TO INVESTIGATE THE EFFECTS OF GINGER-JUICE (ZINGIBER OFFICINALE ROSCOE) ON CNS (LOCOMOTOR ACTIVITY) PARAMETERS IN RAT

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ABSTRACT:

To investigate the effect of ginger-juice (ZINGIBER OFFICINALE ROSCOE) on CNS parameters in rat **Methods:** (A) Albino rats (n=6-12) were administered G.J at two doses (2ml & 4 ml/rat, p.o) as single administration and chronic treatment over period of 30 days. Following this assessment was done. Effect of treatment with G.J acutely and chronically (30 days) administered, was assessed. Parameters used during assessment were locomotor activity. **Results:** The experiments indicate that ginger-juice-treatment has not produced any effect on any parameter of the loco motor activity. **Conclusion:** Ginger-juice acute and chronic administered did not affect loco motor activity.

Key words: Ginger-juice, locomotor, static, rearing count, static count, active time.

INTRODUCTION

A 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 migrane headache. It is also used 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 Zingerberone and ether extract contain Zingerone (Pungent principles).

In view of the available literature, we have tried to screen some actions of ginger-juice; as crude form of ginger. We presume that crude form contains majority of active principles, may be in very low concentrations. Keeping in minded some of its potential therapeutic applications we have carried out animal experiments to investigate the effects of ginger-juice on gastric-ulceration. We are carrying out animal experiments to investigate the effects of ginger-juice on central nervous system.

SEROTONERGIC SYSTEM:

Huang et al., (1990)[4] have found that acetone extract of ginger rhizomes when orally administered, inhibited hypothermia and diarrhoea induced by serotonin. They found that the main active constituent against both disorders was 6-Shogaol, while other anticathartic components were 6-dehydrogingerdione, 8-Gingerol and 10-Gingerol. They isolated anti-5-hydroxytryptamine effect of active principle of galanolactone, diterpenoid from ginger.

Material and Methods: A keeping in view the aims and objectives, experiments were planned to study the effects of ginger in different physiological function.

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.

500gm ginger rhizome yielded about 250ml juice.

250ml juice was filtered which yielded about 120 - 150ml 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:

The study was **Loco motor activity**

A. Loco motor activity: The loco motor activity of rats was studied using the Benwick activity monitoring equipment (Model-AM1051). Animal movements in principle were detected with help of two sets of infra-red beams; Upper and lower; the lower set is used to detect normal movement and the upper set is used to detect if the animal is rearing. The activity detector operated by counting the number of times the beams changed from unbroken to broken (or visa-versa) and incrementing the relevant counters. The activity was split into 6 distinct types. The main distinctions were between mobile, static, fast and slow movement. Here, we have taken only four parameters under the loco motor activity which were as follows:

1. Mobile count- Slow

3. Rearing count- Slow

2. Static count- Slow

4. Active time- Total time

1. Study of acute and chronic (seven days') treatment of ginger-juice on loco motor activity in rats:

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.

Result:

CENTRAL NERVOUS SYSTEM FUNCTIONS:

A. Locomotors activity:

1. Effect of acute treatment of ginger-juice (4ml/rat):

1. Mobile count-Slow:

The mean mobile count-'slow' in this vehicle treated group was 26.43 ± 8.84 minutes, while in the ginger-juice treated group it was 26.00 ± 12.06 minutes depicted in table-21. The difference between mean of both groups was statistically not significant. Results reflect that ginger-juice treatment has no effect on mobile count-slow.

2. Static count- Slow:

In the vehicle treated control group the mean static count-slow was 73.13 ± 16.63 minutes, while in ginger-juice treated group it was 57.83 ± 14.13 minutes. The difference between these counts is not significant statistically. The results are shown in table-21. This shows that ginger-juice treatment has no effect on static count-slow.

3. Rearing count-Slow:

The mean rearing count-slow in this vehicle treated group was 9.94 ± 3.66 minutes and in the ginger-juice treated group it was 20.46 ± 8.08 minutes. There is no significant difference between the two groups indicating that there is no effect of ginger-juice treatment on rearing count-slow. The results are shown in table-1.

4. Active time:

The mean active time in this vehicle treated group was 79.49 ± 12.44 minutes and in the ginger-juice treated group it was 68.96 ± 16.43 minutes. It is evident that this difference was not significant statistically. So it indicates that there is no effect of ginger-juice treatment on the active time. The results are shown in table-1.

The above results are shown in the following table-1.

Table-1: EFFECT OF ACTIVE TREATMENT WITH GINGER-JUICE (4ML/RAT) ON LOCOMOTOR ACTIVITY.

Parameters	**Control (n=6) minutes**	**Ginger (n=6) minutes**
Mobile Count- S	26.43 ± 8.84	26.00 ± 12.06
Static Count-S	73.13 ± 16. 63	57.83 ± 14.13
Rearing Count-S	9.94 ± 3.66	20.46 ± 8.08
Active Time	79.41 ± 12.44	68.96 ± 16.43

Table-1: It shows the effect of acute treatment with ginger-juice on the parameters like mobile count-slow, static count-slow, rearing count-slow and active time of loco motor activity in rat, compared to the vehicle treated control group. The statistical significance vis-à-vis the vehicle treated control is presented as *p<0.05 **P<0.01 ***P<0.001.

The results of the above experiment indicate that ginger-juice-treatment has not produced any effect on any parameter of the loco motor activity.

2. Effect of chronic treatment of ginger-juice (4ml/rat for 7 days):

1. Mobile count-Slow:

The mean mobile count-slow in this vehicle treated group was 26.43 ± 8.84 minutes, while in the ginger-juice treated group it was 28.60 ± 0.61 minutes depicted in table-2. The difference between means of both groups was statistically not significant. This proves that ginger-juice treatment has no effect on mobile count-slow.

2. Static count- Slow:

In the vehicle treated control group the mean static count-slow was 73.13 ± 16.63 minutes, while in ginger-juice treated group it was 59.55 ± 9.49 minutes. These counts are not significant statistically. The results reflect that there is no effect of ginger-juice on static count-slow. The results are shown in table-2.

3. Rearing count-Slow:

The mean rearing count-slow in the vehicle treated group was 9.94 ± 3.66 minutes and in the ginger-juice treated group it was 11.38 ± 0.82 minutes. There is no significant difference between the two groups indicating that there is no effect of ginger-juice treatment for 7 days on rearing count-slow. The results are shown in table-2.

4. Active time:

The mean active time in the vehicle treated group was 79.49 ± 12.44 minutes and in the ginger-juice treated group it was 53.77 ± 8.99 minutes. It is evident that this difference was not significant significantly. So it indicates that there is no effect of ginger-juice treatment on the active time. The results are shown in table-2.

Table-2: VALUE OF DIFFERENT PARAMETERS IN VEHICLE CONTROL GROUP AND GINGER-JUICE TREATED GROUP (acute & chronic).

Parameters	(Ctrl. Vehicle) n=6	Ginger-juice 4ml/rat (acute) n=6	Ginger-juice 4ml/rat (7days) n=6
1.Mobile Count- S	26.43 ± 8.84	26.00 ± 12.06	28.60 ± 0.61
2.Static Count-S	73.13 ± 16.13	57.83 ± 14.13	59.55 ± 9.49
3.Rearing Count-S	9.94 ± 3.66	20.46 ± 8.08	11.38 ± 2.82
4.Active Time	79.41 ± 12.44	68.96 ± 16.43	53.77 ± 8.99

Table-2: It shows the effect of acute and chronic (4ml/rat for 7 days) treatment with ginger-juice on the parameters like mobile count-slow, static count-slow, rearing count-slow and active time of loco motor activity in rat compared to the vehicle treated control group. The statistical significance vis-à-vis the vehicle treated control is presented as *p<0.05 **P<0.01 ***P<0.001.

The results of the above experiments indicate that ginger-juice-treatment has not produced any effect on any parameter of the loco motor activity.

Discussion:

Observations on acute and chronic treatment with ginger-juice did not affect this locomotor activity significantly. However, Amphetamine in the dose (1mg/kg i.p) administered to the rats exhibited enhanced locomotor activity this may be considered by virtue of stimulation of central dopamine receptors (Shigenabu et al., 1994)[5]. Ginger-juice on acute as well as chronic treatment failed to modify the locomotor activity.

This indicates that there is neither prodopamenergic nor antidopaminergic effect on part of ginger.

Further, lack of antidopaminergic effect may also possibly rule out the possibility of acute dystonia as is the case with anti-dopaminergic antiemetics.

The role of dopaminergic mechanisms in the regulation of stress responses has been studied in experimental animals. The complex dopaminergic mechanisms are involved in the regulation of visceral, endocrinological and immune responses during stress (Puri et al., 1994)[6]. As ginger-juice is not affecting the central dopaminergic system. Any speculation that ginger-juice treatment may modify stress or endocrinal and immune responses may not be sustained.

In the present study, it is observed that ginger-juice administration acutely and chronic over a period of 7 days did not increase and decrease significantly the Mobile count, Rearing count, Static count, Active time.

Administration of ginger-juice acutely and chronic however did not increase any parameters of locomotor activity. 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-shagoal was considered as active principle responsible for these effects.

Ginger-juice administered in the present study was in the Crude form. Possibility remains that active ingredient separated in acetone extract may be present in a very small quantity in crude form of the ginger-juice used in the present study. Possibly that may not be enough to exhibit serotonin antagonist effect in the present study. Even if we presume enough quantity of 6-Shagoal present in crude form, antiserotonin effect might have not manifested in the present study because of possibility of presence of other components.

Why acute and chronic treatment did not change any parameters of locomotor activity caused by no 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)[7]. Still chronic treatment did not change too.

In traditional Chinese medicine ginger is used as an analgesic (Naora, 1992)[8]. Ease® a polyherbal preparation from the company "Indian Herbs", Saharanpur, India, contains Zinger officinale as one of the ingredients, It is claimed to have anti-arthritic property Chatterjee et al., (1994)[9]; Singh et al., (1994)[10] reported anti-arthritic and anti-inflammatory effects in laboratory and domesticated animals Jana et al., (1999)[11] have also shown anti-inflammatory effects in experimental animals.

Observations in the present study, with acute as well as chronic administration of ginger-juice do not show any significant changes in locomotor activity.

Conclusion:

Ginger administered itself did not affect loco motor activity.

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