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Original Article

GREATER CARDAMOM (*AMOMUM SUBULATUM* ROXB.) – A CARDIO-ADAPTOGEN AGAINST PHYSICAL STRESS

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ABSTRACT: ***Greater cardamom (Amomum subulatum) was evaluated for its protective effect against stress induced myocardial damage in an animal experimental study. Thirty six guinea pigs were equally divided into three groups. Group I was normal control, fed on stock diet; Group II was drug control received stock diet and Ashwagandha (Withania somnifera) 25 mg/kg and Group III was treated group received stock diet and greater cardamom 200 mg/kg daily for 15 days. They were subjected for swimming endurance till exhaustion. Half of the animals in each group received injection adrenaline 2 ml before the procedure. Administration of adrenaline significantly reduced the swimming endurance in all the three groups of animals. However, the level of significance was less in greater cardamom ($p<0.01$) than in other two groups ($p<0.001$). When actual reductions in swimming time caused by adrenaline were compared with control the reduction was much more less (44.77%) in greater cardamom group than in the Ashwagandha (32.84%) group. This has offered 62.75% protection against the effect of stress by greater cardamom and 58.38 % by Ashwagandha. It is the first time that cardio-adaptogenic property of greater cardamom has been demonstrated.***

Keywords: Greater cardamom, Stress, Adaptogen.

INTRODUCTION

Spices are consumed in most of the countries of the world since ages. The practice of using spices is based on the common assumption that their consumption is related to taste and aroma. However, the recent scientific researches have explored their different biological activities and important therapeutic implications as well as isolation of active components[1]. They are known to possess hypolipidaemic, hypoglycemic, anti-thrombotic, anti-atherosclerotic, anti-inflammatory and platelet aggregation inhibition properties[1,2]. Spice, such as garlic does combat stress induced alteration in platelet aggregation and stress hormone cortisol and improves exercise tolerance in animal and human experimental studies, thereby proves itself to be an adaptogen[3,4].

Greater cardamom or large cardamom (*Amomum subulatum* Roxb.) is one of the spices commonly used in Ayurvedic, Yunani, Chinese and Tibs medical system to treat various ailments. In Ayurveda it is commonly used for dyspepsia, cough, nausea, vomiting and itching. It is also used as preventive as well as curative for throat troubles, congestion of lungs, inflammation of eyelids, digestive disorders and in the treatment of pulmonary tuberculosis[5]. The seeds contain 2-5 percent of essential oil rich in 1,8-cineol and alpha-terpineol[6,7] and have antifungal[8,9] and antioxidant[10,11] activities. The pericarp of the fruits is reported to contain steroids, terpenoids, flavanoids, tannins and saponins[12].

It was Sarkar who first described its cardio beneficial properties. He advised that one teaspoonful of cardamom powder, if taken with honey twice a day, will be beneficial to patients with ischemic heart disease[13]. However he did not mention in what way it will be beneficial. In view of this, the present animal study was envisaged to evaluate the anti-stress effect of greater cardamom and to observe its protective effect against stress induced myocardial damage in guinea-pigs.

MATERIAL AND METHODS

After approval from institutional animal ethics committee, the study was conducted on 36 guinea pigs weighing between 500 to 700 g. For the initial 15 days, all the animals was fed on stock diet alone and water to acclimatize to the conditions of the animal house. They were then divided into three groups of twelve each and reared in separate cages.

Group I (Normal control): fed on stock diet alone which consisted of *Razaka* (*Meliolotus indica*) and Bengal gram.

Group II (Drug control): fed on stock diet and 25 mg/kg of *Ashwagandha* (*Withania somnifera*) root extract daily.

Group III (Treated group): fed on stock diet and crushed seeds of Greater cardamom in the dose of 200 mg/kg body weight daily.

Preparation of drugs and feeding

Greater cardamom

The seeds of greater cardamom were separated from the capsules, dried and crushed into fine powder using an electric grinder. 2400 mg of this powder was mixed uniformly with 120 g of wheat flour. This was divided into 12 equal parts of 10 g each. One part was fed to one animal daily equivalent to a dose of 200 mg/kg body weight.

Ashwagandha

Root extract was mixed with wheat flour. 150 mg of extract was mixed with 120 g of wheat and kneaded with water. It was then divided into 12 equal parts of 10 g each. One part was fed to one animal receiving a dose of 25 mg/kg body weight.

Drugs mixed with wheat flour were fed to each animal at 8 am, two hours before the stock diet was given in order to ensure adequate absorption of drugs. They were administered for a period of 15 days.

Stress induction (Swimming endurance)

Physical stress was induced by allowing the animals to swim till exhaustion with or without prior administration of injections adrenaline. Two animals from each group were left in a tank of water 3 m × 2 m ×1 m in dimension. One of the two animals was given 2 ml of 1:1000 adrenaline injection subcutaneously 10 minutes before the procedure. They were allowed to swim till they were completely exhausted i.e. when there were no more active efforts to swim. The swimming time was noted. Animals of all three groups were thus made to swim, half of each group received injection adrenaline before swimming while half were served as control.

Statistical analysis

Data were expressed as mean ± standard error (SE). Results were statistically analyzed with student's t-test and a 'p' value less than or equal to 0.05 was considered as significant.

RESULTS

Administration of adrenaline significantly reduced the swimming endurance in all the three groups of animals (Table 1). However, the degree of significance was less in greater cardamom group ($p<0.01$) than in other two groups ($p<0.001$). When actual reduction in swimming time caused by adrenaline pretreatment in drug treated groups was compared with normal control group, the reduction in swimming time was significantly ($p<0.01$) less in both Ashwagandha and Greater cardamom groups. However, it was much more less (44.77%) in cardamom group than in Ashwagandha (32.84%) group (Table 2).

DISCUSSION

Administration of adrenaline significantly ($p<0.001$) reduced the mean duration of swimming in the normal control group (Table 1) signifying that adrenaline intensifies the stress caused by swimming.

Ashwagandha, the well known adaptogenic agent has demonstrated a significantly ($p<0.01$) less reduction (32.84%) in swimming time as compared to normal control (Table 2). Greater cardamom on the other hand also, significantly checked the swimming endurance after adrenaline administration and the level

of significance was less ($p<0.01$) than the other two groups ($p<0.001$) (Table 1). Not only this, the actual reduction caused by adrenaline injection in greater cardamom group was significantly less (44.77 %) as compared to normal control group (Table 2). It signifies that the exercise tolerance was much preserved in animals received the drug.

In terms of percentage protection provided by the drugs, Greater cardamom has provided sixty three percent while Ashwagandha offered fifty eight percent protection (Figure 1).

Adrenaline adversely affects the performance of the organism under stress by its effects on myocardium. Acute large doses result in diffuse myocardial necrosis[14] and repeated exposures cause myocardial fibrosis[15]. Various theories ave been proposed for the possible mechanism of adrenaline induced myocardial damage. They include the effect on tissue metabolism[16], the increased oxygen requirement and the induction of platelet aggregation in the coronary vessels[17].

Ashwagandha is a well known adaptogen and the mechanism by which it acts as stress adaptogen or anti-stress agent has been studied[18]. However, the mechanism of greater cardamom on myocardial protection against stress has not been evaluated. It might be possible that it induces a state of non-specific resistance in the body. Breckhman[19] has described many substances of plant origin which have such adaptogenic properties. *Panax ginseng, Elecetherococous senticoccus, Echinopanax elaum, Acantopanax sessliflorum* and *Rhodiola rosea* are some of them. He proposed that these medicines probably act at the cellular level by their antioxidant property and by their influence on the process of biosynthesis of proteins and nucleic acid. Greater cardamom also possesses antioxidant proery[10,11]. The mechanisms of action might be similar.

The seeds of greater cardamom have been reported to contain about 2.5 percent essential oil with 1,8-cineol (72.77%) and alpha-terpineol (13.3%) as the two major constituents of the oil[6,7]. The other major components reported are alpha and beta-pinene, sabinene, gamma-terpinene and allarmodendrene[20]. The seeds were found to contain cardamonin, alpinetin, glycosides[21] and a new aurone glycoside subulin[22]. The pericarp of fruits contains steroids, flavanoids, tannins and saponins. Alkaloids and phenolics are not present[6].

The 50 % ethanolic extract of the root and rhizome studied for various pharmacological properties showed some hypoglycemic activity in rat without any other significant biological activity. The essential oil obtained from the seeds was found to have inhibitory effect against various keratinophilic and dermophytic fungi[8,9]. The maximum tolerated dose of the extract was 1000 mg/kg body weight, intra-peritoneally in mice[13].

Table 1 : Effect of Greater cardamom on swimming endurance in guinea pigs

Group	Swimming endurance (minutes)		p value	Percent reduction
	Without adrenaline	After adrenaline		
Normal control	13.38 ± 0.34	6.50 ± 0.13	<0.001	51.42
Drug control (Ashwagandha)	11.10 ± 0.56	6.48 ± 0.19	<0.001	41.62
Treated group (Greater cardamom)	10.20 ± 0.75	6.40 ± 0.92	<0.01	37.25

Table 2 : Reduction in swimming endurance (minutes) induced by adrenaline.

	Normal control	Drug control	Treated group
Mean ± SE	6.88 ± 0.32	4.62 ± 0.54	3.80 ± 0.78
Percentage reduction	51.42	32.84	44.77
p Value*		<0.01	<0.01

* p as compared with normal control

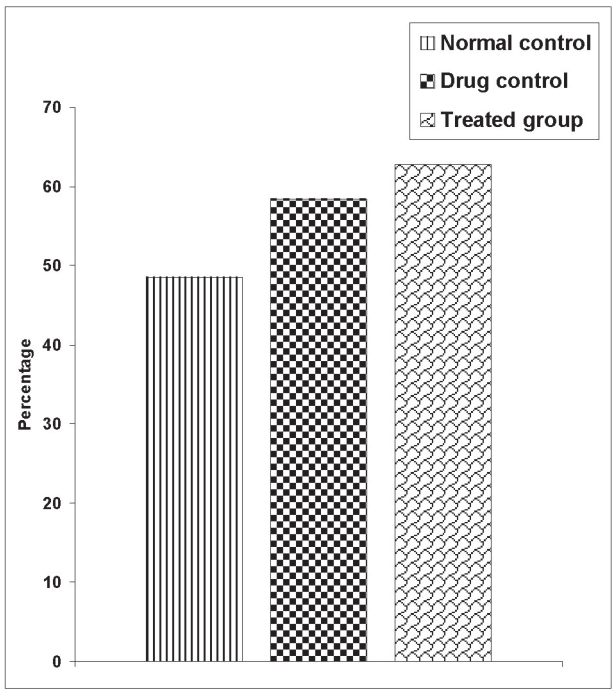

Figure 1: Percentage protection provided by drugs against the effect of adrenaline

Interestingly, the seeds also have antioxidant activity as studied on hepatic and cardiac antioxidant enzymes, glutathione content and lipid conjugated dienes in rats fed high fat diet. The antioxidant enzyme activities was found to be significantly enhanced while glutathione content was markedly restored in rats fed a diet with cardamom seeds. In addition, the spice partially counteracted increase in lipid conjugated dienes and hydroperoxides. The antioxidant activity of the seeds was attributed to their ability to activate antioxidant enzymes that catalyze the reduction of antioxidants[10].

Radical scavenging activity of greater cardamom against 1,1-diphenylpicrylhydrazyl (DPPH) was also studied. The three fractions of cardamom, dichloromethane extract, ethyl acetate soluble and water soluble fractions of the 70% aqueous acetone extract were studied. The ethyl acetate soluble fraction showed a high radical scavenging activity against DPPH. Four compounds were isolated from ethyl acetate soluble fraction, out of which compound 1 and 3 showed stronger activity than á-tocopherol and á-ascorbic acid while compound 2 and 4 were comparable to these natural antioxidants[11].

Greater cardamom, the natural antioxidant, may thus be of clinical utility in those situations where an acute and severe stress can cause myocardial damage from increased sympathetic activity. Regular consumption of powder of greater cardamom as advised by Sarkar may therefore be of logical treatment for patients with IHD facing day to day stressful situations and where sympathetic activity remains at higher threshold. However further studies are warranted to evaluate this significant cardio-adaptogenic property of greater cardamom.

REFERENCES

[1] Verma, S.K., Bordia, A.: Commonly used condiments in North India- their medicinal properties and relevant information. Project report submitted to Spices Board (Ministry of Commerce, Govt. of India) Cochin (1992).

[2] Verma, S.K. Effect of certain herbs on some risk factors of ischemic heart disease in man. Thesis submitted to Indian Board of Alternative Medicine, Kolkata for the degree of D.Sc. (2002).

[3] Verma, S.K., Bordia, A., Srivastava, K.C.: South Asian J. Prev. Cardiol. 7:128-135 (2003).

[4] Verma, S.K., Rajeevan, V., Jain, P., Bordia, A.: J. Physiol. Pharmacol. 49:115-118 (2005).

[5] *The Wealth of India*. First supplement series. Vol. I, NISCAIR, CSIR, New Delhi, p 55 (2004).

[6] Nigam, S.S., Purohit, R.M.: Perfume. Essen. Oil Res. 51:121-123 (1960).

[7] Nigam, S.S., Purohit, R.M.: Indian Perfum.5:3-7 (1961).

[8] Thind, T.S., Dahiya, M.S.: Indian Drugs. 14:17-18 (1976).

[9] Jain, P.C., Agarwal, S.C.: Trans. Mycol. Soc. Japan.19: 197(1978).

[10] Dhuley, J.N.: Indian J. Exp. Biol. 37: 238-242 (1999).

[11] Kikuzaki, H., Kawai, Y., Nakatani, N.: J. Nutr. Sci. Vitaminol (Tokyo). 47:167-171 (2001).

[12] Mukherjee, K., Ray, L. N.: Int. J. Crude Drug Res. 24: 184-205 (1986).

[13] Sarkar P.R.: *Yogic Treatment and Natural Remedies,* II Ed. AMPS Publication, Tiljala, Calcutta, p 85, (1986).

[14] Maling, H.M., Higliman, B., Thompson, E.C. : Am. J. Cardiol. 5 : 628 (1960).

[15] Flevscher, M.S., Loeb.L. : Arch. Intern. Med. 3 : 78 (1909).

[16] Kurup E.A: Antibiol. Chemotherapy. 8 : 511 (1958).

[17] Jacob, I. : Circulation. 47 : 164-169 (1973).

[18] Bhattacharya, A. : Phytother. Res.1 : 32-73 (1987).

[19] Brekhnan, I.I., Dardymov, I.V. : Ann. Rev. Pharmacol. 9 : 419-430 (1969).

[20] Singh, P.D. : Bull. Med. Ethnobot. Res. 14 : 126-136 (1993).

[21] Balakrishnan, K.V., George, K.M., Mathulla, T., Narayanapillai, O.G., Chandran, C.V., Vaghese, J. : Indian Spices. 21 : 9-12 (1984).

[22] Gurudatta, K.N., Naik, J.P., Srinivas, P., Ravindranath, B. : Flav..Frag. J. 11 :7-9 (1998).

[23] Chouhan, V.J.P. : J. Indian Chem. Soc. 53 : 633 (1976).