COMPARATIVE EVALUATION OF ANTIMICROBIAL ACTIVITY OF *PANAX GINSENG* ON ORAL MICROBES

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ABSTRACT:

Introduction: Medicinal plants have long been a valuable source of natural active constituents that have been used in products for preserving human health and treating a wide range of diseases. *Panax ginseng* belongs to the Araliaceae family of plants. *P.ginseng* roots have been used in herbal medicine in Japan, China, and Korea for their two medicinal properties. These plant are well-known for developing antimicrobial compounds. *Panax ginseng* has a lot of therapeutic properties, it increases immunization function, also acts as an anti-diabetic function, anti-fatigue, anti-stress, improves male sexual dysfunction, inhibits AIDS virus growth, etc.

Aim: The aim of this study was to assess the antimicrobial potential of *Panax ginseng* extract against oral pathogens.

Materials and methods: *Panax ginseng* root extract was purchased commercially and used for the assay. 450 grams of ginseng extract was diluted in 24 ml of distilled water and sterilized using a membrane filter. Agar well diffusion method was used to screen the antibacterial activity of different concentrations of *Panax ginseng* extract against *Streptococcus.mutans and Enterococcus.faecalis*. The zone of inhibition was measured and tabulated which was compared with 2% chlorhexidine standard. The test was repeated in triplicate to minimize test error.

Results: Agar well diffusion demonstrated that *Panax ginseng* significantly inhibited the growth of *Streptococcus mutans* and *Enterococcus faecalis* . At a concentration of 200 ul against *Streptococcus mutans* the maximum observed zone of inhibition was 23mm. At the same concentration for *Enterococcus faecalis* the maximum zone of inhibition observed was 16mm. This shows that the increase in the extract is directly proportional to the increase in zone of inhibition.

Conclusion: The present study can be concluded that *Panax ginseng* extract showed good antimicrobial activity against the oral microbes tested.

KEYWORDS: Antimicrobial activity, Agar well diffusion method, oral microbes; *Panax ginseng*.

INTRODUCTION:

Medicinal plants have long been a valuable source of natural active constituents that have been used in products for preserving human health and treating a wide range of diseases. *Panax ginseng* (Chinese ginseng) is ginseng botanicals that have been used as essential health food resources around the world for thousands of years[1]. *Panax. ginseng* belongs to the Araliaceae family of plants[2]. Ginseng was developed as a self-pollinating plant. It begins to bloom in the middle of May when it is in its third year of growth[3,4]. The roots are pale yellowish-white, with a stout primary root, 2 or 5 rootlets, and root hairs. Soil quality, water content, transplant methods, temperature, and fertilizer all influence the size and shape of rootlets. *P.ginseng* roots have been used in herbal medicine in Japan, China, and Korea for their two medicinal properties [3] .[2]. These plants are well-known for developing antimicrobial compounds[5]. This phenomenon is thought to be a microorganism defense mechanism. Allelopathy refers to the release of these substances (*Panax.ginseng*), and the discovery of allelopathic compounds has received a lot of attention recently[6]. *P.ginseng's* saponins, also known as ginsenosides, are thought to be the primary biological constituents. At least 289 saponins have been described in *Panax* species to date[1].Saponin is *Panax ginseng's* key medicinal product, and it has a variety of therapeutic effects, including anti-tumor, anti-aging, and blood vessel softening[7]. *Panax.ginseng* has a lot of medicinal properties: it increases the immunisation function , anti diabetic function, anti fatigue, anti stress,improves male sexual dysfunction, inhibits AIDS virus growth , etc[8]. *P.ginseng* hairy roots in vitro cultures provide an appealing option for obtaining biologically active compounds[9]. The Rb and Rg ginsenoside groups, which are derived from the 20(S) protopanaxadiol, are the two most common forms of ginsenosides[9].

Previous studies stated that Ginseng is also useful for central nervous system disorders, aging, and neurodegenerative diseases[10].Pseudomonas aeruginosa, the pathogen that causes cystic fibrosis, is not inhibited by ginseng extracts, but only 0.25 percent of a ginseng extract prevents swarming motility and biofilm formation in P. aeruginosa[11].Another study stated that White, red, and extruded ginseng all have antimicrobial properties against gram-positive bacteria and yeast[11]. To extract functional components from ginseng, various extraction methods have

been used, mainly by using different solvents such as methanol, ethanol, and water to identify the antimicrobial activity[12,13].There are no studies currently available regarding the antimicrobial activity of ginseng extract obtained by ginseng roots generated as by-products during ginseng processing against commonly occurring oral pathogens such as S.mutans and E.faecalis[12].The aim of this study was to assess the antimicrobial potential of *Panax ginseng* extract against oral pathogens.Our team has extensive knowledge and research experience that has translate into high quality publications [14–25],[26–30]. [31] [32] [33]

MATERIALS AND METHODS:

Synthesis of *Panax ginseng* extract:

Panax ginseng root extract was purchased commercially and used for the assay. 450 grams of ginseng extract was diluted in 24 ml of distilled water and sterilised using membrane filters .

Antimicrobial Activity:

Antimicrobial activity of *Panax ginseng* against the strain *Enterococcus faecalis* and *Streptococcus.mutans* .Well diffusion agar was utilized for this activity to determine the zone of inhibition. Agar well diffusion method was used to screen the antibacterial activity of different concentrations of Panax ginseng extract against *Streptococcus.mutans and Enterococcus faecalis.* Well diffusion agar was prepared and sterilized for 45 minutes at 120lbs. Media poured into the sterilized plates and let them stabilize for solidification. The wells were cut using the well cutter and the test organisms were swabbed.The *Panax ginseng* with different concentrations were loaded and the plates were incubated for 24 hours at 37°C. After the incubation time the zone of inhibition was measured and tabulated and compared with 2% chlorhexidine. The test was repeated in triplicate to minimise test error.

RESULTS AND DISCUSSION:

Agar well diffusion demonstrated that *panax ginseng* significantly inhibited the growth of *Streptococcus.mutans* and *Enterococcus faecalis* . The zone of inhibition for *S.mutans* at 25µl is none, the zone of inhibition of 50 µl is 10mm, the zone of inhibition of 100µl is 16mm, the zone of inhibition of 200µl is 23mm .The zone of inhibition for *E.faecalis* at 25µl is none, the zone of

inhibition of 50 µl is none, the zone of inhibition of 100µl is 9mm, the zone of inhibition of 200µl is 16mm.The zone of inhibition for 2%chlorhexidine at 25µl is 14mm, the zone of inhibition of 50 µl is 19mm, the zone of inhibition of 100µl is 24mm, the zone of inhibition of 200µl is 30mm.Maximum zone of inhibition of 23 mm was seen against *S.mutans* at concentration of 200µl. The maximum zone of inhibition against *Enterococcus.faecalis* at 200µl concentration was 16mm. The increase in concentration increases the zone of inhibition. Similar articles state that , The antimicrobial activity of *Panax ginseng* assayed by a well diffusion method against pathogens showed significant activity at different concentrations .

Organisms	**25 µl**	**50 µl**	**100 µl**	**200 µl**
S.mutans	no zone	10 mm	16 mm	23 mm
E.faecalis	no zone	no zone	9 mm	16 mm
Control 2% chlorhexidine	14 mm	19 mm	24 mm	30 mm

Table 1: Depicting the values of the zone of inhibition against the oral microbes and 2% chlorhexidine.

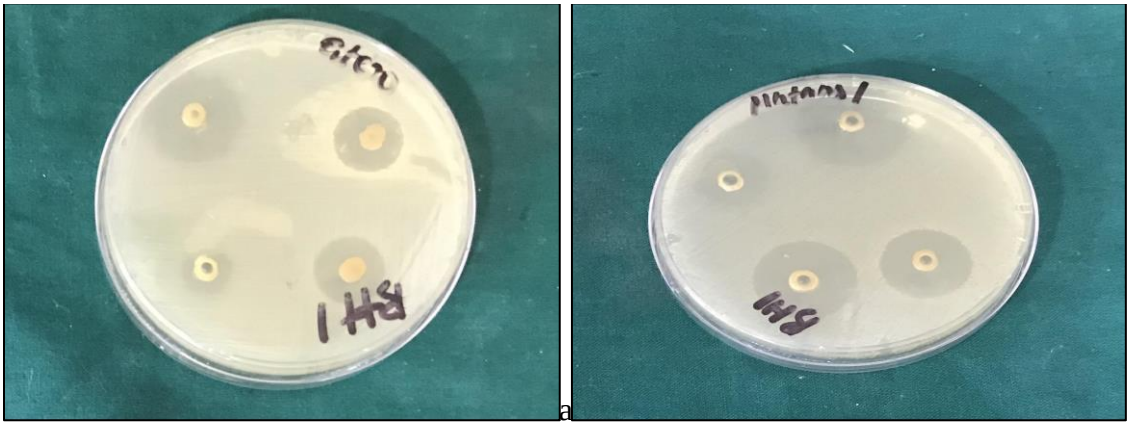

Figure 1: Image showing the Zone of Inhibition of *Panax.ginseng* against *E.faecalis* and *S.mutans.*

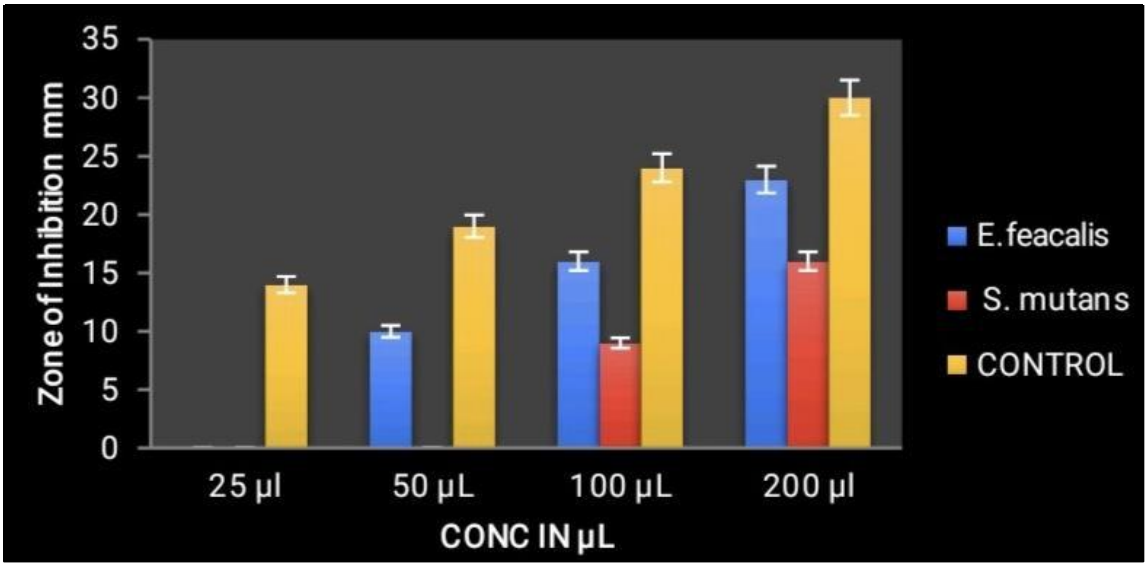

Figure 2: The bar graph depicts the antimicrobial activity of selenium nanoparticles synthesised from the extract of *Panax ginseng* .x axis represents the concentration in µl and the y axis represents the zone of inhibition in mm.

Recent research showed that polyacetylenes are defensive compounds that *P.ginseng* plants produce and release from their roots into the soil.In other studies, we discovered that steaming American ginseng roots at a high temperature modified the ginsenoside structures in a way that enhanced antibacterial activity against Propionibacteria and Streptococcus species[5].The concentrations of total phenolics and flavonoids in ginseng extracts increased when they were extracted at a higher temperature[12,34].A similar article showed distinct zones around the wells, indicating that ginseng extracts had inhibitory activity[6,35].The previous article stated that *Panax.ginseng* extract showed sensitivity towards streptococcus and Enterococcus bacteria and other viruses[6,35,36]. The related article stated that Ginseng root extract, prepared by SWE at 190°C for 10 minutes, was chosen for research due to its high phenolic content and antimicrobial properties[36,37].The findings also indicated that the SWE extraction method for producing ginseng extract from ginseng stems and leaves was effective in having antibacterial activities against bacteria strains, including foodborne and oral pathogens[2,38]. These results would aid in the

manufacture of food and pharmaceuticals using ginseng extract obtained from ginseng stems, roots and leaves in an environmentally friendly manner[2].

There was an opposing article which stated that the antimicrobial activity of *P. ginseng* hairy root culture extracts was first tested against methicillin-susceptible Staphylococcus aureus (MSSA)[5,39]. As a result, the medium extract was effective against MSSA and the results about the root extract weren't specifically shown[5]. The study done by Battenelli stated that Because of their potency in inhibiting microorganism growth and their involvement in the whole compound, the inactivity of P. ginseng fractions and complete extract does not appear to be due to a low concentration of ginsenosides. It's conceivable that the lack of antimicrobial activity is due to an antagonistic relationship between ginsenosides and other P. ginseng components[40].

The limitations of this study are the antimicrobial activity of panax ginseng was checked only on certain microbes. In further studies this can be used for development of different drugs for different pharmacological uses.

CONCLUSION:

From the present study it can be concluded that *Panax ginseng* extract showed good antimicrobial activity against the oral microbes tested. Further studies on their toxicity can be carried out so that the extract can be used in the preparation of mouth washes or tooth pastes.

CONFLICT OF INTEREST: There was no conflict of interest in the present study.

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AUTHOR CONTRIBUTIONS

Author 1: A.Sabaritha, carried out the study by collecting data and drafted the manuscript after performing the necessary statistical analysis and in the preparation of the manuscript.

Author 2: Dr.R.V.Geetha aided in conception of the topic, designing the study and supervision of the study, correction and final approval of the manuscript.

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