

# GINGER: ITS ESSENTIALS AND CHEMICO – ALI NATURE TO THE BENEFIT OF MANKIND

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**Abstract:** Ginger is a spice that can be commonly found in markets, backyard gardens and in the kitchen, either as the fresh root, or in dried, powdered form. It adds a strong, pungent flavour to dishes as a consequence of a number of chemical compounds it contains; additionally, these compounds are altered when the ginger is cooked or dried, producing alterations to its flavour. Some of these compounds have also been investigated for potential health benefits, including potential anti-tumor activity, regenerative abilities and healing effects all for the benefit of mankind.

**Key Words:** Flavonoids, medicinal plant, polyphenol, spice, tannin, ginger, nutrients, anti tumour.

## 1.0 INTRODUCTION:

Ginger (*Zingiber officinale*) is a flowering plant whose rhizome, ginger root or simply ginger, is widely used as a spice or a folk medicine. It is herbaceous perennial which grows annual stems about a meter tall bearing narrow green leaves and yellow flowers. Ginger is in the family Zingiberaceae, to which also belong turmeric (*Curcuma longa*), cardamom (*Elettaria cardamomum*), and galangal. Ginger originated in the tropical rainforest in Southern Asia. Although ginger no longer grows wild, it is thought to have originated on the Indian subcontinent. The ginger plants grown in India show the largest amount of genetic variation.

The larger the number of genetic variations, the longer the plant is thought to have grown in that region. As with all spices, fresh ginger root contains a large range of chemical compounds. Of these, zingiberene is the most dominant, making up 30% of the root's essential oil, whilst other contributors to the characteristic flavour of ginger include  $\beta$ -sesquiphelandrene and arcurcumene.

## 2.0 METHOD:

Sample research where taken from scientific data from other works done and published in peer reviewed journals. They were analysed, criticized constructively, appraised and some which the writers deem fit was taken as a reference on this work. Stratified and probity of empirical data and cross sectional surveys done on the subject matter was also revised by the authors in bringing out the final write up.

## 3.0 DISCUSSION:

### *The Chemico – Ali nature of Ginger and its roots*

The chemical composition and antioxidant activity (in aqueous and solvent extracts) of Ginger root (*Zingiber officinale*) were determined. The antioxidant components analysed were polyphenols, vitamin C,  $\beta$  carotene, flavonoids and tannins. Antioxidant assays such as free radical scavenging activity, reducing power and total antioxidant activity were carried out for ethanol, methanol, acetone, 80% methanol and 80% ethanolic extracts. Protein and fat of sample were 5.08 and 3.72 g/100 g respectively. Ash, minerals namely iron, calcium, phosphorous, zinc, copper, chromium and manganese) and vitamin C were 3.85 (g), 8.0 (mg), 88.4 (mg), 174 (mg), 0.92 (mg), 0.545 (mg), 70 ( $\mu$ g), 9.13 (mg) and 9.33 (mg) per 100 g of sample, respectively. Antioxidant components (polyphenols, flavonoids and total tannin) were higher in hot water (100°C) extract than other solvent extracts and 30°C water extract.

Antioxidant activity by 3 different methods showed higher activity in solvent extract than water extract. Order of antioxidant activity by reducing power and free radical scavenging activity by DPPH was as follows, 80% methanolic, 80% ethanolic, methanolic, ethanolic, 30°C water, 100°C water, acetonitrile extract. As with all spices, fresh ginger root contains a large range of chemical compounds. Of these, zingiberene is the most dominant, making up 30% of the root's essential oil, whilst other contributors to the characteristic flavour of ginger include  $\beta$ -sesquiphellandrene and arcurcumene.

The pungency can be attributed to the presence of gingerols; one of the main culprits here is the compound [6]-gingerol. This particularly chemical is not too distant from capsaicin, the compound that gives chillies their spiciness, and piperine, found in black pepper.

Whilst these may be the primary compounds in fresh ginger, when ginger is cooked, the story changes. When the ginger is heated or dried, gingerols are transformed into different compounds, which can alter both the flavour and pungency. Cooking produces zingerone, which is less pungent, and is characteristic of the ginger flavour found in gingerbread. It's less pungent than the gingerols, leading to a differing flavour to fresh ginger. Another class of compounds that can be produced by cooking or drying is the shogaols, which are approximately twice as pungent as the gingerols which precede them. This helps explain why dried ginger has a greater pungency than fresh ginger.

Of particular interest is the glut of health claims surrounding some of the compounds in ginger. Many of these are conclusions drawn from studies with limited designs or small sample sizes, but there does seem to be some promise for the applications of ginger compounds in a variety of health issues. It's already known that a number of the compounds found in ginger have anti-inflammatory and analgesic properties; in a similar manner to non-steroidal anti-inflammatory drugs, ginger is known to reduce production of prostaglandins by inhibiting the enzymes that help produce them.

More research in recent years has suggested that [6]-shogaol has a strong anti-coughing effect, and could help reduce blood pressure. Additionally, it may have some anti-allergic effects, as it has been shown to inhibit the release of histamine from mast cells, a chemical whose effects manifest as the allergic response to an allergen. An anti-fever effect has also been noted.

On top of this, research into [6]-gingerol has suggested it could have applications as an anti-tumour agent. In lab conditions, and in mouse models of cancer, it has been shown to have an anti-angiogenic effect; that is, it prevents the formation of new blood vessels. As tumours require the growth of new blood vessels in order to spread, it's possible that [6]-gingerol could prove useful in their treatment. It's worth mentioning that the majority of studies looking at the anti-tumour activity of [6]-gingerol have been carried out in mouse models, rather than in humans, so whilst the results are promising, it remains to be seen whether results of the same significance will be observed in humans.

Lab tests on human cancer cells have also shown that [6]-shogaol may inhibit cancer growth for ovarian cancer. Finally, before you go adding a ton of ginger to every meal, note that eating too much can lead to the combined delights of heartburn and diarrhoea – so maybe just continue to enjoy that ginger in moderation.

#### 4.0 ANALYSIS:

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## **5.0 FINDINGS**

### ***5.1 Potential health benefits if ginger***

Shogaol is gotten when ginger is dried cooked and gingerol is a constituent of fresh ginger.

A number of compounds in ginger are bioactive, shogaol has a strong anti – coughing effect, whilst gingerol has anti – inflammatory and anti-analgesic properties. Studies have also suggested that 6 – gingerol inhibits production of new blood vessels which may make it useful in the treatment of tumours. Ginger has additionally been found to be more effective than a placebo for treating nausea during pregnancy and chemotherapy.

### ***5.2 Zingiberene effect***

Gingers flavor is influenced by a number of compounds. The pungency of fresh ginger comes from gingerol, whilst flavor also comes from zingiberene. Cooking ginger breaks down gingerols into the compound zingerone which is less pungent and a significant contributor to gingers flavor. Another class of compounds formed during cooking are the shogaols which also contribute to flavor and pungency

### ***5.3 Reducing power***

It has been reported that the reducing power of bioactive compounds is associated with antioxidant activity (Yen et al., 1993; Siddhuraju et al., 2002). Hence, it is essential to determine the reducing power of phenolic constituents to explain the relationship between their antioxidant effect and their reducing power. The reducing power of different solvent extracts of ginger was estimated. Highest reducing power was also in 80% methanolic extract followed by 80% ethanolic extract. As reported by Chen et al. (2008), the reducing power of methanolic extract of 18 different species of ginger ranged from 0.34 to 1.6 nm in 100 mg of sample. In our study, methanolic extract of sample showed much higher activity of 0.208, 0.393, 0.558, 0.681 nm for 2.0, 4.0, 6.0 and 8.0 mg of sample.

Antioxidant components and activity are highly dependent on extracting solvent and concentration of solvent (Turkmen et al, 2006), but they also vary within the samples. Many researchers have reported the relationship between phenolic content and antioxidant activity. In some studies, they found a correlation between the phenolic content and antioxidant activity (Velioglu et al., 1998), whereas others found no relationship (Kahkonen et al., 1999). In this study we also found high correlation between polyphenol content and antioxidant activity in both water extract ( $R^2 = 1$ ) and solvent extract (DPPH,  $R^2 = 0.901$ , reducing power,  $R^2 = 0.847$  and total antioxidant activity  $R^2 = 0.579$ ).

Total tannin and flavonoids did not show any correlation with antioxidant activity in aqueous extract. In solvent extract, total tannin showed high correlation with reducing activity ( $R^2 = 0.887$ ), total antioxidant activity ( $R^2 = 0.885$ ) and free radical scavenging activity ( $R^2 = 0.985$ ). Flavonoids showed correlation with reducing power ( $R^2 = 0.505$ ), total antioxidant ( $R^2 = 0.613$ ) and DPPH ( $R^2 = 0.493$ ). Since the antioxidant activity was higher in alcoholic extract than aqueous extract, it is advisable to use the extracting media capable of extracting the lipophilic antioxidant compounds from ginger

#### 5.4 Total polyphenols

Total polyphenols were highest in aqueous extract with almost similar amounts at different temperatures (840 and 830 mg/g). Least polyphenols were seen in acetonic extract. Antioxidant activities of plant extracts were usually linked to their phenolic content. Hydrogen donating characteristics of the phenolic compounds is responsible for the inhibition of free radical induced lipid ability to scavenge free radicals and give oxygen species such as singlet oxygen, superoxide free radicals and hydroxyl radicals (Hall, 1997), though, it is well accepted that non phenolic antioxidants might also contribute to the antioxidant activity of plant extract (Hassimotto et al, 2005; Harish and Shivanandappa, 2006). In a study, researchers estimated total polyphenol content of 35 different herbs and medicinal plants in 80% methanolic extract. The polyphenol content was between 0.8 to 42.1mg of gallic acid equivalent /g dry weight (DW) (Kahkonen et al., 1999). Hinneburg et al. (2006) found the total phenolic content of aqueous ginger extract to be 23.5 mg gallic acid/g of sample. Another researcher (Rababah et al, 2004) estimated the total phenolic content of 60% ethanolic extract of ginger to be 39.9 mg of chlorogenic acid equivalent/g DW. In our study, when we calculated total polyphenols content in 80% methanolic extract/g of DW ginger, it showed 780 mg of TAE/ 100 g of sample.

#### 5.5 Flavonoids

Flavonoids were estimated in all the extracts and data is shown. Highest flavonoid content was reported in 30 and 100°C aqueous extract at 1.37 and 2.98 g/100g of sample, respectively. Flavonoid content of 80% methanolic extract and 80% ethanolic extracts were found to be more than methanolic and ethanolic extracts, respectively, but lesser than aqueous extract. It can be due to higher solubility of ginger flavonoids in water than other solvents.

### 6.0 RESULTS:

#### Summary of Health Benefits of Ginger and its Root

1. Nausea and vomiting: ginger is effective against nausea and vomiting which occur after surgery or in patients who are receiving anti – cancer agents. It relieves morning sickness of early pregnancy. But it is strongly recommended that the to – be –mother must let her obstetrician or midwife know before she begins consuming kilos of ginger/ this is because large amounts of ginger may pose the risk of miscarriage.
2. Ginger and chronic indigestion; this is a common malady. Everybody has had an attack at one time or another. It takes the form of pain or discomfort in the upper part of the belly, and the lower end of the chest. Researchers have shown that ginger works to end indigestion.
3. Muscle pain and muscle soreness: ginger relieves muscle pain, soreness or both. The pain can be exercise – induced or its onset can be obscure. These benefits are not immediate; at least consume 2gm of ginger daily continuously for over 10 days before the impact will emerge.

4. Anti-inflammation; ginger knocks out inflammation. This is how it can reduce the pain in the muscle or joints (arthritis). Knee joint is common site of this disorder. Ginger helps in the intake of pain killers or analgesics that has ulcer effects to the stomach.
5. Ginger and menstruation; soe studies have shown that ginger relieves the pain of monthly goings just like a well-known pain killer “ibuprofen”. But any lady must remember to take it from the beginning of her periods.
6. Ginger in diabetes; authority nutrition.com categorically stated: ginger may have powerful anti-diabetic properties. Ginger can drastically reduce blood sugar; improve heart disease risk factors among diabetic patients but more studies and research need to be done in this area.
7. Ginger can lower levels of cholesterol; ginger can lower levels of not only cholesterol but also other types of bad fat in the blood.
8. Ginger and cancer; ginger may help treat cancers of the breast, large gut, ovary, pancreas but this still needs more scientific investigations.
9. Ginger and Alzheimer’s disease ; studies in mince have shown tremendous prove that ginger was able to protect against age related brain damage, although it needs more collaborative efforts and scientific backing but in our homes it can help boost brain functions in elderly women.
10. Infection control: ginger can knock out infections in the gums and deeper around the teeth, it helps reduce halitosis and infections by creating a high alkaline medium in the mouth which most bacteria’s and virus cannot resist.

## 7.0 RECOMMENDATION:

Ginger as a natural spice ha essential benefits and should be used in all households, at least small portions in our daily soups, stews and drinks. Many foods now a days are full of addictive which are inorganic and doubtful giving a lot of both evidential life style diseases like diabetes mellitus, atherosclerosis , hypertension etc. a serving of ginger even weekly could help prevent h the human being from uncomplicated tumors, gastritis , arthritis and many other ailments. Is time nutrition and dietetic professionals creating more awareness on our natural aromatic spices than fortified ones found in supermarkets with addictive.

## 8.0 CONCLUSION:

It can be concluded that ginger is a good source of antioxidant and most of the antioxidant components exhibit higher activities in alcoholic media as determined by different assays.

Hence, apart from its medicinal properties, ginger can also be used as an antioxidant and anti – arthritic supplement for every use in both the young and old aged.

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