Research Article

Comparative Study of Centrally Acting Skeletal Muscle Relaxant Activity of Aqueous Extract of *Cinnamomum zeylanicum* Bark with Methocarbamol on Albino Mice

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ABSTRACT

Cinnamon bark is used as a spice. It is employed in cookery as a condiment and flavouring material. The essential oil of this herb is a potent antibacterial, anti-fungal, and uterine stimulant. It is useful in diarrhoea and haemorrhage of the womb. It also reduces blood sugar and cholesterol level. One of its uses is in musculoskeletal disorder. The aim of the study was to evaluate the centrally acting skeletal muscle relaxant activity of aqueous extract of *Cinnamomum zeylanicum* bark in albino mice using methocarbamol as a standard drug. The mice were divided into three groups to receive the following treatments: group 1, control (distilled water); group 2, standard drug (methocarbamol 60mg/kg suspended in distilled water); group 3, test drug (aqueous extract of *Cinnamomum zeylanicum* bark (ABCZB) 200mgkg^{-1} suspended in distilled water). Various preliminary phytochemical group tests of the aqueous extracts of *Cinnamomum zeylanicum* bark was performed by the standard methods. Aqueous extract of *Cinnamomum zeylanicum* bark (AECZB) showed better muscle relaxant effect as compared to standard drug (Methocarbamol, 60 mg/kg). As this aqueous extract is having antioxidant properties, so it shows fewer side effects as compared to methocarbamol. The result from the Rotarod test showed that the extract significantly reduced the motor coordination of the tested animals. These results demonstrate that the aqueous extract of *Cinnamomum zeylanicum* bark possesses better skeletal muscle relaxant activities than that of the standard drug used.

Keywords: *Cinnamomum zeylanicum*, Methocarbamol, Skeletal muscle relaxant activity.

INTRODUCTION

Skeletal muscle relaxants are centrally acting agents that work by reducing the tone of skeletal muscle causing muscle to relax. These drugs are used to relieve skeletal muscle spasms due to spastic conditions and can be used to relieve musculoskeletal pain and spasms. [1]

Common musculoskeletal conditions causing tenderness and muscle spasms include fibromyalgia,[2] tension headaches,[3] myofascial pain syndrome, and mechanical low back or neck pain. Skeletal muscle relaxants are one of several classes of medications (including antidepressants, neuroleptics, anti-inflammatory agents, and opioids) frequently used to treat these conditions. [4-6]

Skeletal muscle relaxants have been approved for either treatment of spasticity or for treatment of musculoskeletal conditions. Drugs classified as skeletal muscle relaxants are baclofen, carisoprodol, chlorzoxazone, cyclobenzaprine, dantrolene, metaxalone, methocarbamol, orphenadrine, and tizanidine.

Methocarbamol is structurally related to mephenesin. [7] The mechanism of action for most of these agents is unclear, but may be related in part to sedative effects. These drugs are often used for treatment of musculoskeletal conditions whether muscle spasm is present or not.[6] But it is having some Potential side-effects include drowsiness, dizziness, upset stomach, flushing, blurred vision, skin rash or itching, slow heart rate, fainting, jaundice, persistent nausea/vomiting, stomach/abdominal pain, mental/mood changes, clumsiness, trouble urinating etc.

Cinnamon extract have shown to decrease muscular pain and other musculoskeletal complications by providing skeletal muscle relaxant activity. The possible mechanism by virtue of which cinnamon extract exerts this effect is that,

- The bark of *Cinnamomum zeylanicum* was found to contain a major phenolic metabolite of doubly linked proanthocyanidins. C. zeylanicum bark extract was found to have anti-inflammatory activity.
- *Cinnamomum zeylanicum,* causes reduction of swelling associated with inflammatory conditions, shortening of recovery time, and increase of mobility in the joints were observed, these properties helps in treatment of arthritis. [8]

MATERIALS AND METHODS

Plant material

The bark of *Cinnamomum zeylanicum* was obtained from a local supermarket. The identification and authentication of the bark was done at the Department of Botany, St. Joseph College women.

Preparation of the bark extract[9]

Cinnamon bark (~100 g) was thoroughly powdered and kept airtight in cool, dry and dark conditions. Approximately 75 g was placed in a soxhlet apparatus and extracted in aqueous medium at 34 c for 60 h. The extract

(Fig.2) was dried under vacuum, stored at room temperature, and protected from direct sunlight.

Preliminary Phytochemical investigation

Phytochemical screening

The preliminary phytochemical group test of the aqueous extracts of *Cinnamomum zeylanicum* bark was performed by the standard methods (Tyler et al., 1993; Pollock and Stevens, 1965; Trease and Evans, 1996 and Plummer, 1985).[10] The results of different phytochemical tests (Table 1) of the crude aqueous extract showed that components like phenol, carbohydrates, tannins, saponin, phytosterol (steroid), fixed oils and fats were present while components like alkaloids, flavonoids, proteins and amino acid were absent.

Drugs and chemicals

Methocarbamol (Fig 1) (YARROW chemicals Ltd., India), 60 mg / kg dissolved in distilled water were administered in a volume of 10 ml / kg. [11] The extracts were suspended in distilled water and subjected to muscle relaxant activity using the Rotarod apparatus. The extracts were administered orally (p. o.) in a volume of 10 ml / kg of body weight, in doses of 200 mg / kg. [8]

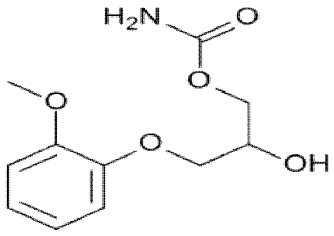

Figure 1: Chemical structure of Methocarbamol

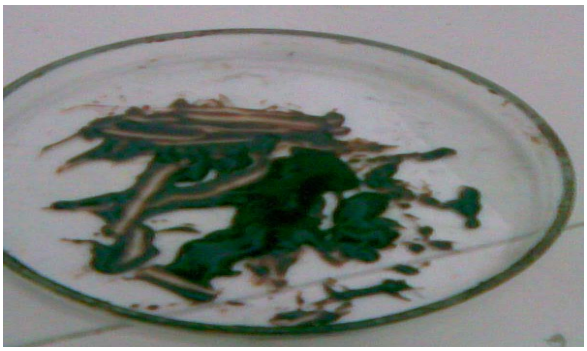

Figure 2: Aqueous extract of *Cinnamomum zeylanicum* bark

Skeletal muscle relaxant activity (motor coordination)

The mice were divided into three groups consisting of four animals each. Group I served as the control, which received distilled water 10 ml / kg, Group II received the standard drug Methocarbamol, at a dose of 10 mg / kg, p.o., Group III received the aqueous extract of *Cinnamomum zeylanicum* bark orally at a dose of 200 mg / kg. The animals remained on Rotarod (25 rpm) for five minutes or more after low successive trials were included in the study. After the administration of control, standard, and test material, the fall off time from the rotating rod was noted after 30 minutes. The difference in the fall off time from the rotating rod between the control and the treated mice was taken as an index of muscle relaxation.

Table 1: Test results for identification of phytoconstituents in *Cinnamomum zeylanicum*.

Constituents	Name of the test	Result
Alkaloids	Mayer's test	_
	Wagner's test	_
	Hager's test	_
	Dragendorff's test	_
Saponins	Foam test	+
	Bromine water test	+
Steroids	Salkowaski test	+
	Liebermann Burchard test	+
Carbohydrates	Molisch's test	+
	Fehling's solution test	+
Flavonoids	Shinoda test	-
	Lead acetate test	-
Phenol and Tannins	Ferric-chloride test	+
	Gelatin test	+
	Potassium dichromate test	+
Proteins	Millon's test	-
	Biuret test	-
Amino acids	Ninhydrin test	-
Fixed oils and fats	Sodium hydroxide test	+
	Sodium hydrogen sulphate test	+

(+=Present, =Absent)

Table 2: Effect of AECZB on the muscle Coordination on the rotarod apparatus

Groups	Time spent on Rotarod apparatus (in second)
Vehicle control (distilled water, 10mg/kg)	92.75 ± 4.38
Standard (Methocarbamol, 60mg/kg, p.o)	60.25±3.19*
Drug (AECZB,200mg/kg,p.o)	9.5 ±2.10***

RESULTS

Rota rod test for muscle relaxation

In this test, aqueous extract of *Cinnamomum zeylanicum* bark (200 mg / kg) showed highly significant reduction in the time spent by the animals on the revolving rod when compared to the control ($P < 0.01$). The standard drug (methocarbamol) also showed a significant effect when compared to the control ($P < 0.01$). Treatment with extract at a dose of 200 mg/kg and Methocarbamol at dose of 60 mg/kg decreased fall off time (motor coordination). A highly significant (***$P<0.001$) reduction in the motor coordination was observed in the test drug (AECZB). Aqueous extract of *Cinnamomum zeylanicum* bark (AECZB) showed better muscle relaxant effect as compared to standard drug (Methocarbamol, 60 mg/kg, *$P<0.05$), also this herbal drug is having antioxidant

properties, so that it shows less side effects as compared to methocarbamol. The result from the Rotarod test (Table 2) showed that the extract significantly reduced the motor coordination of the tested animals.

DISCUSSION

Cinnamon is obtained by peeling off the sweet inner bark, or skin, of the tree. As a home remedy, it can be made into a tea or added to food to improve circulation, thus warming cold hands and feet and relieving a general feeling of coldness. It can also alleviate menstrual pain, abdominal cramping and muscle spasms. The oil is used for toothache and dental infections.

It warms the kidneys, strengthens the adrenals and the heart and purifies the blood. Acting as an expectorant on the lungs, it is useful for coughs, congestion and asthma. Cinnamon is considered an aphrodisiac and is indicated for male sexual debility.

This herb stimulates the circulation, especially to the fingers and toes and has been used for arthritis. Cinnamon is also a traditional remedy for aching muscles and other symptoms of viral conditions such as colds and flu. The cinnamon bark contains volatile oils, cinnamaldehyde, eugenol, transcinnamic acids; phenolic compounds, condensed tannins, catechins, and proanthocyanidins; monoterpenes, and sesqiterpenes, (pinene); calcium monoterpenes oxalate; gum; mucilage; resin, starch, sugars, and traces of coumarin. The bark contains dimeric, trimeric, and higher oligomeric proanthocyanidins with doubly linked bis-flavan-3-ol units in the molecule. [12] The bark of *Cinnamomum zeylanicum* was found to contain a major phenolic metabolite of doubly linked proanthocyanidins. C. zeylanicum bark extract was found to have anti-inflammatory activity.Cinnamon possesses chemopreventive, antispasmodic, sedative, hypothermic, choleretic, antibacterial, antifungal, antipyretic, antiviral, antiplatelet, antiseptic, lipolytic, anesthetic, cytotoxic, anodyne, and hypolipidemic properties, and also stimulates the immune system, which may be useful adjuncts in helping to reduce the risk of cardiovascular disease and cancer.

Cinnamomum zeylanicum, causes reduction of swelling associated with inflammatory conditions, shortening of recovery time, and increase of mobility in the joints were observed, these properties helps in treatment of arthritis.

CONCLUSION

The results of this study provide support for the traditional use of *Cinnamomum zeylanicum*, as a skeletal muscle relaxant drug. Rotarod test showed that the extract significantly reduced the motor coordination of the tested animals. In conclusion, our data indicates that aqueous extract of *Cinnamomum zeylanicum* bark possesses skeletal muscle relaxant activities. The AECZB contains volatile oils, cinnamaldehyde, eugenol, and transcinnamic acids, and phenolic compounds, which are probably responsible for the actions. However, further studies are necessary to find the antioxidant properties and the hepatoprotective activity of *Cinnamomum zeylanicum* extract.

REFERENCES

1. http://www.drugs.com/drug-class/skeletal-muscle-relaxants.html
2. Leventhal LJ, Management of fibromyalgia. Annals of Internal Medicine, 131,1999, 850–858.
3. Redillas C, Solomon S, Prophylactic pharmacological treatment of chronic daily headache, Headache, 40, 2000, 83–102.
4. Deyo RA, Bergman J, Phillips WR, Drug therapy for back pain: Which drugs help which patients?, Spine, 21, 1996, 2840–2850.
5. Arnold LM, Keck PE JR, Welge JA, Antidepressant treatment of fibromyalgia. A meta-analysis and review, Psychosomatics, 41, 2000, 104–113.
6. Cherkin DC, Wheeler KJ, Barlow W, Medication use for low back pain in primary care, Spine, 23, 1998, 607–614.
7. Preston EJ, Miller CB, Herbertson RK, A double-blind, multicenter trial of methocarbamol (Robaxin(TM)) and cyclobenzaprine (Flexeril(TM)) in acute musculoskeletal conditions, Todays Therapeutic Trends, 1, 1984, 1–11.
8. Tirumalasetty J, Rasamal K, Nutalapati C, Samreen S, Evaluation of centrally acting skeletal muscle relaxant activity of aqueous extract of *Cinnamomum zeylanicum* bark in albino mice, Journal of Dr.NTR University of health sciences, 1, 2012, 94-98.
9. Hassan SA, Barthwal R, Nair MS, Haque SS, Aqueous Bark Extract of *Cinnamomum zeylanicum*: A Potential Therapeutic Agent for Streptozotocin-Induced Type 1 Diabetes Mellitus (T1DM) Rats, Tropical Journal of Pharmaceutical Research, 11, 2012, 429-435.
10. Ranasinghe P, Perera S, Gunatilake M, Abeywardene E, Gunapala N, Premakumara S, Perera K, Lokuhetty D, and Katulanda P, Effects of *Cinnamomum zeylanicum* (Ceylon cinnamon) on blood glucose and lipids in a diabetic and healthy rat model, Pharmacognosy Research, 4, 2012, 73–79.
11. Obach R, Pruñonosa J, Menargues A, Nomen M, Vallès J, Pharmacokinetics and bioavailability of methocarbamol in rats, Disposition, 9, 1988, 501-11.
12. Fang SH, Rao YK, Tzeng YM, Inhibitory effects of flavonol glycosides from Cinnamomum osmophloeum on inflammatory mediators in LPS/IFN-gamma-activated murine macrophages, Bioorganic and Medicinal Chemistry letters, 13, 2005, 2381-2388.

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