

# EFFECT OF INGESTED RAW GINGER (*ZINGERBER OFFICINALE*) ON TEAR PRODUCTION

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## ABSTRACT

Zingerber Officinale (Ginger) is a perennial herbal spice widely used as flavour in drinks, condiment in food and herbal medicine for different ailments. Four grammes of fresh ginger were given to 40 volunteers of mean age  $23.48 \pm 4.36$  years to chew and swallow as a bolus. Its effect on tear production was then monitored using Schirmer's test. The initial rate of tear production was measured before administration of ginger for each subject. Subsequent measurements were made at 30mins interval till reversal of the effect. In this way, subjects acted as their own control. Ginger was found to induce statistically significant increase in tear production ( $P > 0.05$ : from 21.78mm-27.55mm or 26.49% increase). The peak effect was noticed 60mins post ingestion. The effect was not sustained as the induced values went back to baseline within 120mins post ingestion of ginger. Patients suffering from dry eye syndrome could include intake of fresh ginger in their menu as adjuvant measure towards alleviating their condition.

**KEYWORDS:** Zingiber officinale, Gingerol, Tear production, Schirmer's test, Precorneal tear film.

## INTRODUCTION

Man ingests every palatable and edible substance, which he believes can quench his hunger and satisfy his nutritional needs. Some of these edible foods are consumed, not only for their nutritional values, but also for their medical potentials. Some have adverse effect(s) when taken in excess.

Ginger (*Zingiber Officinale*) is one of those edible with nutritional and medical qualities. It thrives in most parts of the world<sup>1</sup>. *Zingiber Officinale* (*Z. Officinale*) is a perennial herb with fleshy underground rhizomes. It is of two varieties: yellow and black ginger. Ginger is used in spicing alcoholic liquor, as condiment in food seasoning, as flavour in cakes, bread and curry powder<sup>2</sup>. Traditionally, it is used in the prevention and relief of many ailments. *Z. Officinale* is used as an antiseptic and antioxidant agent<sup>3</sup>, anti-motion sickness<sup>4</sup>, anti-cancer<sup>5</sup>, anti-hypercholesterolaemic<sup>6</sup>, antiarthritis, antibacterial, antiviral, fever reducer, antimetic, anti-ulcer and carrier herb<sup>7,8,9,10</sup>.

Ginger has been recommended for menstrual and sexual disorders, and impotence due to its aphrodisiac effect, has been used as a remedy in conjunction with honey in managing cough, cold,

aches, pains and in asthma as an expectorant<sup>11</sup>. It has been found to neutralize free radicals and acts as important antioxidant with more than twelve constituents superior to vitamin C<sup>12</sup>.

The main active component of ginger is an oily liquid called gingerol consisting of homologous phenols. Biological activity of ginger is said to have general relaxant effect. The recommended daily dosage of ginger is 2-4g<sup>12</sup>.

Precorneal tear film (tear) is a mixture of secretions from the major and accessory lacrimal glands, which form a thin layer of approximately 9.0ml to 4.5ml covering the corneal and conjunctival epithelium<sup>13</sup>. The precorneal film provides the smooth and regular anterior refracting surface of the eye<sup>14</sup>. The produced tear is drained through the lacrimal apparatus. The rate of production should equal the rate of drainage; otherwise the patient will have problems. The normal rate of tear production is taken to be 10mm and above in 5mins. Five millimeters and below was considered deficiently abnormal and above 30mm wetting was considered excessive<sup>15</sup>. The rate of tear production decreases with advancing age.

Since ginger is widely consumed by people for different reasons, eye care practitioners should

have a working knowledge of its effect in the eyes especially as it affects tear production. The purpose of this study, therefore, is to find the effect of ingesting raw ginger on tear production.

## MATERIALS AND METHODS

The study of the effect of orally ingested ginger (*Z. Officinale*) was a prospective and clinically based study. Forty volunteers of mean age  $23.48 \pm 4.36$  years who passed the inclusion and exclusion criteria were used for the study. Young adults were used to reduce to minimum the adverse effects of age on tear production. Standard Optometry tests were used for the screening tests. Subjects excluded were those with systemic or ocular disease, those on ocular or systemic medication including contraceptives, gravid or breast-feeding women and those whose tear production rate from Schirmer's test is less than 10mm over a period of 5minutes.

*Z. Officinale* used for the study was obtained from a vegetable shop in Okigwe market of Imo State. The purchased fresh, raw ginger was authenticated and certified safe for human consumption by a renowned nutritionist. The ginger was peeled, washed with warm water and salt and stored for use. The volunteers were briefed on the research procedure. Their baseline tear production was measured using Schirmer's test. Whitman filter paper strip (5x35mm size) was used for the test. The strip was inserted into the temporal portion of the inferior cul-de-sac. Five minutes later it was removed and the extent wetted by tears beyond 5mm fold was read off<sup>16</sup>.

Subjects were given 4g of fresh ginger to chew and swallow as a bolus. Schirmer's test was repeated at 30mins intervals till the rate of tear production went back to baseline. In this way subjects acted as their own control. Monitoring of induced tear production rates started after 30mins, because according to Mowrey and Ciayson<sup>17</sup>, digestion of ginger has been put between 15 to 30mins and ginger attains peak plasma level between 30 and 70mins. This study lasted for 2hours for each subject.

The data obtained were tabulated and analyzed statistically using Z-test.

## RESULTS

Results obtained showed that consumption of 4g of fresh ginger gradually increased the rate of tear production, from  $21.78 \pm 1.50$ mm to  $27.55 \pm 2.03$ mm (a 26.49% increase). This result was recorded at peak effect of fresh ginger and the

effect easily reversed back 120mins post ingestion. The mean induced change in tear production at peak effect was found to be  $5.77 \pm 3.32$ mm (see table1). The effect was found to be statistically significant ( $p > 0.05$ ).

## DISCUSSION

Result obtained from this study revealed that consumption of 4g of ginger increased the rate of tear production from  $21.78 \pm 1.50$ mm to  $27.55 \pm 2.03$ mm (26.49% increase) as measured by Schirmer's test. Ginger has a general relaxant effect which can best be explained in the ability to relax blood vessels in the head, reduce swelling in the human brain, relieve nausea and migraine<sup>11</sup>. The principal active component of *Z. Officinale* is gingerol. It is said to be a potent inhibitor of prostaglandin synthesis, hence an anti-inflammatory, anti-rheumatic and antihistamine agent<sup>18,19</sup>. Gingerol, substance responsible for ginger pungency<sup>1</sup> is said to produce carminative and anti-emetic effect<sup>17</sup>. The above effects of ginger are due to stimulation of the autonomic nervous system (ANS) by its active ingredient. Gingerol inhibits the action of cholinesterase, prolonging the action of acetylcholine in body<sup>3</sup>. Stimulation of parasympathetic ANS results in contraction of detruser muscles, relaxing the sphincters of guts (carminative and antiemetic effects) and increased glandular secretion of which lacrimal gland is one of them<sup>3</sup>. These effects of raw ginger on the ANS explain the statistically significant increase in rate of tear production recorded in this study.

The peak effect ( $5.77 \pm 3.32$ mm) was noticed about 60mins post ingestion of 4g of *Z. Officinale*. The effect was found to be transient. The values reversed to baseline values at 120mins. These results agreed with that of Mowrey and Clayson<sup>17</sup>, who found that gingerol is easily absorbed through the walls of the stomach and small intestine and peak plasma level is attained within 30 to 70mins. Direct effect on the walls of the stomach and small intestine starts 15mins after administration of powdered ginger to produce its carminative effect. Its anti-emetic effect is attained about 25mins after ingestion of powdered ginger<sup>20</sup>. The half-life of ginger in man has been reported to be within 5 to 6 hours<sup>20</sup>.

In conclusion, dry eye syndrome patients could be encourage to make consumption of fresh ginger a habit (normal daily dose of 2-4g) to improve tear production and help alleviate their condition.

**TABLE 1: CHANGES IN TEAR PRODUCTION DUE TO THE INGESTION OF 4G OF FRESH GINGER WITH TIME (MEAN BASELINE TEAR PRODUCTION 21.78±1.50).**

Time (mins)	Mean Tear Production (mm)	Mean Induced Change (mm)	% Mean Changed
30		1.83±2.83	8.36
60	27.55±2.03	5.77±3.32	26.49
90	24.98±1.99	3.20±3.05	14.69
120	22.10±1.53	0.32±0.03	1.47

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