JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

TO STUDY THE EFFECT OF VARIOUS SPASMOGENIC & SPASMOLYTIC DRUGS & VARIOUS GINGER EXTRACTS ON CHICKEN ILEUM.

Ezaj Y. Dadubhai[i], Azima Madha[ii], Samir Madhi[iii], Het Mahida[iv], Nazhat Malek[v], Amreen Master[vi], Dr. Nidhi Chauchan[vii]

Abstract: Ginger herb is grown in many areas around the world it is used as medicinal herb. However, only a limited amount of research exists to support their efficacy. The aim of the present work is to demonstrate the antispasmodic effect of ginger (Zingiber officinale) on chicken intestine in vitro. the chicken ileum Segments 2 cm long are cut mounted in a 10 ml tissue automatic organ bath containing Ringer lock solution at 37°C and aerated with oxygen, where One end of the ileum was attached to an S-shaped aeration tube and the other end to an isotonic frontal writing lever attached to Sherrington recording drum with kymograph. The tissue was allowed to equilibrate for 30 min under an optimum load. The results revealed that the effect of low doses of ginger on exogenous acetyl choline (ACh) and Histamine induced contraction is Antispasmodic as a dose of 0.4ml=40µg of ginger / tissue bath produced decrease in the magnitude of ach induced contraction, while doses of 0.4 ml = 40µg of ginger/of tissue bath produced decrease in magnitude of Histamine induced contraction.

Keywords: Spasm, Spasmogenic, Spasmolytic, Acetylcholine, Contraction, Charley horse, Gingerol, Twitching, Distension, Downstream Signalling, Antagonism.

INTRODUCTION

WHAT IS MUSCLE SPASM?

A muscle spasm, also known as a charley horse or muscle cramp, refers to the involuntary and forceful contraction of a muscle, most commonly in the thighs, calves, feet, hands, and arms. They can also occur in the abdomen or along the rib cage. Muscle spasms are typically harmless, but they may result in an inability to use the affected muscle for a short period of time.

CAUSES

Muscle spasms are very common. They can happen in any part of the body, but they tend to affect the:

Feet, Hands, Arms, intercostal muscles, which are around the rib cage, Muscle pain, fatigue, and overuse are the most common causes of muscle spasms. Other causes include stress or anxiety, which can lead to muscle twitches in the face. Trapped nerves can result in spasms in the back. Athletes who either do not warm up before they exercise or exercise in very hot conditions may also experience muscle spasms.

Charley horse, for example, is a term that people often use to describe spasms in runners' calf muscles. Drinking insufficient water before exercise can also cause muscle spasms.

Some people are more vulnerable than others to muscle spasms. Those who are most at risk are: older adults, athletes, people with overweight or obesity, pregnant women, People who have certain health conditions, such as nerve disorders or thyroid-related problems, also tend to experience a higher-than-average frequency of muscle spasms.

SYMPTOMS

Not all muscle spasms are painful, but some can cause pain. It can feel as though the muscle is jumping or moving on its own, with this feeling typically lasting just a few seconds. Some people might even be able to see the muscle twitching.

Sometimes, it can feel as though the whole muscle has cramped up and cannot move. This effect most commonly happens in the legs, and it can be quite painful.

The muscle may feel hard to the touch. While the cramping sensation tends to pass within several minutes or so, the muscle may continue to hurt for some time afterward.

If a muscle spasm is part of a neurological health condition, the person will usually experience other symptoms.

These might include:
pain in the back, neck, or head, weakness in the muscles, skin numbness, pins-and-needles sensation, a tremor, paralysis, poor coordination, slow movements

HOW LONG DO MUSCLE SPASMS LAST?

Muscle spasms can last anywhere from a few seconds to 15 minutes or longer. Within that time frame, multiple muscle spasms may occur before ultimately subsiding.

SMOOTH MUSCLE ANTISPASMODICS (SPASMOLYTICS)viii:

ANTOSPASMODICS are drugs that suppress smooth muscle contraction, especially in tubular organs. The effect is to prevent spasms of the stomach, intestine or urinary bladder.

Specific indications:

Irritable bowel syndrome.
Flatulent distension of the abdomen.
Painful smooth muscle spasms of tubular organs. To reduce the movement (motility) of the intestine.
Overactive bladder.
Movement problem in Parkinson's diseases.
Diarrhoea, nausea/vomiting Muscle spasms
Chronic obstructive pulmonary diseases. (COPD) & Asthma

PHARMACOGNOSY OF GINGER

CHEMICAL NAME- Zingiber officinale Roscoe
SYNONYMS- Gingerin, Rhizoma Zingiberis, Zingiberre, Ginger Officinale.
FAMILY- Zingiberaceae
BIOLOGICAL SOURCE- The ginger is the rhizomes of zingiber officinale, Roscoe and dried is the sun.
USES - Spice and flavouring agent and has many medicinal properties.
However, only a limited amount of research exists to support their efficacy.
Traditionally, ginger has been used in folk medicine for indigestion, flatulence, Diarrhoea, malaria and fever.
DOSAGE- The ginger has been listed in document "Generally Recognized as Safe" (GRAS) of the US FDA.
A dose of 0.5–1.0 g of ginger powder ingested 2-3 times for 3 months to 2.5 years not produced adverse effects.

MACROSCOPY:

Morphological characters of Ginger plant are;
Rootstock: Horizontal, tuberous.
leafy stem: Elongated leaves; oblong-lanceolate, clasping the stem by their sheaths.
Spikes: Usually radical, rarely lateral or terminal on the Leafy stem peduncle short or long; bracts persistent, usually single.
Calyx: Cylindric, shortly three-lobed.
Corolla tube: Cylindric; segments lanceolate, upper concave Lateral staminodes: Zero or adnate to obovate-cuneate lip; filament short; anther cell contiguous, crest narrow, as long as the cells.
Ovary: Three celled; ovules many, superposed; style filiform; stigma small, sub globose. **Capsule:** Oblong, finally dehiscing.
Seed: Large, globose, arillate.
Rhizome: Stout tuberous with erect leafy stems 0.6 to 1.2 m high.
Leaves: Narrow, distichous, subsessile on the sheaths, linear lanceolate 1 to 2 cm wide, glabrous.
Flowers: Greenish with a small dark purple or purplish black lip, in radical spikes 3.8 to 7.5 cm long and 2.5 cm diameter on peduncles 15-30 cm long.
Stamens: Dark purple, as long as the lip, rather shorter than the corolla. [3]

MICROSCOPY OF GINGER

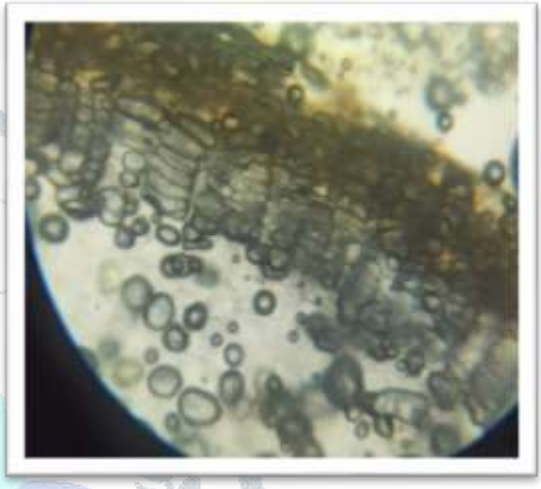


Figure no. 1 T.S. of Ginger

Figure no. 2 Oil Cells

CHEMICAL CONSTITUENTS

1. MAJOR PUNGENT PRINCIPLES

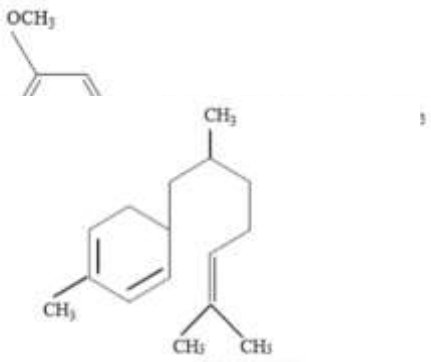
The ginger consists of major pungent principles like gingerols which give ginger its characteristic aroma and volatile oils, oleoresins, starches, proteins, and fats.
Gingerols are homologous phenols with 6-gingerol (5- Hydroxy-1 -(4'-hydroxy-3'-methoxyphenyl)-3-decanone) and shogaols are less pungent.

2. MINOR PUNGENT PRINCIPLES

Minor pungent compounds are paradols, gingediols, gingediacetates, gingerdiones, gingerenones, sesquiterpenes (zingiberene, zingiberol, zingiberenol,

ß-bisabolene, and sesquiphellandrene), monoterpenes (phellandrene, camphene, cineole, citral, and borneol), zingiberene, curcumene, sesquiphellandrene and bisaboene.

Ginger also contains phosphatidic acid, lecithins, saturated fatty acids. [3]



Zingiberene

IUPAC NAME: 2-Methyl-5-(6-methylhept-5-en-2-yl) cyclohexa-1, 3-diene

MATERIAL AND METHODS

The chicken intestine was procured form the local market from slaughter house in Maktampur village, District Bharuch.

SAMPLE PREPARATIONS OF GINGER

1. Plant Material Zingiber officinale rhizomes powder was obtained from Paras herbal pharma GIDC makarpura and authenticated by the Department of Pharmacognosy. A specimen was deposited for the same for future reference. The powdered material (60 gm) was extracted with ethanol and 6 hours and solvent was evaporated under vacuum to obtain the crude ethanolic extract of Zingiber officinale extract (ZOE). The extract was concentrated.

2. Physiological salt solution: For 10 liters of water] Composition (g/L): NaCl [90.0g], KCI [4.2g], CaCl2 [2.4g], NaHCO3 [5.0g], C6H12O6 [10.0g]

3. Standard drugs used were: Acetylcholine chloride (0.1g/ml), histamine (0.1g/ml), atropine (0.1g/ml).

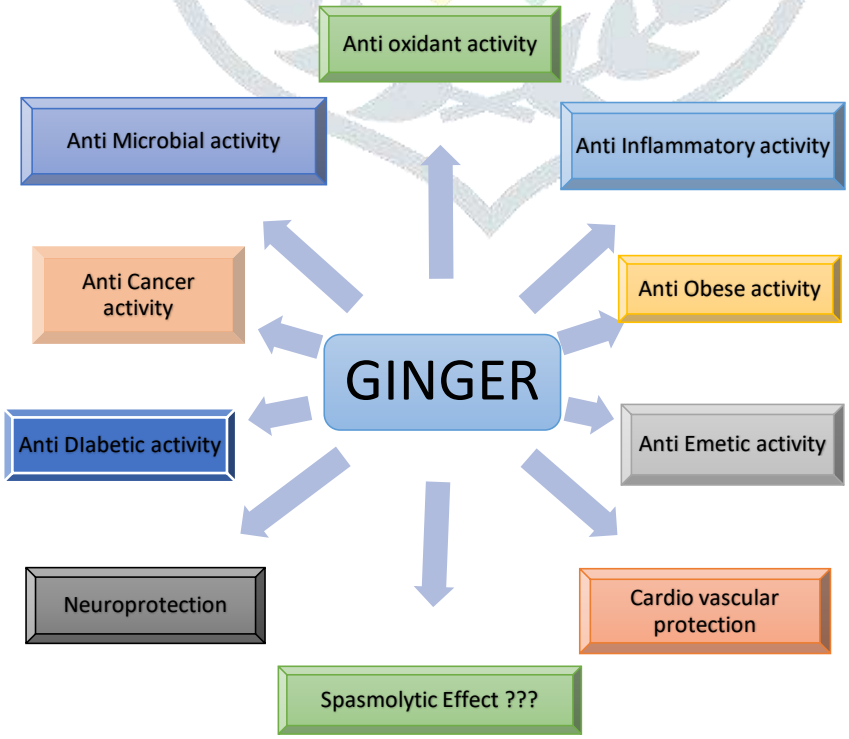
4. Sample extracts used were: Ethanol extract of ginger, acetone extract of ginger, water extract of ginger.

Figure no. 3 Extracts of Ginger

PHYTOCHEMICAL SCREENING

PHARMACOLOGICAL ACTION OF GINGER

Sr. No.	CONSTITUENT	IDENTIFICATION TEST	ETHANOLIC EXTRACT OF GINGER	ACETONE EXTRACT OF GINGER	WATER EXTRACT OF GINGER
1.	CARBOHYDRATES	MOLISCH TEST	+	+	+
2.	REDUCING SUGAR	BENEDICT TEST FEHLING'S TEST	+ +	+ +	– +
3.	MONOSACCHARIDES	BARFOED'S TEST	+	+	+
4.	PENTOSE SUGAR		+	+	+
5.	HEXOSE SUGAR		+	+	+
6.	NON-REDUCING SUGAR POLYSACCHARIDES TEST [STARCH]	IODINE TEST TANNIC ACID TEST FOR STARCH	– +	– +	+ +
7.	AMINO ACID TEST	NINHYDRIN TEST TYROSINE TEST	– –	– +	– +
8.	TANNINS	FECL3 LEAD ACETATE TEST	+ +	+ +	+ +
9.	TEST FOR STEROID	SALKOWASKI TEST LIBERMANN BURCHARD TEST	– –	+ –	– –
10.	ALKALOIDS	DRAGENDORFF'S TEST MAYER'S TEST	+ +	+ +	+ +
11.	GLYCOSIDE TEST	BALJET'S TEST	+	+	+

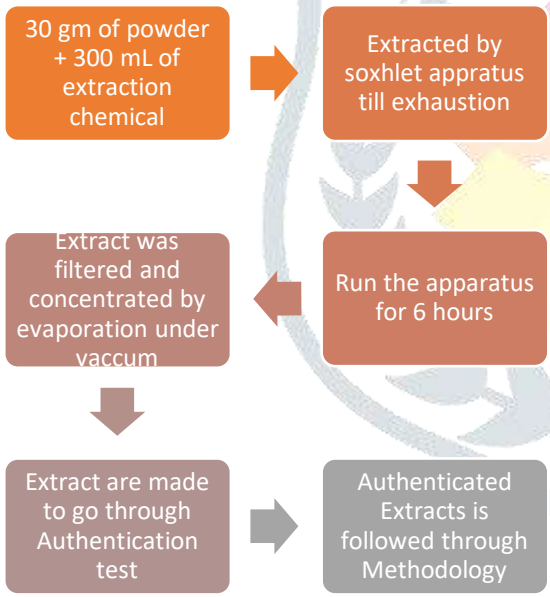


EXTRACTION OF GINGER EXTRACT FROM GINGER POWDER

Extraction of Ginger Extract from Ginger powder can be done by using following method:

Soxhlet Apparatus Method

SCHEME OF PROCEDURE FOR EXTRACTION OF GINGER USING VARIOUS SOLVENT



PHARMACOLOGICAL SCREENING

ISOLATED CHICKEN ILEUM PREPARATION:

About 2 cm length ileum segment was cut, mounted in an organ bath containing Ringer Lock Solution and continuously aerated and maintained at 37±0.5◦C. One end of the ileum was attached to an S-shaped aeration tube and the other end to an isotonic frontal writing lever attached to Sherrington recording drum with kymograph.

The tissue was allowed to equilibrate for 30 min under an optimum load. Contact time of 60 seconds with three washings at an interval of 50 seconds were followed by recording the responses.

DOSE RESPONSE CURVE OF ACETYLCHOLINE:

Acetylcholine (0.1gm/ml) of dose 0.4 ml. was given to the tissue in organ tube to obtain contractile response. The contractile responses were measured from the baseline of the response. Wash was given to the tissue after recording the contractile response.

DOSE RESPONSE CURVE OF ACETYLCHOLINE + ATROPINE:

In similar way to acetylcholine, responses of acetylcholine(0.1gm/ml) + atropine (0.1gm/ml) of dose 0.4ml were recorded. Washings was given to the tissues after the response have been recorded.

DOSE RESPONSE CURVE OF HISTAMINE:

After the response have been recorded the histamine (0.1gm/ml) of dose of dose 0.4ml was given to the tissue and the contractile responses were recorded. Wash was done after the responses were recorded.

DOSE RESPONSE CURVE OF GINGER ETHANOL EXTRACT IN PRESENCE OF ACETYLCHOLINE:

In similar way to Acetylcholine, responses of the ginger ethanol extracts of dose 0.4ml was taken in presence of acetylcholine of dose 0.4ml were recorded.

DOSE RESPONSE CURVE OF GINGER ETHANOL EXTRACT IN PRESENCE OF HISTAMINE:

After the washing period, response of the ginger ethanol extract of dose 0.4ml was taken in presence of histamine of dose 0.4 ml were recorded.

DOSE RESPONSE CURVE OF GINGER ACETONE EXTRACT IN PRESENCE OF ACETYLCHOLINE:

Response of the ginger acetone extracts of dose 0.4ml was taken in presence of acetylcholine of dose 0.4ml were recorded.

DOSE RESPONSE CURVE OF GINGER ACETONE EXTRACT IN PRESENCE OF HISTAMINE: Responses of the ginger acetone extract of dose 0.4ml was taken in presence of histamine
of dose 0.4ml were recorded.

DOSE RESPONSE CURVE OF GINGER WATER EXTRACT IN PRESENCE OF ACETYLCHOLINE:

In similar way to Acetylcholine, responses of the ginger water extracts of dose 0.4ml was taken in presence of acetylcholine of dose 0.4ml were recorded.

DOSE RESPONSE CURVE OF GINGER WATER EXTRACT IN PRESENCE OF HISTAMINE:

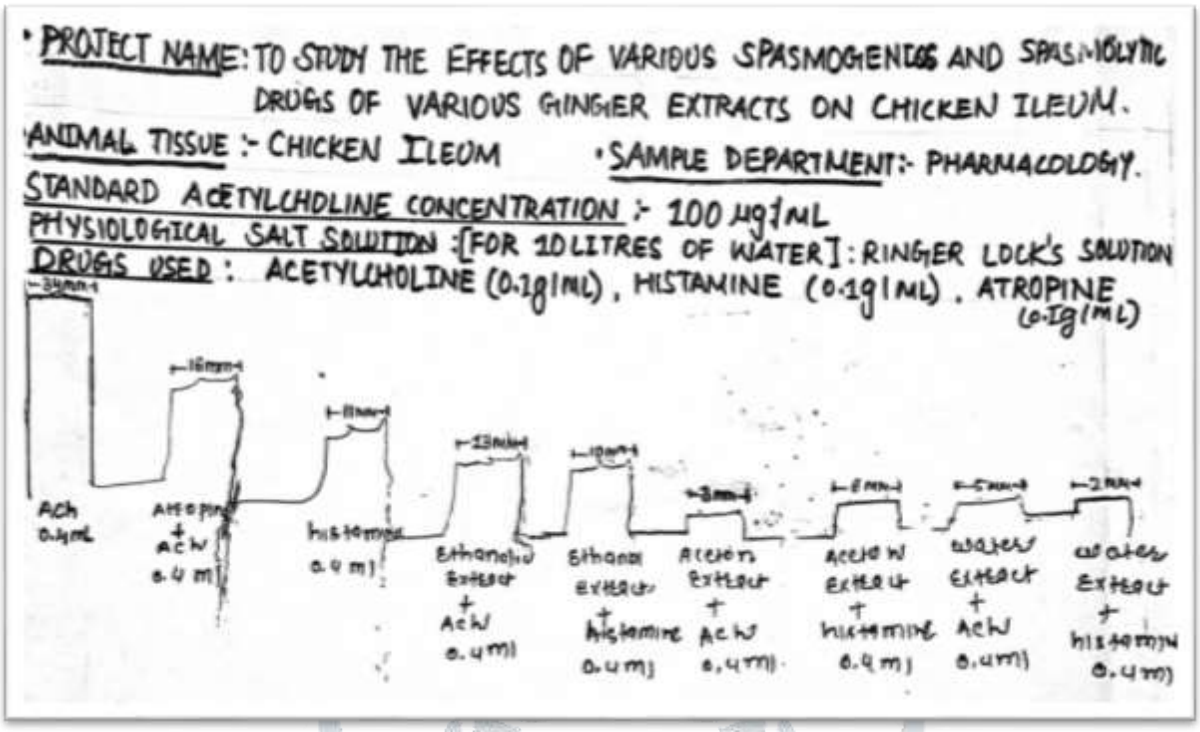
After the washing period, response of the ginger ethanol extract of dose 0.4ml was taken in presence of histamine of dose 0.4ml were recorded.

Figure no. Student Organ Bath

OBSERVATION TABLE

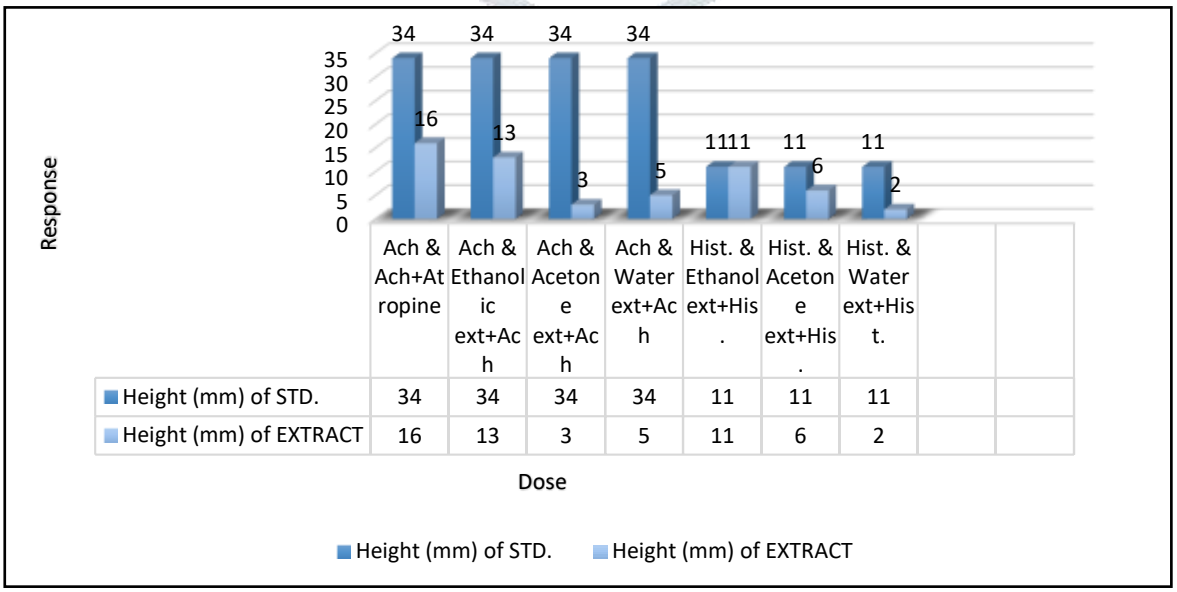
Sample	Dose (ml)	Height in mm	Sample	Dose (ml)	Height in mm
Acetyl Choline	0.4 ml	34 mm	Ethanol extract + Acetyl choline	0.4 ml	13 mm
Atropine + Acetyl Choline	0.4 ml	16 mm	Ethanol extract + Histamine	0.4 ml	11 mm
Histamine	0.4 ml	11 mm	Acetone extract + Acetyl choline	0.4 ml	3mm
			Acetone extract + Histamine	0.4 ml	6 mm
			Water Extract + Acetyl choline	0.4 ml	5 mm
			Water Extract+ Histamine	0.4 ml	2 mm

RESPONSE CURVE (KYMOGRAPH) OF DRUGS & GINGER EXTRACTS



GRAPH

Sample	Height (mm) of STD	Height (mm) of EXTRACT
Ach & Ach+Atropine	34	16
Ach & Ethanolic ext+Ach	34	13
Ach & Acetone ext+Ach	34	3
Ach & Water ext+Ach	34	5
Histamine & Ethanol ext+Histamine	11	11
Histamine & Acetone ext+Histamine	11	6
Histamine & Water ext+Histamine	11	2



RESULT

From the present study results it was observed that acetylcholine (Ach) alone causes contraction of excised chicken ileum but when acetylcholine was given in presence of different Ginger extract of plant Zingiber officinale. There was a marked decrease in contraction of ileum was observed. This revealed that different extracts of Zingiber officinale possess a high degree of spasmolytic (anti-spasmodic) activity by blocking cholinergic receptors.

In addition, Ginger extract concentration dependently reduced the amplitudes of spontaneous contractions of all portions of the isolated chicken ileum. Ginger extract inhibited spontaneous contractile movements of chicken ileum segments by blocking calcium influx through L-type calcium channels. Nevertheless, the effect of ginger extract may be mediated through additional actions such as inhibition of M3 receptors or at any point along their downstream signaling pathways.

The repetitive ginger extract dosing has down regulated or desensitized the ACh triggered molecular signaling pathways. Gingerol containing material acts directly on gut.

Concerning the effect of ginger on chicken ileum, the present study demonstrated that the effect of low doses of ginger extract on exogenous acetyl choline (ACh) induced contraction is spasmolytic as a dose of 0.4ml = 40µg of ethanol ginger extract / tissue bath produced decrease in the magnitude of ach induced contraction from 35mm to 13mm, while doses of 0.4 ml = 40ug of acetone ginger extract / of tissue bath produced decrease in magnitude of ach induced contraction from 34mm to 3mm , and a dose of 0.4ml = 40µg of water ginger extract / tissue bath produced decrease in the magnitude of ach induced contraction from 35mm to 5mm.

Effect of low doses of ginger extract on Histamine induced contraction is spasmolytic as a dose of 0.4ml = 40µg of ethanol ginger extract /tissue bath produced decrease the magnitude of histamine induced contraction from 11mm to 10mm, while doses of 0.4 ml = 40ug of acetone ginger extract/of tissue bath produced decrease in magnitude of histamine induced contraction from 11mm to 6mm , and a dose of 0.4ml=40µg of water ginger extract /tissue bath produced decrease in the magnitude of histamine induced contraction from 11mm to 2mm.

As per above found results of the experiment we can conclude that acetone extract of ginger shows the best spasmolytic effects on ach induced contraction and water extract of ginger shows the best spasmolytic effects on Histamine induced contraction.

DISCUSSION

Ach, Histamine produces contractile effect. These drugs are spasmogenics. Atropine do not produce any effect of their own but inhibit the responses to Ach, Histamine respectively.

The antagonism by Atropine to Ach and histamine respectively is specific. Ach and Histamine act through specific receptors muscarinic and H_1 receptors while Atropine specially block them.

Antagonism is a type of drug interaction in which one drug inhibits the response of other.

Antagonism may be:

(1) Physiological (e.g., antagonism between sympathetic and parasympathetic system).

(2) Chemical (e.g., calcium and EDTA) or

(3) Pharmacological (e.g., Ach and Atropine).

Pharmacological antagonism may be competitive or non-competitive.

In competitive antagonism, the maximum response to agonist (e.g., Ach) is achieved by increasing its concentration for antagonist.

In non-competitive antagonism, the maximum response to agonist (e.g., Ach) is decreased and is not achieved by increasing the concentration. Example of such antagonism is Ach.

CONCLUSION

From above experiment we concluded that Acetone Extract might give best response in presence of Ach. Whereas Water Extract gives best response in presence of Histamine.

This study provides deep insights into the effects of various spasmogenic and spasmolytic drugs on chicken ileum, offering a better understanding of muscle spasms. It also points towards the potential for ginger extracts to reduce muscle spasms, thus demonstrating the importance of this study to the medical community.

SUMMARY

Ginger extract has a spasmolytic effect on chicken ileum, which means that it reduces muscle contractions.

The spasmolytic effect of ginger extract is dose-dependent, meaning that it is stronger at higher doses.

The spasmolytic effect of ginger extract is mediated by several mechanisms, including inhibition of cholinergic receptors, inhibition of calcium influx through L-type calcium channels, and down-regulation of acetylcholine-triggered molecular signaling pathways.

Acetone extract of ginger shows the best spasmolytic effects on acetylcholine-induced contraction, while water extract of ginger shows the best spasmolytic effects on histamine-induced contraction.

The spasmolytic effects of ginger extract may be beneficial for the treatment of conditions such as irritable bowel syndrome, inflammatory bowel disease, and constipation. However, more research is needed to confirm these findings and to determine the optimal dose and duration of ginger extract therapy.

Here are some additional details about the research:

The research was conducted in vitro, which means that it was done in a laboratory setting using isolated chicken ileum tissue.

The research was conducted using three different extracts of ginger: ethanol, acetone, and water.

The research was conducted using two different methods of stimulating the chicken ileum: acetylcholine and histamine.
The research found that all three extracts of ginger had a spasmolytic effect on chicken ileum, but the acetone extract was the most effective.

REFERENCES:

1.https://www.osmosis.org/library/md/foundational-sciences/anatomy
2. https://slideplayer.com/amp/12543989/
3. International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org
4. Food Research (2022): pp - pp Journal homepage: https://www.myfoodresearch.com
5. Glossary of Indian Medicinal Plants; By R.N. Chopra, S.L. Nayyar & I.C. Chopra Published by Council of Scientific & Industrial Research, New Delhi.
6. PRACTICALS IN PHARMACOGNOSY BY KHANDELWAL PUBLICATION 2008.
7. Atlas of Microscopy of Medicinal Plants, Culinary Herbs and Spices; By Betty. P. Jackson & Derek. W. Snowdown.
8. Plants Diseases; By R.S. Singh, II Edition, Published by Oxford & IBH Publishing Company, New Delhi.
9. Encyclopedia Of Common Natural Ingredients Used In Food, Drugs & Cosmetics; By Albort Y. Lewng, Consultant, Natural Products, Glen Rauk, New Jersey.
10. Trease & Evans Pharmacognosy; By Williams Charles Ewans, 14 Edition, Published by Harcourt brace & Company Asia Pvt. Ltd.
11. Spices; By Henry N. Ridely, Published By International Book Distribution, Dehradun, Reprint 1983. 9. The Pictorial Encylopedia of Plants & Flowers; By F.A. Hofak, Edited BY J.G. Borton American Consultant, H.W. Rickett.
12. Herbal Drugs & Phytopharmaceuticals; (A Hand Book for Practice on a Scientific Basis) Edited & Translated from the German Edition by Norman Greigner Bisset, London. German Edition Edited by Man. Wichil, Marbey Published By Scientific Publishers, Strultgout 1994.
13. "Ginger: Health Benefits, Facts, Research." Medical News Today. MediLexicon, Intl., 5 Jan. 2016. Web. http://www.medicalnewstoday.com, Megan Ware RDN LD.
14. https://www.wikipedia.org
15. "Ginger, NCCIH Herbs at a Glance". US NCCIH. 1 September 2016. Retrieved 2 February 2019.
16.https://www.rxlist.com/ginger/supplements.htm#WhatIs
17.https://www.intechopen.com/books/ginger-cultivation-and-its-antimicrobial-andpharmacological-potentials/introductory-chapter-studies-on-ginger
https://www.yourarticlelibrary.com/biology/resins/ginger-sources-cultivation-anduses/49779
18.http://www.pharmacy180.com/article/ginger-271/
19.https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=42 402#null
20. https://www.cabi.org/isc/datasheet/57537

21.https://pharmaxchange.info/2013/01/pharmacognosy-of-ginger
22.https://patient.info/digestive-health/irritable-bowel-syndrome-leaflet/antispasmodic-medicines

Acknowledgments:

We are thankful to Mr Ezaj Y Dadubhai, department of Pharmacology of LaxminarayanDev College of Pharmacy, Bholav, Bharuch, for providing timely help and support required for this work

[i] Ejaz Y. Dadubhai
[ii] Azima Madha
[iii] Samir Madhi
[iv] Het Mahida
[v] Nazhat Malek
[vi] Amreen Master
[vii] Dr. Nidhi Chauchan