

IN VITRO ANTIMICROBIAL ACTIVITY OF ALOE VERA GEL ON SELECTED URINARY PATHOGENS

BUKHARI S.,¹ NAWAZ H.,² TARIQ S.³ AND MUNEER A.⁴

^{1,2,3}Departments of Pharmacology, Ayub Medical College Abbottabad; ⁴Fatima Memorial Hospital/ University of Health Sciences, Lahore – Pakistan

ABSTRACT

Background and Objectives: Urinary tract infection is a common bacterial infection in the general population with an estimated incidence of 18 per thousand persons. It is more common in women and the reported annual incidence is 12%. The problematic factors in urinary tract infection are its high incidence, recurrence and increasing resistance of uropathogens towards antibiotics. The objective of the study was to find a herbal anti bacterial alternative to avoid side effects and other problems of antibiotics. The anti microbial activity of Aloe vera Gel is known. The purpose was to observe the effect of Aloe vera Gel (in vitro) against some selected uropathogens mainly involved in causing urinary tract infection.

Methods: In vitro activity of Aloe Vera Gel was studied on 3 selected urinary micro organisms i.e., *E-coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*, collected from the positive urine cultures of UTI patients. 30 cases were included consisting of 10 for every urinary pathogen. Aloe Vera Gel was obtained by incising longitudinally the fresh and mature leaf of the Aloe vera plant and collecting the pare-chymatous colorless Gel from them. 0.1 ml of the gel was introduced into the 7 mm holes bored into the nutrient agar media inoculated with the selected urinary pathogens and incubated at 37°C for 24 hours. Zones of inhibition were measured in mm.

Results: Aloe vera Gel was found to have anti bacterial effect against the selected uropathogens. It produced zones of inhibition against *E-coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Its anti bacterial activity against these organisms was of 76.9%, 75% and 40% respectively.

Conclusion: Aloe vera Gel exhibited varied anti microbial activity against all the said uropathogens by producing zone of inhibition against them. Aloe vera Gel expressed almost equal anti bacterial activity against *E-coli* and *Staphylococcus aureus* with comparatively less effect against *Pseudomonas aeruginosa*.

Key words: Urinary tract infection, Aloe vera Gel, *E-coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*.

INTRODUCTION

Herbal medicines have been used since long for the treatment of different ailments. It is estimated that about 80% of the world population in the developing countries rely on herbal medicinal products.^{1,2} Herbal medicinal treatment is popular in Pakistan and a large population especially in rural areas prefers the traditional pansari treatment because of no side effects, efficacy and economy. Researchers have also diverted their attention to extracts and biologically active compounds of the plants used in herbal medicine because of the side effects of antibiotics and increasing resistance by the micro organisms.³ A number of herbal medicines are available for different illnesses. Aloe Vera is well known for its medicinal properties and is the one of the richest natural sources of human health.⁴

Aloe Vera is a stem less or short stem succulent plant. It is 60 to 100 cm tall. The leaves are thick and fleshy green with serrated margins and small white teeth. Flowers are found in summer. Each flower is pendulous with yellow tubular corolla. Aloe Vera plant can survive wide range of temperature of 104°F to freezing temperature. The leaves contain the yellow sap called juice and a thick colorless mucilaginous material called gel. The active compound of aloe vera includes anthroquinones, chromones, polysaccharides, monosaccharides, vitamins, inorganic and organic ingredients, enzymes and upto 99% water.⁵ Due to the presence of active compounds Aloe Vera possesses anti-diabetic, anti-oxidant, anti-microbial and wound healing activities.⁶ Aloe vera Gel is effective in certain diseases of gastro intestinal tract such as irritable bowel disease.

ase, ulcerative colitis and peptic ulcer.⁷ Aloe vera leaves are laxatives. Aloe vera Gel is the most widely recognized remedy in US. It is known for its topical use of treating wounds and burns.⁸ It also stimulates the body's immune system.⁹ Currently, various products obtained from Aloe vera are used in the food, pharmaceutical and cosmetic industries all over the world.¹⁰

Much work has been done on the anti bacterial and anti viral aspect of Aloe Vera. UTI is one of the most problematic and recurring disease with increasing resistance. Attention is therefore drawn to investigate the anti microbial effect of Aloe Vera Gel on urinary pathogens of symptomatic UTI patients. The purpose of this study was to investigate (in vitro) the anti microbial effect of Aloe vera Gel on selected urinary pathogens.

MATERIAL AND METHODS

The anti microbial effect of Aloe vera Gel was studied in vitro against urinary pathogens isolated from the symptomatic patients of urinary tract infection. Organisms selected were E-coli, Staphylococcus aureus and Pseudomonas aeruginosa which were identified on the basis of their cultural characteristics. Samples of a number of urinary tract infection patients were screened. Out of which 30 cases were selected for the procedure consisting of 10 culture positive cases each of the 3 test bacteria. CLED agar media was freshly prepared in Petri dishes of the same size and depth for bacterial culture. The study was performed in the microbiology laboratory of Ayub Medical College Abbottabad while the sample collection work was done in the outdoor clinics of its hospital situated nearby. Duration of study was 3 months (July – September 2016).

Mature Aloe Vera plant was obtained from the gardens of Ayub Medical College. Fresh mature Aloe Vera plant leaf was taken, washed in running tap water for 5 minutes to remove the debris and dust particles and then rinsed with distilled water. The leaf was incised longitudinally by a sterile surgical blade and the colorless Aloe vera Gel scrapped by a clean scraper.

Seven mm holes were bored by the same size cork borer into the nutrient agar media and were filled with 0.1 ml of Aloe vera Gel as such. Test bacteria was spread over the media by a sterilized glass spreader and then incubated at 37°C for 24 hours. Anti microbial activity was expressed in the form of zone of inhibition which was measured in mm. The sensitivity procedure was performed in a total of 30 cases, 10 for each organism. Control strains of the same organisms were used for sensitivity purposes. These strains included E-coli (ATCC 25922) Staphylococcus aureus (ATCC 25923), Pseudomonas aeruginosa (ATCC 27853).

RESULTS

Results revealed anti bacterial activity of the Aloe vera Gel against the 3 selected urinary pathogens. The zone

of inhibition (mm) produced by Aloe vera Gel against E-coli was 10.0 ± 0.8. The inhibitory zone against staphylococcus aureus was 6.0 ± 0.2. The activity against Pseudomonas aeruginosa was comparatively less. It was 0.4±0.2 (Table 1).

The control strains of the pathogens were used in the sensitivity procedure. Aloe Gel exhibited anti bacterial response against the strains in the form of zone

Table 1: Anti microbial activity of Aloe Gel against uropathogens.

Uropathogens	No	Mean ± SE	antimicrobial Activity of Zone of Inhibition
E-coli	10	10 ± 0.8	76.9%
Staphylococcus aureus	10	6 ± 0.2	75%
Pseudomonas aeruginosa	10	0.4 ± 0.2	40%

of inhibition (mm) i.e., E-coli 13 mm, Staphylococcus aureus 8 mm and Pseudomonas aeruginosa 1.0 mm (Table 2). Comparing the results with the control strains, the anti bacterial activity revealed by pathogens was 76.9%, 75% and 40% respectively.

Table 2: Activity of Aloe vera Gel against control strains.

No.	Control strains	Zone of inhibition (mm)
1.	E-coli ATCC- 25922	13
2.	Staphylococci ATCC- 25923	8
3.	Pseudomonas ATCC- 27853	1

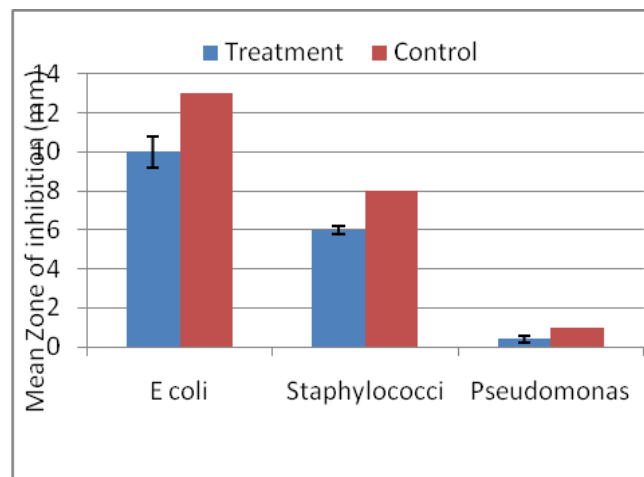


Figure also represents the activity of Aloe vera Gel against the said uropathogens.

DISCUSSION

Aloe Vera products are used throughout the world for different ailments. Fresh Aloe Gel, juice and formulated products are used for cosmetic purposes and general health.

Plants are unlimited source for treatment of diseases. There is growing interest in investigation of different plant species for their therapeutic potentials. They have medicinal properties with no side effects. Herbal products are comparatively cheaper than allopathic products. The present investigation revealed anti microbial effect of Aloe vera Gel against uropathogens (in vitro) with varied activity. Aloe vera Gel exhibited almost equal anti microbial response against E-coli and staphylococcus aureus. It also expressed some varied activity against *Pseudomonas aeruginosa*.

Our results are in agreement with the findings of some other workers. Antonisamy et al 2012 in their study on Dimethyl Sulpho Oxide (DMSO) Gel extract of Aloe vera observed activity against bacteria. The maximum zone of inhibition was observed against E-coli (13mm) and Staphylococcus (10mm). Alamdar and Agaoglu 2009, studied the anti bacterial effect of Aloe juice obtained from cold pressed leaves of Aloe vera plant. They concluded no inhibitory effect of aloe vera juice against E-coli, Staphylococcus aureus and *Pseudomonas aeruginosa*. Agarry et al (2005) tested the anti microbial activity of Aloe vera Gel and Aloe leaf. They observed maximum inhibitory effect of Gel against staphylococcus aureus than Aloe vera leaf but no response of Gel against *Pseudomonas*.

Our study is also supported by the findings of karpagam and Devaraj (2011). They studied the anti bacterial activity of Aloe vera and the presence of active compounds responsible for this activity.

Takou IA (2015) observed *Pseudomonas aeruginosa* to be completely resistant to anti bacterial activity of Aloe vera Gel with no zone of inhibition. We observed varied sensitivity of *Pseudomonas aeruginosa* to Aloe vera Gel, comparatively lesser than E-coli and Staphylococcus aureus. We believe *Pseudomonas aeruginosa* to be more resistant and potent uropathogenic microbe and will need antibiotic cover but still can be benefited safely with Aloe vera Gel. At the end it is confirmed that Aloe vera Gel has anti microbial effect (in vitro) against the selected uropathogens. Clinical correlation is suggested for further achievements.

It is **concluded** that Aloe Vera Gel has anti bacterial activity with almost equal response against E coli and Staphylococcus aureus with varied activity against *Pseudomonas aeruginosa*.

Conflict of Interest: None.

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Authors' Contribution

SB: Principle author, conceived the idea, data collection, literature review, write-up. HN: Supervised the study, Literature search, proof read the manuscript. ST: Improvement of manuscript. AM: Statistical analysis.

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