Evaluation of the Antibacterial Activity of *Cyperus rotundus* Extract (An *in vitro* study)

Ghada Younis Abdul-Rahman
College of Dentistry
University of Mosul

Aveen Hawal Rasoul
College of Medicine
University of Dohuk

الخلاصة

إن درنات نبات السعد *Cyperus rotundus* شائعة الاستخدام في الطب الفلكلوري فـــي عـــدة أقطار كعلاج مضاد للطفيليات ومضاد للاكتئاب ..الخ.تم تقييم التأثير المضاد للجراثيم للمستخلص المائي لهذا النبات على مجموعة مختارة من الجراثيم باستخدام تقنية التخافيف الدقيقة.

أظهرت النتائج تأثير معنويا للتخافيف 2-10 و 3-10 للمستخلص المائي على الجـــراثيم الـــسالبة لصبغة كرام و ليس على جرثومة *Staphylococcus aureus*

ABSTRACT

The *Cyperus rotundus* tubers are commonly used in folk medicine in many countries as antiparasitic antidepressive and etc...... The antibacterial effect of the aqueous extracts of this plant was evaluated using selected Gram positive and Gram negative bacteria and microdilution technique.

The results showed a significant inhibitory effect of 10–2 and 10–3 dilutions of the aqueous extract on all the tested Gram negative but not the *Staphylococcus aureus*.

INTRODUCTION

Chemotherapy is the chemical treatment of the disease, especially diseases caused by microorganisms.(1) Antibiotics were either natural products from microbial sources produced partially or completely by chemical procedures (semi–synthetic or synthetic respectively).(2) The use of plants and preparations made from them to treat infection is an old practice.(3) A large number of researches had been performed to screen the antimicrobial activities of the medicinal plants especially those had been used in folk medicine.(4,5) The tubers of *Cyperus rotundus* or nut grass plant were used in different countries (China, Japan, Egypt, India, Turkey, etc.....) as food, talcum powder, perfumes and the plant rhizomes were the plant parts used mainly.

It was used for therapeutic purposes as antidepressive, antiparasitic, antifingal, etc........, with no toxic or side effects noticed. The nut grass plant or *Cyperus rotundus* belongs to the family *Cyperaceae* (sedge family), and its pharmaceutical name is *Rhizoma cyperi*.(6)

This study was designed to the *in vitro* evaluation of the antibacterial effect of the aqueous extract of *Cyperus rotundus* tubers (the sweet type).

MATERIALS AND METHODS

I. Preparation of the Extracts:

Fresh tubers of the plant were collected from the local market, washed carefully with tap water, then dried in fresh air. The seeds grinded by coffee grinder and sieved to separate the large pieces and fine threads found around the seeds. The fine white pulp material was the part used in this study.

Ten grams of the white material was dissolved in 100 ml of distilled water, filtered through 3–4 layers of cotton gauze, then through filter paper. The resulted solution is the aqueous extract (AE) of nut grass seed in concentration of 1:10 (10–1).(7,8) Serial dilutions were made from this concentration.

II. Bacterial Cultures:

Six types of pathogenic bacteria were collected and identified from clinical samples at Al–Salam General Hospital's laboratories (in Mosul) and these were: *Staphylococcus aureus*, *Salmonella paratyphi* ,A, *Pseudomonas aerogenes.*, *Proteus spp.*, *Klebsiella spp. and Escherichia coli(9).*

III. The Antimicrobial Assay:

This was carried out by Turbidity–Broth microdilution method.(8) The measurement of the growth was done by spectro-photometer at 590 nm.(7).

IV. Statistical Analyses:

It was carried out using One Way Analysis of Variance (ANOVA) and the data were analyzed and grouped by Duncan's Multiple Range Test at the level of significance (0.01).

RESULTS AND DISCUSSION

From the broth microdilution examination of the different concentrations of the AE of the fresh, sweet tubers of *Cyperus rotundus*, the optical densities of the growth of *Staphylococcus aureus* (Gram positive), and *Salmonella paratyphi*, *Pseudomonas* spp., *Proteus* spp., *Klebsiella* spp. and *Escherichia coli* (Gram negative bacteria), compared to the effect of 1:10, 1:100 and 1:1000 dilutions of both the AE of *Cyperus rotundus* tubers was shown in Table (1) and Figure (1) respectively.

These results showed that the AE had a significant antibacterial effect on all the tested bacteria at both 1:100 (10–2) and 1:1000 (10–3) dilutions, but not at the

high concentration solution (1:10) (Figure 1), and the best antibacterial effect of the AE was found at the 10–2 solution on *Proteus* spp., *Klebsiella* spp., *Escherichia coli* and *Salmonella paratyphi.*

Both *Staphylococcus aureus* and *Pseudomonas* spp. are less inhibited by the AE, where both of them were known to be the most resistant types of bacteria.

Our results gave us an idea that the AE of these rhizomes had a good antibacterial effect, or, in another word, the most antibacterial compound in these rhizomes were the water soluble compounds, which made the extract effective against number of microorganisms with different characters (motile–non motile, capsulated and non, Gram positive–Gram negative bacteria).One of the recent local studies found that both AE and EE of nut grass seeds were effective against *Actinobacillus actinomyce-tecomitans*, which was one of the important Gram negative micro-organisms in the oral cavity.(5) This coincides with our results about the effects of the extracts on the Gram negative bacteria.

CONCLUSION

From the previous results, we found that these simple, cheep, available, sweety and aromatic seeds were very useful when extracted water to be used as antimicrobial agents.

REFERENCES

1) Nolte WA. Oral Microbiology with Basic Microbiology and Immunology. 4th ed. CV Mosby Co. 1982; p: 88.
2) Bergquist LM. Microbiology: Principles and Health Science Application. WB Saunders Co. Philadelphia. 2000; p: 453.
3) Cowan MM. Plant products as antimicrobial agents. *Clin Microbiol Rev.* 1999; 12(4): 564-582.
4) Abdul–Rahman GhY. Effect of some medicinal plants and chemicals on the growth of pathogenic bacteria. *Iraqi Vet J Sci.* 1995; 8: 2.
5) Abdullah BHA. Microbiological study of *Actinobacillus actinomycetecomitans* isolated from periodontal infections. MSc thesis. College of Science. University of Mosul. 2005.
6) Chang MH, Hay BPP. Pharmacology and application of Chinese material medicals. 1987; 29: 893-895.
7) Kassab NH. Antifungal effect of some agents on *Candida albicans* growth on acrylic resin denture base surface (*in vitro* study). MSc thesis. College of Dentistry. University of Mosul. 2002.

8) النعمان، أديبة يونس شريف، (1998). التأثير الجزيئي لبعض المستخلصات النباتية على نمو وايض عدد من الجراثيم الموجبة و السالبة لصبغة كرام. أطروحة دكتوراه، كلية العلوم ،جامعة الموصل.

9) Holt,J G; Krieg, N R;Sneath, p h;Staley,J T& Williams,S T,(1996). Bergis Manual of Determinative Bacteriology. 9th. ed., Williams & WILKINS Company.

Table (1): Analysis of variance and Duncan's Multiple Range Test for the antibacterial activity of *Cyperus rotundus* aqueous extract

Analysis of Variance

Source	df	SS	MS	F–value	*p*–value
Factor	23	5.71493	0.24848	34.21	0.000
Error	48	0.34867	0.00726		
Total	71	6.06360			

SS: Sum of squares.
MS: Mean squares
df: Degree of freedom

Duncan's Multiple Range Test

Microorganism	No.	Absorbance (Mean ± SD)			
		Control Growth	Concentration		
			10th	100th	1000th
Staphylococcus aureus	3	0.85667A ± 0.04163	0.87000 A ± 0.01000	0.54667 B ± 0.02517	0.44333 B ± 0.04509
Salmonella	3	0.85000A ± 0.02000	0.80333 A ± 0.01528	0.22000 C ± 0.02000	0.62667 B ± 0.04041
Pseudomonas	3	0.38333 A ± 0.03512	0.36000 A ± 0.10392	0.00000 B ± 0.00000	0.10000 B ± 0.07000
Proteus	3	0.67000 A ± 0.04359	0.68333 A ± 0.01528	0.07333 C ± 0.03512	0.30333 B ± 0.16563
Klebsiella	3	0.45000 B ± 0.09539	0.72667 A ± 0.17214	0.00333 C ± 0.00577	0.40667 B ± 0.26407
Escherichia coli	3	0.72333 A ± 0.02517	0.63333 A ± 0.05132	0.00333 C ± 0.00577	0.42333 B ± 0.08737

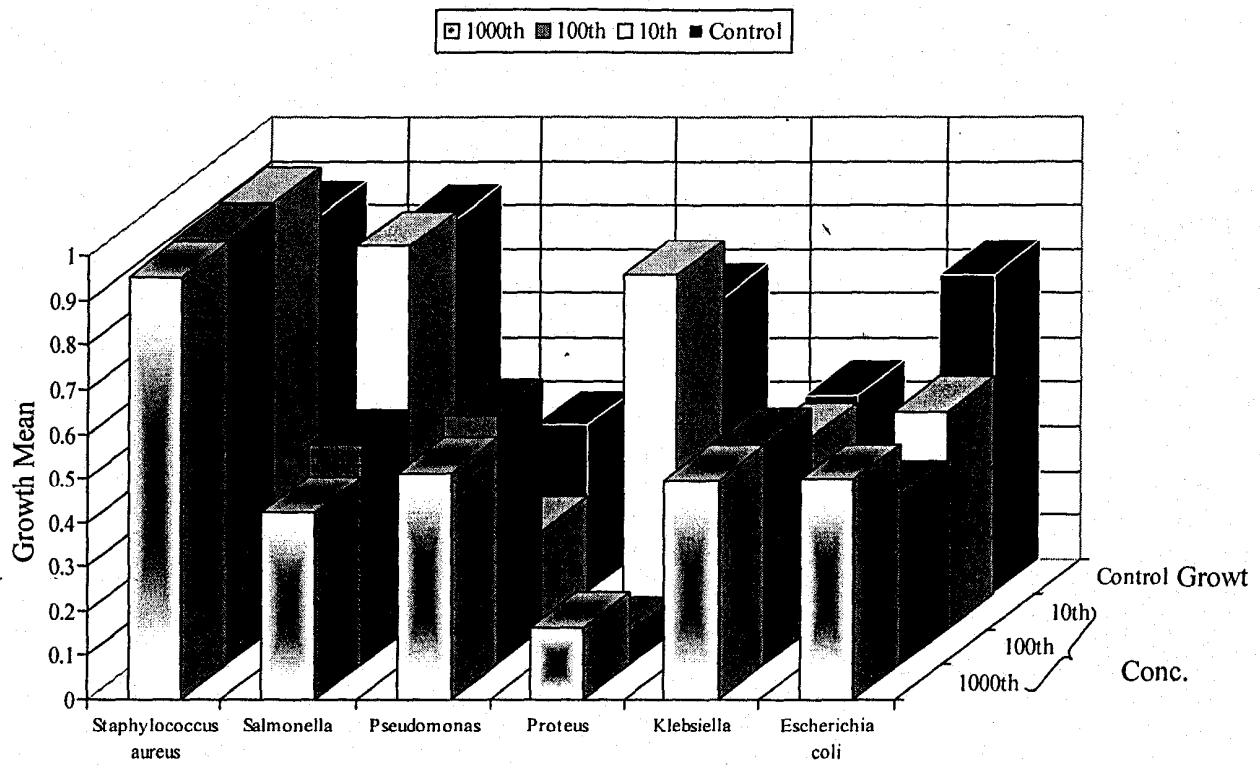Means with different letters were statistically significant

Figure (1): The antibacterial effect of *Cyperus rotundus* aqueous extract on different microorganisms