

Original Research Article

Growth Inhibition of Certain Gram Positive and Gram Negative Bacteria by Local *Plantago Major* Extract

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Abstract: *Plantago major* leaves were used in traditional medicine for treatment many diseases; this research was performed out to qualitative investigation of phytochemical in the Interested herb and also studies the antibacterial activity against certain types of bacterial isolated from clinical samples. The powder of plant leave was extracted with water/ ethanol (1:1). Following a qualitative screening for phytochemicals, the crude extract revealed the presence of several families of chemicals, including saponins, glycosides, phenols, tannins, steroids, alkaloids, flavonoids, and terpenoids. Three concentrations of crude extract were tested against five bacteria species include gram negative and gram positive (*staphylococcus aureus*, *streptococcus pyogenus*, *pseudomonas*, *proteus spp.*) using paper disc diffusion method. The three concentrations of crude extract was active in different percentage against all the tested bacteria.

Keywords: *Plantago major*, antibacterial, phytochemical, gram positive, gram negative.

INTRODUCTION

Because medicinal plants have the potential to benefit society and humanity in many ways, especially in the areas of medicine and pharmaceuticals, they are being researched more thoroughly than ever before. Plant Bark, roots, and leaves are used for medicinal purposes. as well as acting as building blocks for the synthesis of useful substances Medications are utilized because of their ethnomedical significance. The therapeutic the bioactive potentials of these plants could be traced back to them. phytochemical constituents that have a physiological impact on the human body [1]. The Plantaginaceae family includes herbs and tiny shrubs that grow in a variety of environments, from terrestrial to aquatic. The family consists of only one genus and possibly 270 species [2]. The most prevalent phytochemicals in the *Plantago* genus are iridoid glycosides, flavonoids, hydroxycinnamic acids, terpenoids, polysaccharides, unsaturated fatty acids, vitamins, alkaloids, terpenes, and saponins (leaves), xylose, and galacturonic acid (mucilaginous seeds) [3,4]. The genus is widely distributed, and many of its members have weedy traits [5]. The aim of this research to study of the growth inhibition of certain gram positive and gram negative bacteria by local *plantago* extract.

MATERIALS AND METHODS

Sampling

The central laboratory of the medical Baghdad city hospital provided the three Gram negative bacteria (*Escherichia coli*, *pseudomonas aeruginosa*, and *proteus spp.*) and two Gram positive bacteria (*Staphylococcus aureus* and *Streptococcus spp.*) used in this study. The leaves of the herb *Plantago major* L. were collected from Baghdad gardens in December 2020, and the department of biology-faculty of science-Baghdad identified the plant as *P. major* L.

Methods

Plant leaves were washed in water to remove soil and then dried in the shade until they were completely dry. Fresh plant samples were dried until completely dry at 40 degrees. Using a handmade blender, the dry sample is processed into a powder. Aqueous/ ethanol (1:1) extraction were performed by using 50grm powder of dried herbal leaves macerated with

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300 ml of (aqueous/ethanol) solvent. The maceration process continues for 3 day at 45C with shaking. The crude extract then filtered using wammman filter paper. The filtrate was pouring in petri dishes and leave in incubator at 45C for drying. Petri dishes wrapped in cellophane and stored at -30C until use.

Qualitative analysis of phytocomponent:

The preliminary phytochemical screening of *P. major* leaf extracts used to be carried out qualitatively for the presence of certain groups of compounds, tannins, flavonoids, alkaloids, carbohydrates, phenols, and proteins. The preliminary phytochemical screening for bioactive compounds was once carried out with the aid of the standard methods [5-8]. The phytochemical examinations had been carried out on the aqueous/ethanolic extract. The antibacterial activity analysis: A filter paper disc with a diameter of about 6 mm was sterilized in an oven at 180°C for 1 hour. Three concentration of herbal extract (50, 75, and 100µl) were used. The filter paper discs were impregnated in these 3 concentrations, each one separately. The paper discs impregnated in extract solution were then transfer to petri dishes seeded with different types of bacteria included in the present study. For three days, the Petri dishes were incubated at 24°C. Calculating the inhibition zone against the examined organisms allowed for the measurement of the antibacterial activity. Three duplicates of the entire test were run.

RESULTS AND DISCUSSION

The biological action of medicinal herbs is known to be significantly influenced by synthetic compounds called phytochemicals, which are obtained from plants. Because of their potential to fight off specific bacteria and drugs, the phytochemicals included in medicinal herbs are receiving more attention. According to the qualitative analytical results displayed in table (1), the phytocomponent tests revealed the presence of proteins, alkaloids, carbohydrates, flavonoids, tannins, and phenols. The phytochemical evaluations of various phytocomponents were classified as extremely high (+++), moderate (++) , low (+), and nil (-) according to the strength of the colored reaction result.

Table 1: Qualitative analysis of plantago major certain phytocomponent

No.	Components	Test	Water / EthOH 1:1
1	Alkaloids	Wagner’s test	+
2	Carbohydrate	Molish test	++
3	Flavonoids	Shinoda’s test	++++
4	Tannins	Gelatin test	+
5	Phenols	FeCl3 test	+
6	Proteins	Xanthoprotein test	+

"- No presence; + Low concentration; ++ Moderate concentration; +++ High concentration"

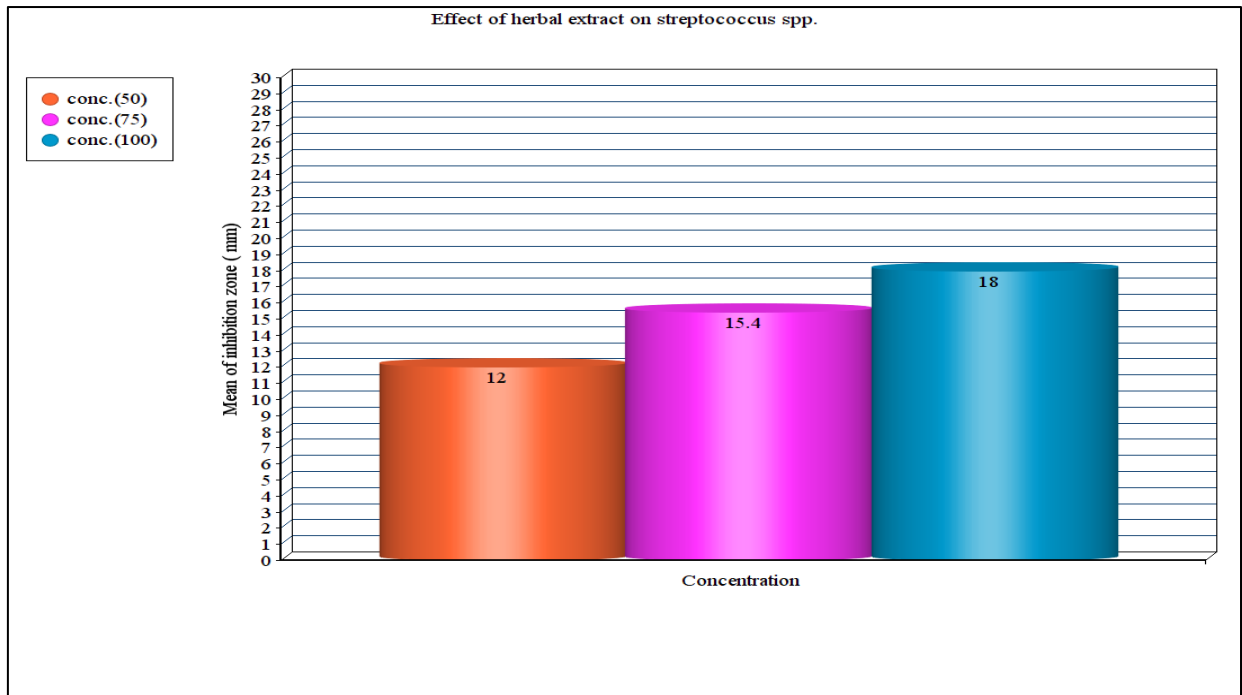
The data in table (1) reveals the presence specific groups of compounds and the flavonoids is exceeds other in concentrations. The differences in environment conditions, types of soil and its levels of nutrient ingredients might affect the presence and level of different types of ingredients in comparison with plantago major growth in other country locations [9-12].

- **Antibacterial activity:** the effect of aqueous/ethanolic extract of plantago major was evaluated using filter paper disc saturated with three concentration of extract and then applied to investigation their effect on 4 types of bacteria.

The results in table (2) and figures (1, A1) showed that the *streptococcus pyogenous* was more affected with 100µl of *plantago major* in comparison with other concentration. A potentially fatal cause of *Streptococcal* toxic shock syndrome is streptopyogenous, as are myonecrosis, bacteremia, pneumonia, necrotizing fasciitis, and scarlet fever [13]. Therefore, it is possible that the herb of interest will help prevent streptococcus pyogenous infections.

Table 2: Effect of plantago major extract on streptococcus pyogenous

	Conc. of herbal extract		
	50µl	75µl	100 µl
Inhibition zone Diameter (mm)	12	15	15
	10	15	15
	13	18	20
	13	14	22
Mean, SD	12±1.2	15.4±1.5	18±1.5



Figures 1, 1a: Effect of *plantago major* extract on *streptococcus pyogenes*

The effect of aqueous/ethanolic extract of interested herb against *staphylococcus aureus* showed increase with increase the concentration as showed in table and figure (2). The *staphylococcus aureus* is infecting human lead to cause urinary tract infection, food poisoning and skin abscess [14].

Table 2: Effect of *plantago major* extract on *staphylococcus aureus*

	Conc. of herbal extract		
	50µl	75µl	100µl
Inhibition zone	13	15	20
Diameter (mm)	10	10	13
	11	13	22
	11	12	22
Mean, SD	11.25±1.8	12.5±1.8	19.25±3.6

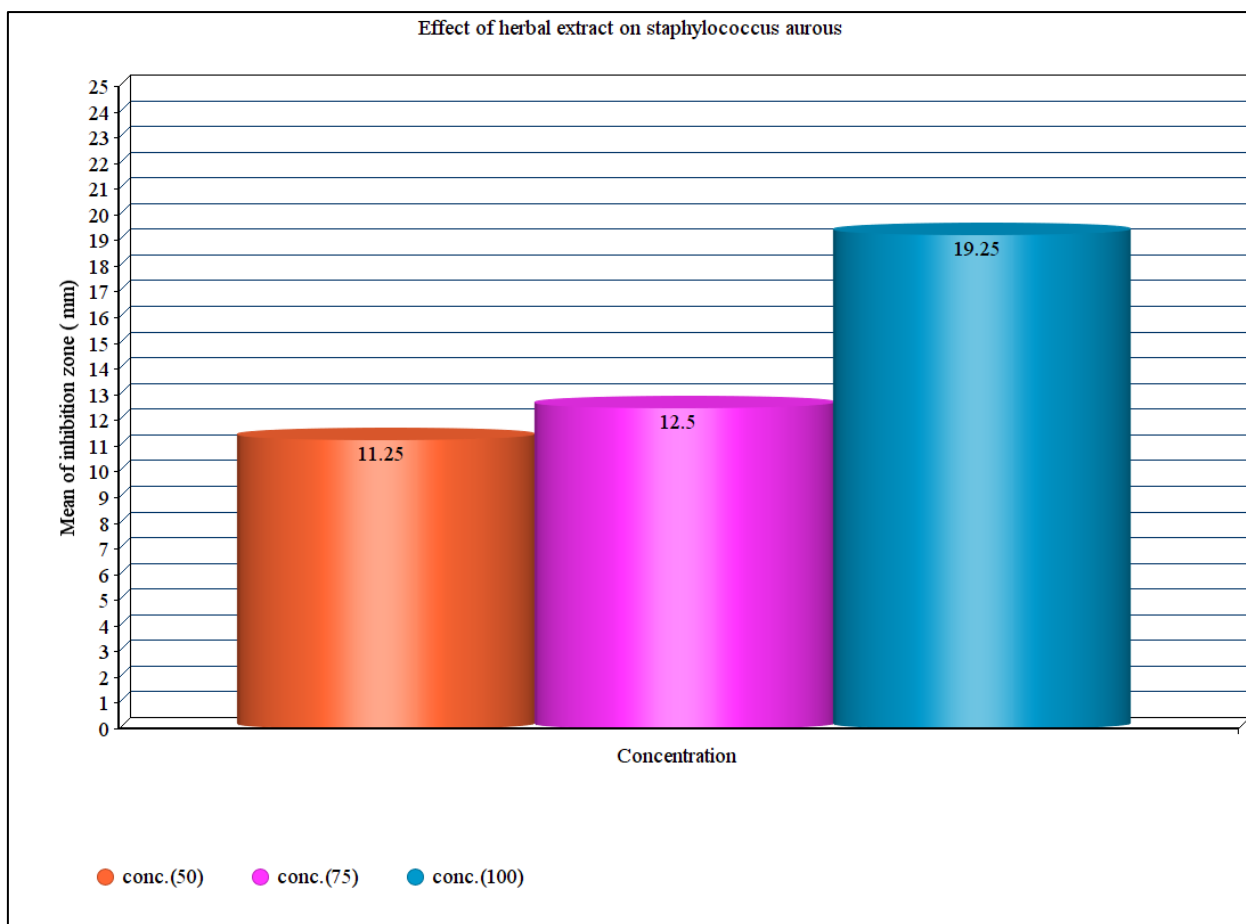


Figure 2: Effect of plantago major extract on *staphylococcus aureus*

The observations in table and figures (3, 3A) respectively concern with effect of interested herbal extract at 3 three concentrations on growth of *Escherichia coli*, the results revealed approximately equal effect of three concentration of herbal extract on growth of *Escherichia coli*. The most common type of *S. aureus* infection is a skin infection, which can take many different forms, such as small benign boils, folliculitis, impetigo, cellulitis, and more serious, invasive soft-tissue infections. *S. aureus* is also the cause of food poisoning, which it causes by producing toxins in the human body [15].

Table 3: Effect of plantago major extract on *Escherichia coli*

	Conc. Of herbal extract		
	50µl	75µl	100µl
Inhibition zone Diameter (mm)	9	12	10
	12	13	14
	9	10	12
	8	11	10
Mean, SD	9.5	11.5	11.5

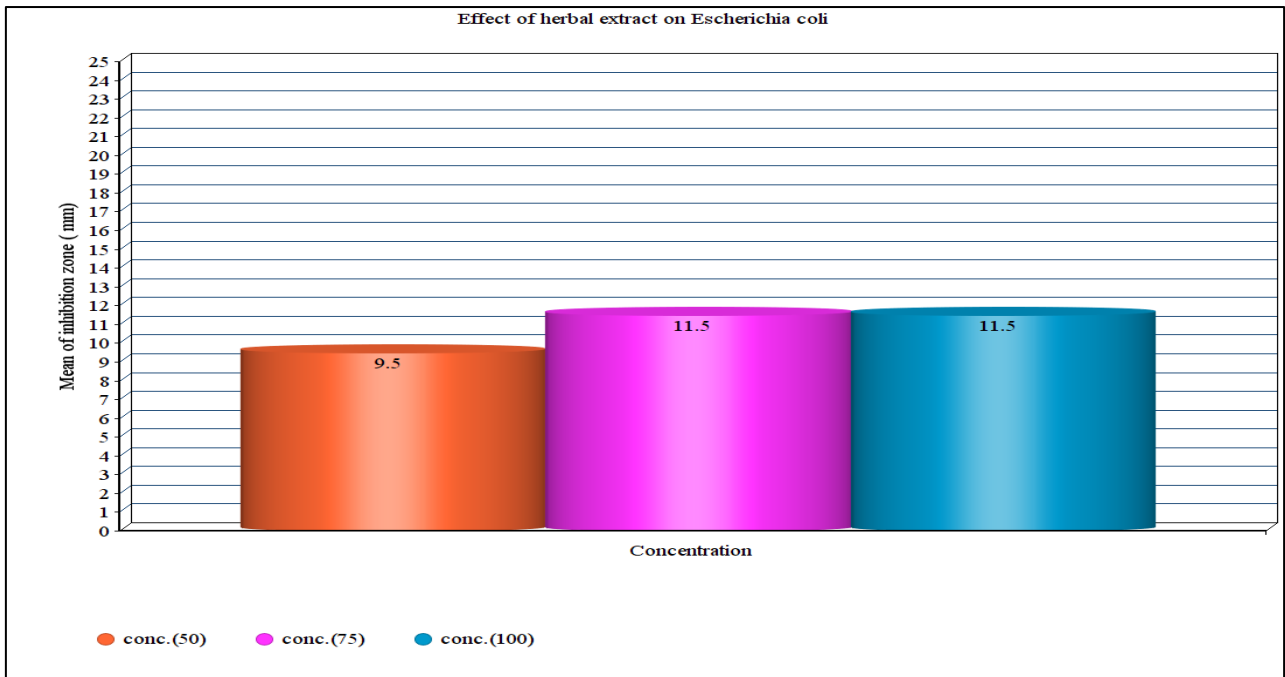


Figure 3, 3A: Paper disc diffusion of plant extract activity against *E.Coli*

The effect of three concentrations of *plantago major* on the growth of *pseudomonas aeruginosa* showed slightly difference in spite of that exceed at higher concentration (100µl, 11.50) as we shown in table and figures (4, 4A) respectively. *Pseudomonas aeruginosa* is the most common colonizer of medical devices (e.g., catheters), the most prevalent cause of infections of burn injuries and otitis externa, and it can proliferate on healthcare workers' hands or on contaminated equipment that is not thoroughly cleansed [16].

Table 4: Effect of *plantago major* extract on *pseudomonas aeruginosa*

	Conc. of herbal extract		
	50µl	75µl	100µl
Inhibition zone Diameter (mm)	10	12	11
	10	10	12
	9	11	10
	11	12	13
Mean, SD	10	11.25	11.5

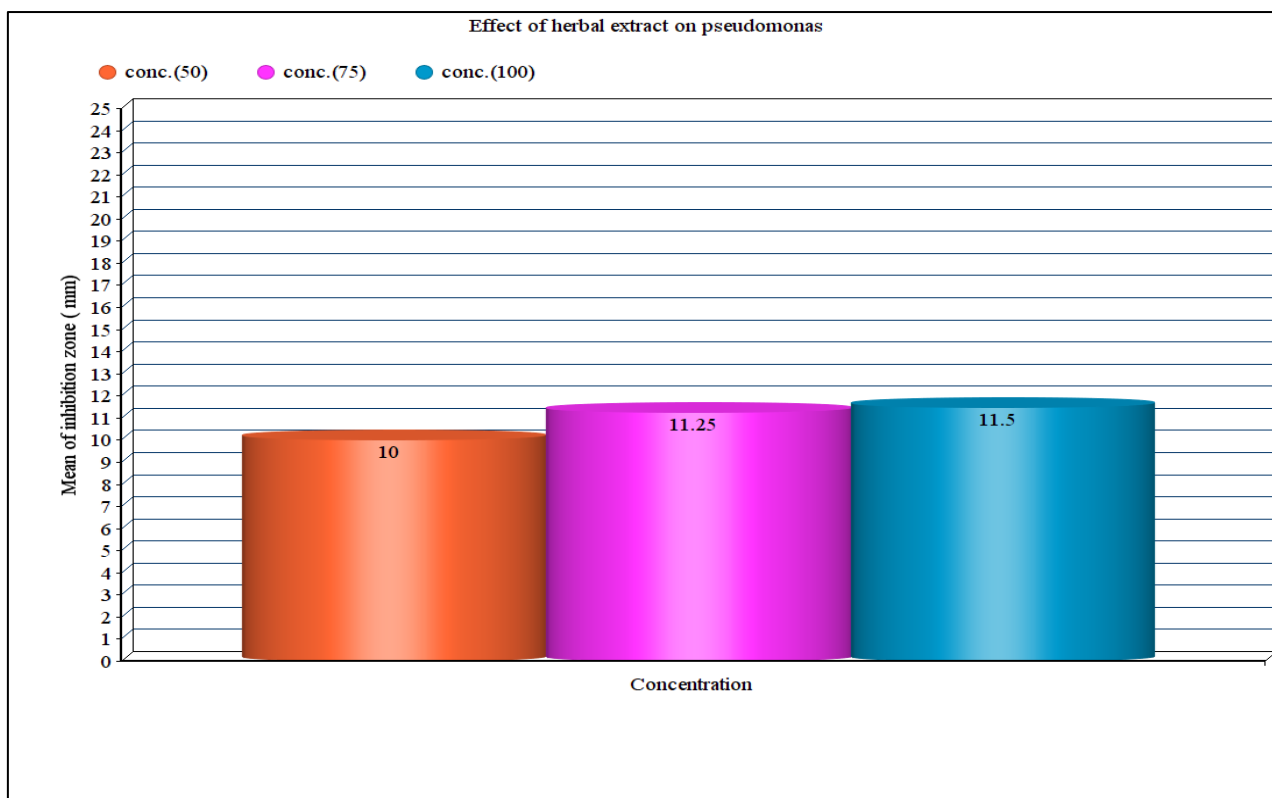


Figure 4, 4A: Effect of plantago major extract on *pseudomonas aeruginosa*

Table 5: Effect of plantago major extract on *proteus spp.*

	Conc. Of herbal extract		
	50µl	75µl	100µl
Inhibition zone	9	10	6
Diameter	11	13	10
(mm)	11	12	11
	8	10	6
Mean, SD	9.75	11.25	8.25

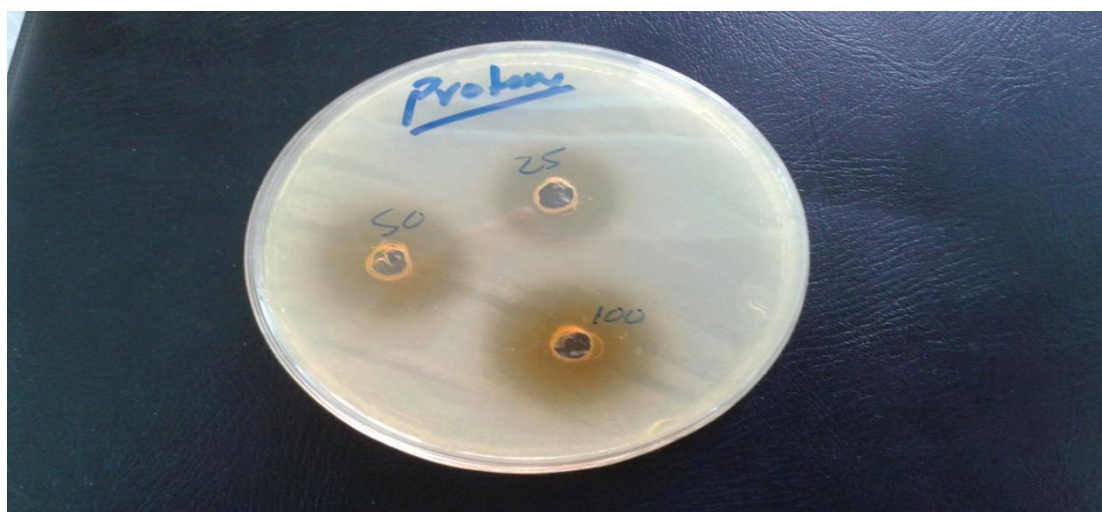
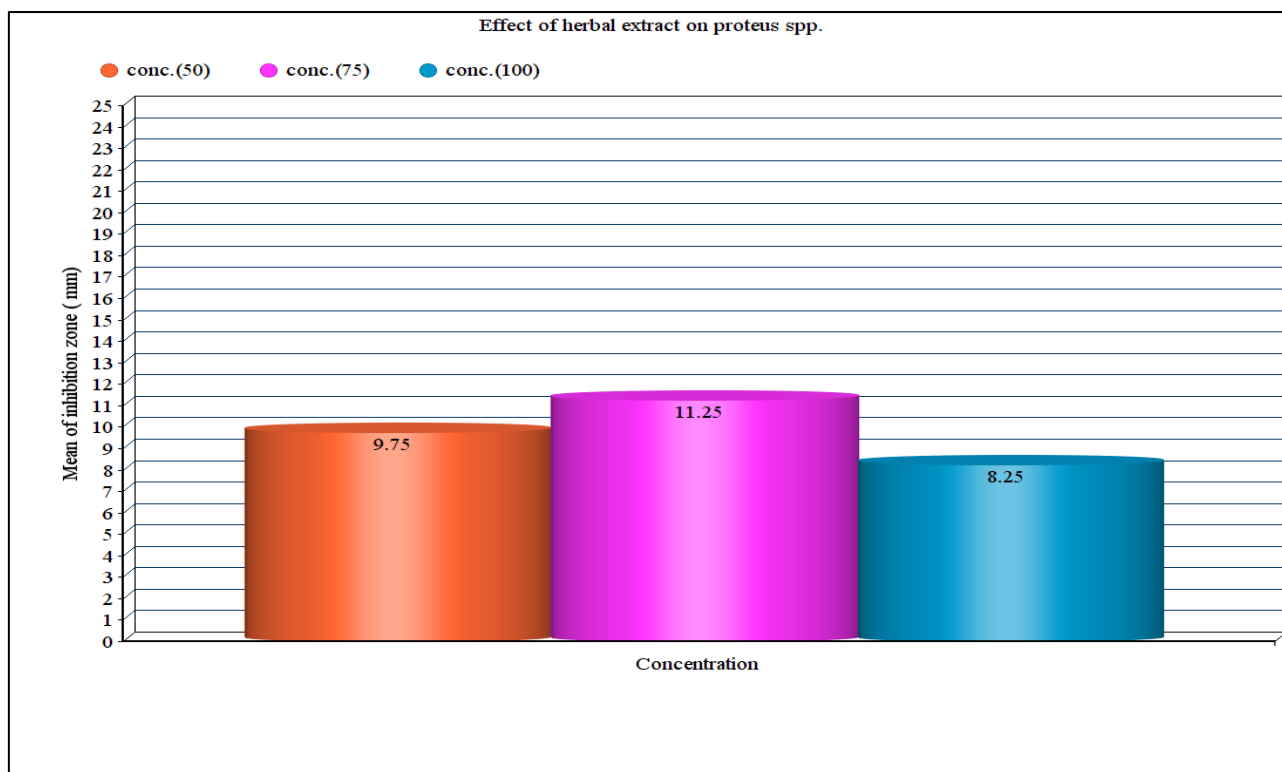


Figure 5, 5A: Paper disc diffusion of plant extract activity against *proteus spp.*

The present results related with effect of different concentration of aqueous/ethanolic extract of *plantago major* on certain types of gram positive and negative bacteria confirm the results of other investigators concern with such herb in spite of variance in conditions of herbal growth.

CONCLUSION

Plantago major has had different activities against different types of pathogenic bacteria and this might be response to its active ingredients.

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