis arborea mitigates visceral nociception-induced by different noxious agents.

METHOD

Plant material

The essential oil from Vanillosmopsis arborea Baker bark (EOVA) was obtained at the Natural Products Research Laboratory of Regional University of Cariri the composition (w/w) of EOVA revealed the presence of α-bisabolol to extent of 70%. Others identified compounds were α-cadinol (8.4%), elemicine (6.21%), β-bisabolene (4.46%), δ-guaiene (2.31%), β-cubebene (1.76%) and estragole (1.08%).

Animals

Male Swiss albino mice (20–25 g) obtained from the Central Animal House of Regional University of Cariri were used. They were housed in environmentally controlled conditions (22° C, 12 h light–dark cycle), with free access to standard pellet diet (Purina, São Paulo, Brazil) and water. Animals were kept in cages with raised floors to prevent coprophagy. They were fasted over a period of 15 h and were habituated to the test environment for 2 h before the experimentation. The experimental protocols were approved by the Animal Care and Use Committee of the University of Fortaleza in accordance with the ethical guidelines of National Institute of Health, Bethesda, U.S.A.

Cyclophosphamide-induced visceral nociception

Mice divided in groups (8 in each) were treated with vehicle (2% Tween 80 in distillated water, 10 ml/kg, p.o.) or EOVA (100, 200 or 400 mg/kg, p.o.), 1 h before the intraperitoneal administration of cyclophosphamide (CPM, 400 mg/kg). Immediately after CPM or saline injection, each animal was examined for the time spent in expressing the visceral nociceptive behaviors (transient crises) like piloerection, licking the abdomen, squashing of the abdomen against the floor and the abdominal contractions and retractions) during a 4 h period. A normal control, that received only saline intraperitoneally, was included in the study.

Mustard oil-induced visceral nociception

To assess the antinociceptive effect of EOVA against the mustard oil (MO)-induced visceral nociception, mice in groups (n = 8) were orally treated with EOVA (100, 200 or 400 mg/kg) or vehicle (2% Tween 80 in distillated water, 10 ml/kg, p.o.) 1 h before the intracolonic administration of MO (0.75% in saline 0.9%, 50 μl/animal). A group of normal control received a similar dose of saline (10 mL/kg). Immediately following the intracolonic MO or saline administration, the mice were observed of the total number of nociceptive behaviors (licking the upper abdomen, stretching the abdomen, squashing the abdomen against the floor and retraction of the abdomen characterized for an arched position), for a 20 min period.

Capsaicin-induced visceral nociception

Male mice divided into groups of eight in each were pre-treated with the vehicle (2% Tween 80 in distilled water, 10 ml/kg, p.o.) or EOVA (100, 200 or 400 mg/kg, p.o.). One hour after oral and 30 min following systemic treatments, capsaicin (0.3% in a solution of PBS: Tween 80: ethanol (8:1:1) was instilled into the colon (50 μl/animal).
using a fine cannula (1.6 mm external diameter), 4 cm far from the anal sphincter. Solid petroleum jelly was applied onto the perianal region to avoid local nerve stimulation. The animals were then observed during a 30 min period for the spontaneous visceral pain-related behaviors (licking the upper abdomen, abdominal contortion and retraction, squashing the abdomen against the floor). A normal group, that received only saline intracolonically, was also included.

Statistical analysis
The results are expressed as mean ±S.E.M. from 8 mice per group. For statistical analysis, ANOVA followed by Student Newman Keul’s post hoc test, as appropriate were used. A p < 0.05 was considered statistically significant.

RESULTS
Graphics 1, 2 and 3 show the antinociceptive effect of EOV A in cyclophosphamide, mustard oil and capsaicin tests. Intraperitoneal application of cyclophosphamide (CFM 400 mg/kg) and intracolonic application of mustard oil (MO 0.75%), and capsaicin (CAP 0.3%), provoked a significant increase in spontaneous pain-related behaviors when compared with saline treated normal controls. In groups pretreated with EOV A, cyclophosphamide, mustard oil and capsaicin-induced nociceptive behaviors were significantly inhibited.

DISCUSSION
In animals several algogenic substances like capsaicin, mustard, and cyclophosphamide, applied to visceral structures can elicit pain-related behaviors involving capsaicin sensitive primary afferents. These algogenic substances
are capable of inducing pain as well as inflammatory reaction when either visceral afferents are sensitized or central neurons undergo a change in excitability (central sensitization) after persistent visceral input. In the search for novel natural substances, which possess visceral antinociceptive property, we used the acute models of visceral pain induced by intraperitoneal administration of acetic acid or cyclophosphamide or by intracolonic instillation of mustard oil, capsaicin or formalin to produce spontaneous pain-related behaviors in mice, which has disease-relevancy to human irritable bowel syndrome.

The essential oil of *Vanillosmopsis arborea* could significantly suppress the pain-related behaviors against all noxious agents used to induce visceral pain, possibly regulating the functioning of primary afferent fibers. Visceral afferents express a wide range of membrane receptors (including vanilloid receptors, TRPV1) to chemical stimuli, which are involved in sensory signaling from the gut to the central nervous system. This antinociceptive effect may be related to the high bisabolol content in EOV A, since that Alves et al. have just reported that bisabolol is able to reduce the neuronal excitability in a concentration-dependent manner.

**CONCLUSION**

In conclusion, we provided in vivo evidence to show that EOV A inhibits visceral nociception induced by several agents, which needs further elucidation on its antinociceptive activity.

**REFERENCES**


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