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Preliminary analysis of secondary metabolites and antibacterial activity of *Zingiber neesanam* Graham

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Abstract
The present study was carried out on the plant *Zingiber neesanum* comes under the family Zingiberaceae. It is an aromatic stimulant and also medicinally important plant species. Various parameters such as phytochemical profiles of the entire parts of the plant by different solvent extracts were studied and the presence of important chemicals like alkaloids, flavonoids and terpenoids were identified. Methanolic extract of rhizome results the strong presence of alkaloid, flavonoids, terpenoids, sterol and phenols. Antibacterial activity of rhizome was studied by different bacterial strains. The rhizome extracts of chloroform and ethyl acetate were showed the effective antibacterial activity against the pathogenic bacteria.

Keywords: *Zingiber neesanum*, Zingiberaceae, phytochemicals and antibacterial activity

1. Introduction
According to the report of the World Health Organization, about 80% of the world's populations mainly on traditional therapies which involve the use of plant extracts or their active substances [6]. Medicinal plants have important chemical compounds with pharmacological and toxicological value. Many of these indigenous medicinal plants are also used for medicinal purposes [1]. Zingiberaceae is the largest monocotyledonous family in India. Zingiberaceae group has 52 genera and 1400 species concentrated in Indo-Malaysian region of Asia. Out of these 22 genera and 178 species are available in north-eastern and peninsular region of India [2]. The members of the family are used in dyes, perfumes, medicines, ornamentals and other economic uses. Different types of chemical are reported for Development of products from economically important genera like as *Alpinia, Zingiber* and *Curcuma* [7]. Plants have provided a good source of anti-infective agents; emetine, quinine, berberine, tannins, terpenoids, alkaloids and flavonoids remain highly effective instruments in the fight against microbial infections [3]. The present study was deals with the various plant parts of *Zingiber neesanam.* It is endemic to peninsular India and reported from Maharashtra, Karnataka and Kerala. It prefers the growth areas such as dense forests, teak plantation area and grass land at high altitude [4]. It is an aromatic plant also used for many ayurvedic preparations.

2. Materials and Methods

Fig 1: Habit and Rhizomes of *Z. neesanum* plant

The plant materials were collected from Pooyamkutti forest, Ernakulum, Kerala. The leaf, stem and rhizome parts were used for this study. The plant parts were cleaned, air dried and grinded into fine powder mechanically. The above powdered sample in which 10 g were kept steeped for 72 h in the solvents like as petroleum ether, chloroform, ethyl acetate, methanol and aqueous solvent. The extracts were filtered and concentrated by evaporation. The crude extracts were tested for preliminary qualitative analysis of phytochemicals.

The rhizome extracts were used for antibacterial activity against the four pathogenic bacteria such as *Actinomycetes sp, Bacillus subtilus, Pseudomonas arginoses and Seratia sp*. Antibacterial activity was studied by disc diffusion method. The nutrient agar plates were swabbed with each of the bacterial strains. A sterile swab was dipped in to the broth and expressed any excess moisture by pressing the swab against the side of the tube. The filter paper disks were impregnated with the solvent extracts of the rhizome of *Z. neesanam*. Each free disc was placed right on the agar plates with the help of sterile forceps and incubated at 37ºC for 3 to 4 days. The zone of inhibition was measured separately for each microbial strain using a scale. The results were collected and tabulated in Table.No.1. In the phytochemical study, the presence of alkaloids was tested by Mayer's and Wagner's methods. The presence of flavonoids was determined by Shinoda test, sulphuric acid test and ferric chloride test. The presence of terpenoids, cardiac glycosides, saponins, tannins, resins and phenols were studied respectively by Salkowaski test, Keller-Killani test, Salkowaski test, Foam test, Braemer's test, sulphuric acid test and ferric chloride test. The presence of sterols was estimated by Salkowaski and Liberman-Burchard's tests. The results were tabulated in Table. No.2.

3. Result and Discussion

Table 1: Antibacterial activity of *Z. neesanum* Rhizome

S. No.	Solvent extracts	Inhibition zones of bacterial strains in cm			
		Actinomycetes sp.	***Bacillus subtilus***	***Pseudomonas arginoses***	***Seratia sp.***
1.	Petroleum ether	0.2	0.2	0.3	0.1
2.	Chloroform	0.3	0.2	0.5	0.1
3.	Ethyl acetate	0.4	0.3	0.3	0.1
4.	Methanol	0.1	0.1	0.3	0.1

The rhizome extracts of various solvents were used for antibacterial activity against the four pathogenic bacteria such as *Actinomycetes sp, Bacillus subtilus, Pseudomonas arginoses* and *Seratia sp*. The highest percentage of inhibition (0.5 cm) was recorded against *Pseudomonas arginoses* by chloroform extract of rhizome. Among the other compounds, Terpinen-4-ol was responsible for its (*Z. cassumnar*) antibacterial activity [8].

Table 2: Phytochemical analysis of *Z. neesanum* plant parts

S. No.	Phytochemicals	Leaf					Stem					Rhizome				
		P.E	**C**	**E.A**	**M**	**A**	**P.E**	**C**	**E.A**	**M**	**A**	**P.E**	**C**	**E.A**	**M**	**A**
1.	Alkaloides A) Mayer's test.	++	+	-	+	-	-	-	-	+	+	-	++	+	+++	+
	B) Wagner's test.	++	++	+++	+	+++	-	-	-	+	++	+++	++	-	+++	+
2.	Flavonoids A) Sulphuric acid test.	+	++	++	-	-	-	+	+	++	-	+	-	+	+++	-
	B) Ferric chloride test.	-	+	+	-	-	-	++	+	+	-	-	+	-	++	-
3.	Terpenoides (Salkowski test)	-	++	-	-	-	+++	+	++	+	-	+++	+	+++	-	-
4.	Cardiac glycosides (Kellar-killani test)	+	+	++	-	-	-	-	-	++	+	++	++	++	+++	+
5.	Phenol. (Ferric chloride test)	+	-	-	++	++	-	-	-	++	+	-	-	+	+++	+++
6.	Sterols. Liberman-Burchards test.	+++	-	+	+++	-	++	+	-	-	-	-	-	-	+++	+
7.	Saponin. Foam test.	-	-	-	+	+	-	-	-	++	+	-	-	-	+	++
8.	Tannins. Braemer's test.	-	++	++	+++	+	-	-	-	+	++	-	+++	++	+++	+
9.	Resin. Sulpuric acid test.	-	-	-	-	+	-	-	-	-	+	-	-	-	-	+

(- = absent, + = present, ++ = moderately present, +++ = strongly present; P.E – Petrolem ether, C – Chloroform, M – Methanol, E.A – Ethyl acetate, A – Aqueous solvent)

Phytochemical analysis of petroleum ether, chloroform, ethyl acetate, methanol and aqueous extracts of leaf, stem and rhizome of *Z. neesanum* were carried out. The result was listed in Table.No.2. Methanolic extract of rhizome results strong presence of many secondary metabolites compared than the other solvent extracts. The results showed that the major phytochemical compounds were detected in all plant parts. Particularly, rhizomes contain more amounts of alkaloid, flavonoids, terpenoids, sterol and phenols. Methanolic extract of rhizome resulted that the strong presence of many secondary metabolites compared than the other solvents.

4. Conclusion

Medicinal plants are now being used as model for antibacterial agents and it is because that plant based drugs cause less or no side effects when compared with synthetic antibiotics [5]. The rhizome extract of chloroform and ethyl acetate showed a high degree of antibacterial activity against the four bacteria. In phytochemical studies, rhizome contains more amounts of alkaloid, flavonoids, terpenoids, sterol and phenols compared with leaves and stem.

5. References

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