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THE EFFECT OF GINGER-JUICE (*ZINGIBER OFFICINALE ROSCOE*) ON LITHIUM-INDUCED LOCOMOTOR ACTIVITY IN RAT

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ABSTRACT: Ginger has shown to benefit in muscular pain due to eccentric exercise and in osteoarthritis but a later review denied these properties due to uncertainties. To ascertain the reality, this study was proposed. **Methods:** (A) Albino rats (n=6-12) were administered G.J at single dose (4 ml/rat, p.o) as single administration (acute) and chronic treatment 4ml/rat p.o over period of 7 days. Following this assessment was done. Effect of treatment with G.J acutely and chronically (7 days) administered, was assessed. Parameter used during assessment was head twitches. **Results:** Chronic treatment of ginger-juice induced the head twitches significantly. Acute treatment with ginger-juice did not affect this activity. Chronic treatment increased the number of head twitches induced by lithium. **Conclusion:** Lithium induced head twitches were enhanced after chronic administration of ginger-juice.

INTRODUCTION: Ginger is one of the most important and oldest spices, consisting of the prepared and sun-dried rhizomes of *Zingiber officinale* (Zingiberaceae). It is cultivated in many tropical countries. It is produced all over India from ancient times. It has a good commercial value and is claimed to have many medicinal uses. Because of differences in cultivation pattern, harvesting technique and climatic conditions it's commercial value differs and so also the medicinal actions and uses. It is referred by different names in the languages of different regions and countries.

It is widely consumed almost all over the World – however, in tropical countries or warm regions like Asia, it is more popular (Katiyar *et al.*, 1996) ¹.

Because of its typical taste and a pleasant odor, it's widely used as flavoring agent in numerous food recipes, beverages, pickles, many popular soft drinks etc. (Guenther, 1952) ².

From the ancient times it is included in many traditional medicinal systems for treatment of number of diseases. It is widely claimed as a stomachic, aromatic, carminative, aphrodisiacs, diaphoretic, antiemetic, allergic rhinitis and gastric stimulant and for treating migraine headache. It is also used as an antispastic against intestinal colic. Ginger oil is used in mouthwashes and liquors (Evans *et al.*, 1989) ³. Many varieties of ginger are found such as processed, coated or unscraped, unbleached (natural) and bleached ginger having different types of active principles present in the ginger. Many scientists have investigated the ginger oil and found about 50 constituents, mainly aroma, Starch, Volatile oil, Zingiberene, Gingerol, Oleoresin (Gingerin), Zingiberol, Zingerone, Shagaol etc. The acetone extract of ginger contains Zingiberone and ether extract contain Zingerone (Pungent principles).

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In view of the available literature, we have tried to screen some actions of ginger-juice; as crude form of ginger. Ginger has shown to benefit in muscular pain due to eccentric exercise¹ and in osteoarthritis² but a later review denied these properties due to uncertainties³. To ascertain the reality, this study was proposed.

MATERIALS AND METHHODS:

Preparation of ginger-juice: The commercially available ginger was obtained from the local market. It was confirmed from the botanist that it was *Zingiber officinale*.

The rhizome of ginger after cleaning and scrapping the superficial skin was cut into small pieces. With the help of mixer-grinder the pieces were made in to paste. The paste was taken on a white clean cloth and the liquid was squeezed out. The juice so obtained was used in the experiments. The stock of juice was kept in a refrigerator for maximum period of 15 days and the required quantity was used for the experiments after removing particulate matter from it.

500 gm ginger rhizomes yielded about 250ml juice. 250 ml juice was filtered which yielded about 120 – 150 ml filtrate.

The liquid portion which was obtained in the course of filtration looked like yellowish hazy opalescent liquid. It was administered orally in acute or chronic experiments. The doses were 4 ml per rat in acute as well as in chronic (for 7 days).

Central Nervous System Functions:

A. Study of acute and chronic treatment of ginger-juice on head twitches in rats: The study was done as following aim:

Lithium-induced head twitches: The rats were divided into following groups, each group consisting of 6-12 rats.

Control group: Each rats received 4 ml of normal saline orally. After 30 minutes rats were placed in the Benwick activity monitoring equipment (AM1051) for loco motor activity monitoring. After placing inside the animals were given 5 minutes time for acclimatization and 30 minutes reading considered for data analysis.

Test groups:

(a) Effect of acute treatment of ginger-juice: Each rat of this group was administered ginger-juice 4ml orally. After 30 minutes rats were placed in the activity monitoring and after 5 minutes acclimatization 30 minutes readings were considered for data analysis.

(b) Effect of chronic treatment of ginger-juice: Each rat of this group was administered orally 4ml of ginger-juice for 7 days orally. After 24 hours of last dose of ginger-juice rats were placed in the activity monitor and data was recorded as described above.

Test groups:

B. Study of acute and chronic treatment of ginger-juice on lithium-induced head twitches in rats: The rats were divided into following groups, each group consisting of 6-12 rats.

Control group: Each rat received normal saline 4ml orally. After 30 minutes rats received lithium 150 mg/kg, i.p. injection and immediately placed in a transparent glass chamber, and start counting head twitches were counted over period of 40 minutes, this reading considered for data analysis.

Test groups:

(a) Effect of acute treatment of ginger-juice: Each rat received 4 ml of ginger-juice orally. After 30 minutes rats were given lithium 150 mg/kg, i.p. injection and immediately placed in a transparent glass chamber and head twitches were counted as described.

(b) Effect of chronic treatment of ginger-juice: Each rat received 4 ml of ginger-juice orally for 7 days. After 24 hours of last dose of ginger-juice rats were administered lithium 150 mg/kg, i.p. and immediately rats were placed in a transparent glass chamber and head twitches were counted.

RESULT:

Central Nervous System Functions:

Lithium induced head twitches in rats: Count of head twitches after administration of lithium is in different groups of rats is as under.

(a) Lithium treated control group: The mean head twitches in this group were 13.16 ± 3.59 counts. The results are shown in **Table 1** and **Fig. 1**.

(b) Effect of acute treatment of ginger-juice on lithium induced head twitches: The mean head twitches in the lithium treated control group was 13.16 ± 3.59 counts, while in ginger-juice treated group it was 12.16 ± 0.48 counts expressed in **Table 1** and **Fig. 1**. The differences of mean between two groups are not significant statistically as compared to the lithium treated control group. This reflects that acute administration of ginger-juice has no effect on lithium induced head twitches.

(c) Effect of chronic treatment of ginger-juice (4ml/rat for 7 days) on lithium induced head twitches: In the lithium treated control group the mean head twitches was 13.16 ± 3.59 counts, while in ginger-juice treated group it was 25.83 ± 7.40 counts. The differences of mean between two groups are significant statistically ($P < 0.001$). It is evident that 7 days treatment of ginger-juice increased the head twitches. The results are expressed in **Table 1** and **Fig. 1**

TABLE 1: EFFECT OF LITHIUM AND GINGER-JUICE TREATED GROUP (ACUTE AND CHRONIC)

Parameters	Head twitching (counts)
Control (Li 150mg/kg) (n=6)	13.16 ± 3.59
(G. juice + Li 150mg/kg), acute (n=6)	12.16 ± 0.48
(G. juice + Li 150mg/kg), chronic (n=6)	$28.83 \pm 7.40^{***}$

The effect of lithium (150 mg/kg) on parameter like head twitches in pre-treated with ginger-juice (4 ml/rat) 30 minutes before the administration of lithium (150 mg/kg I.P) on rats. The statistical significance vis-à-vis the vehicle treated control is presented as * $p < 0.05$ ** $P < 0.01$ *** $P < 0.001$.

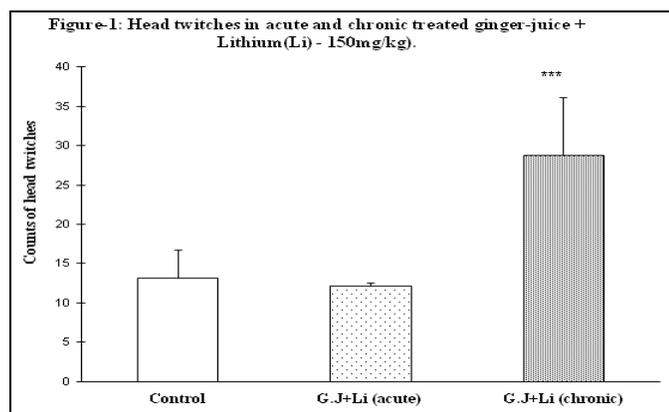


FIG. 1: HEAD TWITCHES IN ACUTE AND CHRONIC TREATED GINGER-JUICE + LITHIUM (Li) - 150mg/kg)

Head twitches induced by lithium administered were not antagonized by acute treatment of ginger-juice. Chronic treatment of ginger-juice induced the head twitches significantly. The above data indicates that lithium in dose of 150 mg/kg induced head twitches. Acute treatment with ginger-juice did not affect this activity. However, chronic treatment increased the number of head twitches induced by lithium significantly.

DISCUSSION: Observations on Lithium-induced head twitches was suppressed by ginger-juice in chronic administered (4 ml/rat, p.o for 7 days) rat. However, ginger-juice had no effect in acute administered (4 ml/rat, p.o.) rat. Lithium is reported to cause release of serotonin in central nervous system (Wielosz *et al.*, 1979) ⁷. Head twitches induced by administration of lithium are considered as model to exhibit this kind of effect (Wielosz *et al.*, 1979) ⁷.

In the present study, it is observed that ginger-juice administration over a period of 7 days increased lithium-induced twitches indicating enhanced serotonergic transmission in CNS.

In acute treatment with ginger-juice head twitches are not antagonized by it. Therefore it is evident that acute treatment with ginger-juice has no interaction with 5-HT system but chronic treatment enhanced the 5-HT mediated response. The possibility of increased sensitivity of 5-HT response is worth considering ^{5,6}.

Administration of ginger-juice acutely, however did not increase the lithium induced head twitches. This indicates lack of serotonergic or serotonin modulating effect on the part of *Z. officinale* when administered as a single dose. Huang *et al.*, (1990) ⁴ reported effect of acetone extract of *Zingiber officinale* on serotonin system. They had observed inhibition of serotonin-induced hypothermia and diarrhoea, and 6-shagol was considered as active principle responsible for these effects. Why chronic treatment caused enhanced serotonergic responses? The question cannot be answered easily. The remote speculation that can be made, which of course does not have any evidence to support, is that the unmanifested antagonist effect of "crude" form of *Z. officinale* on chronic administration might be responsible for up- regulation of 5-HT

receptor. As it is obvious, that chronic treatment with antagonists results into up regulation of the receptors enhancing agonistic response (Tripathi, 1999) ⁸.

CONCLUSION: Lithium induced head twitches were enhanced after chronic administration of ginger-juice (4ml/rat, p.o for 7 days) indicating enhanced serotonergic system in the central nervous system.

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