INVESTIGATING THE IMPACT OF ETHANOLIC EXTRACT OF RHIZOME OF ZINGIBER OFFICINALE ON FROG HEART RATE

Ashwini Pale, Nilam Patole, Snehal Chavan, Dr. Panaskar A. N., Dr. Panaskar B. A.

ABSTRACT

Ginger's leafy stems reach a height of approximately one meter, or three feet). The blooms are made up of overlapping green bracts, sometimes with a yellow border, and are arranged in dense cone-like spikes that are 5 to 8 cm (2 to 3 inches) long and 2.5 cm (1 inch) thick. A single little purple and yellow-green blossom is enclosed by each bract. ginger is used as an Anti-inflammatory, Antioxidant, Digestive aid, Blood sugar regulation , Cardiovascular health. Ginger contain wide varieties of bioactive form different phytochemical group like Volatile oil(1-4%) ,Starch (40-60%),Fat(10%), Fiber(5%0), Inorganic materials (6%), Residual moisture(10%),Acrid resinous matter (5-8%). These finding suggest that curcumin could be a potential source of tachycardia activity for the treatment of Cardiovascular disorders associate. And ginger could be source of Bradycardia activity for treatment of cardiovascular disorders. Ginger (Zingiber officinale) belong to Zingiberacae family is one of the famous spices all over the world. It is a perennial creeping plant with long leaves, yellow green flowers and thick tuberous rhizome. This is a type of storage root having pungent taste. Ginger has a long history of medicinal use for more than 2000 years as one of the most versatile medicinal plants having a wide spectrum of biological activity. From ancient times gingerhas beenexploited bothas Ayurvedicand Chinesemedicine forcuring heart problems, menstruation disorder, food poisoning, osteoarthritis, epilepsy, nausea, inflammation, cough and cold, motion sickness, menstrual cramps, cancer and many more. Besides these it also exhibits antimicrobial and antioxidant properties.

Key Words : Bradicardia activity, Zingiber Officinale , Ethanolic extract.

INTRODUCTION

Spices are utilized all over the world and are crucial as flavoring elements in food. It has been established that a number of phytochemicals included in spices have positive health effects and can help prevent chronic illnesses[1]. Gingerols and their related dehydration products, a series of homologues with varying unbranched alkyl chain lengths, the most abundant of which are 6-, 8-, and 10-gingerol (6 G, 8 G, and 10 G, respectively), as well as volatile oils (1%–3%) and nonvolatile pungent components oleoresin, are mostly found in the fresh rhizome of ginger. Ginger contains a number of pharmacologic properties, including antiemetic, antiulcer, anti-inflammatory, antioxidant, antiplatelet, antidiabetic, antilipidemic, cardiovascular, and anticancer properties. It is used in traditional medicine to treat a number of ailments, including inflammatory illnesses. However, researchers concentrated on ginger extracts and other forms (oil, juice, or powder)[2]. Numerous studies supporting the use of ginger as a functional dietary agent were demonstrated based on animal models for the prevention of chronic disease, such as weight management, fatty liver, hypertriglyceridemia, anemia, complications of diabetes, and the prevention of metabolic disorders. Rarely should a treatment be recommended based only on a heart rate below an artificial cutoff or a pause longer than a predetermined amount of time [3].Ginger exerts many health benefits and may be used to treat ailments, including cramps, arthritis and disorders of the gastrointestinal tract, such as constipation, dyspepsia, diarrhea, nausea and vomiting. In addition, ginger is recommended by traditional healers to treat cardiomyopathy, high blood pressure and palpitations. The main bioactive constituents of ginger are gingerol, shogaol, zingerone and paradol. Furthermore, the main aromatic components of ginger are zingiberol, gingediol, monoacyldigalactosyl-glycerol, aryl

heptanoids and phytosterols. The present study aimed to investigate the relaxant effects of GCE on porcine coronary arteries in vivo[4].Epinephrine is a hormone and neurotransmitter used to treat allergic reactions, to restore cardiac rhythm, and to control mucosal congestion, glaucoma, and asthma[5]. Epinephrine is a sympathomimetic catecholamine that exerts its pharmacological effects on α- and β-adrenergic receptors through a G-protein–linked second messenger system. At small doses, epinephrine has a greater affinity for β-receptors. However, large doses produce selective action on α-receptors. For the treatment of anaphylaxis, epinephrine is preferably injected intramuscularly into the anterolateral aspect of the thigh for rapid absorption, although subcutaneous injection is also an option. In advanced cardiovascular life support (ACLS), epinephrine can be administered IV or IO as needed[6].

REVIEW OF LITERATURE :

Ginger's leafy stems reach a height of approximately one meter, or three feet. The leaves emerge from sheaths that envelop the stem and are elongated, alternating in two vertical rows, and range in length from 15 to 30 cm (6 to 12 inches). The length of dried rhizomes ranges from roughly 2.5 to 7.5 cm (1 to 3 inches). One of the most widely used spices in the world is ginger (Zingiber officinale, Zingiberacae). It spreads throughout India after starting in China. Young rhizomes are pale yellow to brown-orange, whereas older rhizomes are brown and rather scaly. The rhizome has a vivid orange-yellow staining color, a pepper-like scent, and a warm, slightly bitter flavor[7].

Fig.1: Photograph Showing Zingiber Officinale

- **Uses :**
  1. Anti-inflammatory
  2. Antioxidant
  3. Digestive aid
  4. Blood sugar regulation
  5. Cardiovascular health
  6. Diarrhea
  7. Osteoarthritis

MATERIAL AND METHODS

A. Plant Collection, Authentification And Extraction -

- **Plant material**

The dried rhizomes of Zingiber Officinale, were collected in around Dighanchi, Maharashatra the authentification by Prof. Mulani Alisha department of Botany, Ishwarrao More Patil Arts , commerce and science Mahila Mahavidyalaya Ektanagar Dighanchi Atapadi. A voucher specimen has been deposited at the museum of college.

Fig.2: Photograph Showing Zingiber Officinale

- **Preparation of extract of Zingiber Officinale [8]:**

- **Collection And Authentification Of Plant :**
  The dried rhizomes Zingiber Officinale where collected locally during the month February.
- **Drying And Size Reduction Of Plant Material .**
  The rhizomes Zingiber Officinale where dried under the shade in laboratory it was pulverized into coarse powder.
- **Extraction Of Plant :**
  The extraction powder was continued by approach by the soxhlet extraction method extraction was used for the extraction using ethanol as the solvent A 10g of coarsely dried powdered were solvent using 100ml of ethanol for the principle defatting for 7-8hr. The yield obtained was found to be 17%.The crude ethanolic extract was stored in refrigerator below 10°C or crude further studies.

Fig.3: Soxhlet EEOROZO

B. Isolation Of Frog Heart[9]

1. Attach the frog to the frog board using pith.
2. Make an abdominal incision at the midline. To reveal the heart, remove the pectoral girdle.
3. Gently separate the pericardium and cover the heart with a few drops of frog ringer.
4. Put a thread around the inferior venacava and make a small cut to insert the venous cannula, which is then attached to a perfusion bottle that contains frog ringer. To ensure that the cannula stays in place, insert it into the vein and secure it with the thread.
5. For the perfusate to emerge, make a little incision in one of the aortas.
6. Change the perfusion bottle's height to achieve an appropriate venous presser of 2-4 cm. The height in centimeters between the ringer level in the perfusion bottle and the venous cannula is the effective venous pressure. Maintaining the steady pressure is made easier by using Marriott's bottle. To begin the perfusion, open the screw clamp that is fastened to the tubing.
7. 7. Tie a thin pin hook to the free limb of the universal lever that is fastened to a stand using a fine thread that is attached to the hook after passing it through the tip of the heart's apex. Adjust the lever's height to achieve the right tension and magnification. On the smoked drum, see the heart's typical contraction.
8. After injecting 0.1, 0.2, 0.5, and 1 milliliters of the each drug stock solution in that order, observe how the contraction's amplitude and pace alter. The each dose of the medication should be administered at least five minutes apart. The medication is injected into the perfusion tube in close proximity to the venous cannula. Take precaution to avoid any leaking of the medicine from the tube and the injection of air bubbles.
9. Use the "fixing solution" to label and correct the tracing.

C. Bradycardia Activity Assay Procedure[10]

1. First, adrenaline concentration depend response were recorded using sherringtons recording drum and frontal writing liver (at doses of 0.1,0.2,0.3,0.4 and 0.5 ml). For proper recording of the reaction in the presence of plane frog ringer solution as stock-1 solution, contact time of 60 sec. and baseline of 30 sec. time cycle were used.

2. The same approach was then used to record the concentration dependent response of EEOROZO for a stock-2 solution that included a blend of frog ringer solution

3. At last, the same concentration-dependent response of adrenaline and EEOROZO in combination were recorded.

OBSERVATION AND RESULT

- Effect of Adrenaline on frog heart reflected an increased in heart activity which shows Tachycardial effect as shown in fig.4. The effect of Adrenaline dose on frogs heart it could rise 50-80 beats/min.

Table 1: Dose Response Relationship Observation Of Adrenaline.

Sr. no.	Drug	Dose	Response
1	Adrenaline	0.1ml	1.9cm
2	Adrenaline	0.2ml	2.0cm
3	Adrenaline	0.3ml	2.3cm
4	Adrenaline	0.4ml	2.6cm
5	Adrenaline	0.5ml	2.7cm

Fig.4: Response Of Adrenaline.

- Decrease in heart rate: Due to increased parasympathetic activity or improved relaxation (e.g., slowing heart rate to around 30-60 bpm).

- when frog heart is suffer from any stress and cardiac diseases or heart diseases then the dose of EEOROZO gives bradycardia activity.

Table 2: Dose Response Relationship Observation Of EEOROZO

Sr. no.	Drug	Dose	Response
1	EEOROZO	0.1ml	1.9cm
2	EEOROZO	0.2ml	1.8cm
3	EEOROZO	0.3ml	1.4cm
4	EEOROZO	0.4ml	1.3cm
5	EEOROZO	0.5ml	1.1cm

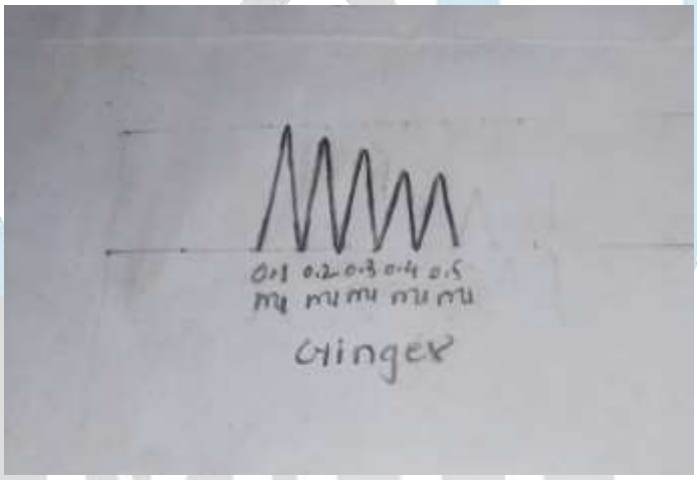

Fig.5: Response Of EEOROZO

- Adrenaline increase heart rate followed by treatment of EEOROZO showed prominent bradicardia activity as depicted in fig.6.

Table 3: Dose Response Relationship Observation Of EEOROZO And Adrenaline.

Sr. no.	Drug	Dose	Response
1	Adrenaline	0.1ml	2.1cm
	EEOROZO	0.1ml	1.9cm
2	Adrenaline	0.2ml	2.2cm
	EEOROZO	0.2ml	1.5cm
3	Adrenaline	0.3ml	2.5cm
	EEOROZO	0.3ml	1.2cm
4	Adrenaline	0.4ml	2.7cm
	EEOROZO	0.4ml	1.1cm
5	Adrenaline	0.5ml	2.8cm
	EEOROZO	0.5ml	0.8cm

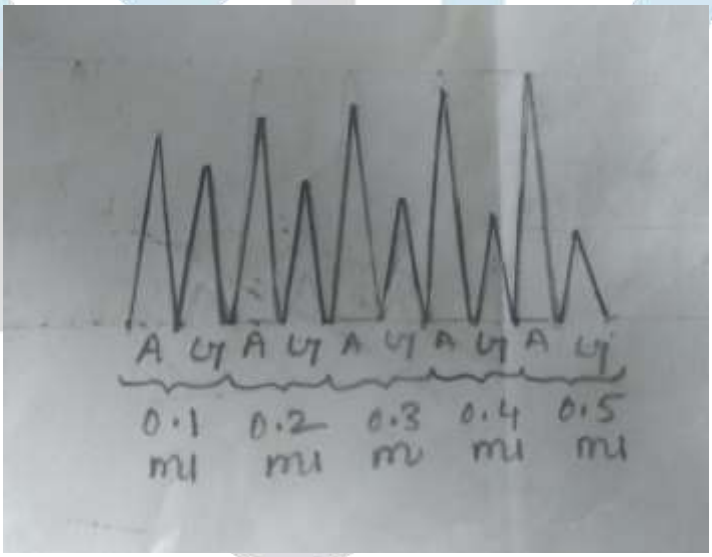

Fig.6: Response Of EEOROZO And Adrenaline.

DISCUSSION

. According to finding of the current study, Adrenaline one promotes contraction of the frog heart; however, When the EEOROZO given, it decrease the heart contraction. In this study the dose of extract can lead to a decrease in heart rate and blood pressure. This shows that EEOROZO has bradycardia effect.

CONCLUSION

. It was determined from all the data collected during the current investigation that the EEOROZO displays promising bradycardiac effect. It was discovered that EEOROZO has comparatively less activity than adrenaline.These data indicate that ginger has a potential preventive property against some chronic diseases, especially hypertension and CHD.

ACKNOWLEDEMENT

The author express their sense of gratitude towards management of Padmini College of Pharmacy, Dighanchi for providing all obligatory facilities necessary to carry out present work. Also principle Dr. A. N. Panaskar, deserve a special mention for their timely suggestion.

REFERENCES

1. Guldiken, B., Ozkan, G., Catalkaya, G., Ceylan, F. D., Ekin Yalcinkaya, I., & Capanoglu, E. (2018). Phytochemicals of herbs and spices: Health versus toxicological effects. Food and Chemical Toxicology: An International Journal Published for the British Industrial Biological Research Association, 119, 37–49. https://doi.org/10.1016/j.fct.2018.05.050.
2. Mao, Q.-Q., Xu, X.-Y., Cao, S.-Y., Gan, R.-Y., Corke, H., Beta, T., & Li, H.-B. (2019). Bioactive Compounds and Bioactivities of Ginger (Zingiber officinale). Foods (Basel, Switzerland), 8(6), 185. https://doi.org/10.3390/foods8060185.
3. Sidhu, S., & Marine, J. E. (2020). Evaluating and managing bradycardia. Trends in Cardiovascular Medicine, 30(5), 265–272. https://doi.org/10.1016/j.tcm.2019.07.001.
4. Wu, H.-C., Horng, C.-T., Tsai, S.-C., Lee, Y.-L., Hsu, S.-C., Tsai, Y.-J., Tsai, F.-J., Chiang, J.-H., Kuo, D.-H., & Yang, J.-S. (2018). Relaxant and vasoprotective effects of ginger extracts on porcine coronary arteries. *International Journal of Molecular Medicine*, *41*(4), 2420–2428. https://doi.org/10.3892/ijmm.2018.3380.
5. (N.d.-b). Drugbank.com. Retrieved April 3, 2025, from https://go.drugbank.com/drugs/DB00668.
6. Dalal, R., & Grujic, D. (2025). Epinephrine. In StatPearls. StatPearls Publishing.
7. The Editors of Encyclopedia Britannica. (2025b). ginger. In Encyclopedia Britannica.
8. Nguyen, S. T., Vo, P. H., Nguyen, T. D., Do, N. M., Le, B. H., Dinh, D. T., Truong, K. D., & Pham, P. V. (2019). Ethanol extract of Ginger Zingiber officinale by Soxhlet method induces apoptosis in human hepatocellular carcinoma cell line. Biomedical Research and Therapy, 6(11), 3433–3442. https://doi.org/10.15419/bmrat.v6i11.572.
9. "Isolated Frog Heart." *Scribd*, https://www.scribd.com/document/432849128/Isolated-Frog-Heart. Accessed 22 Apr. 2025.
10. Bothara, M.A.D.K., and Bothara K. K.(n.d.). buy third year as per PCI-Semester VI PHARMACOLOGY-III book online at low prize in india. Amazon.In. Retrieved March 11 , 2025. From https://www.amazon.in/third -year-as-pci-semesterPHARMACOLOGY/dp/B082Y.