iJRASET

International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6   Issue: VII   Month of publication: July 2018

DOI: <http://doi.org/10.22214/ijraset.2018.7126>

www.ijraset.com

Call: ☎ 08813907089

E-mail ID: ijraset@gmail.com

Antimicrobial Activity of *Lepidium Sativum* against some Gram Positive and Gram Negative Bacteria and Fungi

Enass Kamal¹ and Mohammed Nafi

^{1,2}Alneelain University-faculty of medical laboratory science-microbiology

Abstract: Nowadays it has been wonder if alternative medicine such as using herbs and plants directly could be considered in order to avoid pharmaceuticals enters human body giving side effects such as resistance and allergy rather than treating the local illness. *Lepidium Sativum* is one of the considerable herbs easy and distributed around different continents regardless the phase of using, some use leaf parts, while as treatment seeds have been used always, hall grains or extracts. This study aimed to distinguish that effect of seeds extracts on some microorganisms and possibility of absolute concentration could achieve that. Using standard organisms, such as *E. coli*, *K. pneumoniae*, *salmonella para typhi*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa* and *Candida albicans*, inoculated them in different concentrations of the extract, using different solutions base, such as water, crude, hexane, chloroform and ethanol, high sensitivity determined by the size of the zone in the certain dilution, which presented in plate of each plate cultured, was in 50 mg/ml (5%). More effective appeared with *E.coli* (in crude solution) and *K. pneumoniae* (in hexane solution) as each zone diameter was 16mm, while the low diameter of sensitivity was obtained with *C. albicans* with 7mm.

Key word: *E. coli*, *K. pneumoniae*, *salmonella para typhi*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Pseudomonas aeruginosa*, *Candida albicans*, *Lepidium Sativum*, chloroform and crude

I. INTRODUCTION

Herbal medicines are the oldest remedies known to mankind. Herbs had been used by all cultures throughout history (1), it has become a popular form of healthcare; although several differences exist between herbal and pharmacological treatments, herbal medicine needs to be tested for efficacy using conventional trial methodology and several specific herbal extracts have been demonstrated to be efficacious for specific conditions (2). Medicinal plant products were proved useful in minimizing the adverse effects of various chemotherapeutic agents as well as in prolonging longevity and attaining positive general health (3). The increasing global interest in the medicinal potential of plants during the last few decades is therefore quite logical (4).

L. sativum (family-Brassicaceae) Fetto (Amharic), Garden cress, (English) is an erect annual herb of up to 60 cm in height. The seeds are rich in minerals and vitamins; especially vitamins C, A, B and E (5). A paste of seed flour mixed with water is used on chapped lips, against sunburn and other skin disorders. Seeds are chewed to cure throat disease, asthma and headache. It is an important spice and medicinal plant which is scattered into and grown with other crops, particularly teff in Ethiopia. More uses of *L. sativum* in Ethiopia: for colic, abdominal pain, dysentery, swellings, and aphrodisiac (6). It is still popular and frequently consumed type of leafy vegetables in Europe, in Scandinavia, Netherlands, England and France (7-8). The seeds are used to treat a variety of skin complaints (9), cold, headache, asthma, sore throat and cough; *L. sativum* is a source of folic acid, vitamins C, dietary fiber, iron, calcium, protein, vitamin A, folate and vitamin E. The seeds are also highly nutritive and they contain ascorbic acid, tocopherol, folic acid, calcium, linoleic fatty acids and iron (10-11).

II. MATERIALS AND METHODS

The current is experimental study carried out in order to assess antimicrobial activities of *L. sativum* using different microorganisms to do so in several steps.

A. Fresh seeds of *Lepidium Sativum*

Obtained from an apothecary shop in Omdurman market. The seeds were stored in the air tight container before the preparation of extracts, which performed as: washed seeds of *Lepidium sativum* with distilled water and then blended using mortar and pestle. Grinded seeds then added to 100 ml of 100% solvents (ethanol, hexane, chloroform, water). The suspension was filtered using Whatman No. 1 filter paper. The filtrate was evaporated and powdered form was obtained. Minimum amount of Dimethyl Sulfoxide

(DMSO) was added in the above obtained powdered extract. Different dilutions of the extract were prepared for antimicrobial assay; dilutions were conducted from crude, water residue, hexane, chloroform and ethanol as 100 (10%), 50 (5%), 25 (2.5%), 12.5 (1.25%), 6.25 (0.6%), 3.12 (0.3%), 1.56 (0.2%) and 0.78 (0.08%) mg/ml, those dilutions for minimum inhibitory concentration (MIC), which assessed visually depending in color changes. And minimum bacterial concentration (MBC) it conducted by sub-culture of each extract dilution and determined by which no growth (blue color) on plate that contained Mueller Hinton agar, MBC is the concentration that inhibited growth of the organism.

B. Microorganisms Used For Antimicrobial Assay

Escherichia coli (ATCC No. 25922), Staphylococcus aureus (ATCC No. 25923), Enterococcus faecalis (ATCC No. 29212) Pseudomonas aeruginosa (ATCC No. 27853), and Klebsiella pneumoniae (ATCC No. 13883); while Salmonella paratyphi B (from stool sample) and Candida albicans (from urine sample) were clinical isolated organisms. Cultures used for antimicrobial assay were obtained from Khartoum National Health Laboratory. Microbial inoculums was be standardized at 0.5 McFarland standards.

C. Agar Well Diffusion Assay

Muller Hinton agar was the base of the culture, inoculation of the microorganisms took place first, then using metal porer, different pores were conducted to enable filling with exact extract dilution to be added, which was 50 microliter in each pore from each solvent. Antimicrobial activity of plant extracts was screened against E. coli, S. aureus, E. faecalis, P. aeruginosa, K. pneumoniae, S. paratyphi B and C. albicans using the agar well diffusion assay. Microbial inoculum was aseptically spread on the surface of pre solidified Mueller Hinton agar plates using a spreader.

II. RESULT

This experimental study conducted on L. sativum effect on certain microorganisms, as it used as base of growth media, antimicrobial activity can be presented with increasing the zone of clearance, which indicate the effect occurred though, as diameter more than 12 mm would be considered as a sensitive. Five different solutions were used as solvents for the extract of L. sativum seeds, crude, water residue, Hexane, chloroform and ethanol, with different concentrations of seeds, the result showed that more effective readings or growth was obtained through the dilution 50 mg/ml, which revealed different zones in cultured media with different organisms, high zone diameters obtained with E. Coli and K. Pneumoniae as 16mm, and then decline zone diameters until 7mm which obtain by the C. albicans, as in table 1

Table 1:Antimicrobial activity of seeds of Lepidium sativum extracts

Extract	S. aureus	E. faecalis	E. coli	K. pneumoniae	P. aeruginosa	S. paratyphi	C. albicans
Crude	10	13	16	11	9	8	-
Water	12	-	15	9	8	10	12
Hexane	11	12	14	16	13	12	7
Chloroform	15	11	-	12	14	11	12
Ethanol	14	8	11	11	13	-	-

Minimum inhibitory concentration (MIC) and minimum bacterial concentration (MBC) for each microorganism as in table 2

Table 2: MIC and MBC among different dilutions

Extract	S. aureus		E. faecalis		E. coli		K. pneumoniae		P. aeruginosa		S. paratyphi		C. albicans	
	MIC	MB	MIC	MB	MIC	MB	MIC	MB	MIC	MB	MIC	MB	MIC	MB

		C		C		C		C		C		C		C
Crude	12.5	25	3.12	25	25	50	50	NIL	25	NIL	50	NIL	NIL	NIL
Water	25	50	NIL	NIL	3.12	6.25	12.5	25	NIL	NIL	25	50	12.5	50
Hexane	50	Nil	50	Nil	12.5	25	3.25	12.5	12.5	50	6.25	25	50	50
Chloroform	3.12	12.5	12.5	50	Nil	Nil	25	50	6.25	25	12.5	50	25	50
Ethanol	3.12	6.25	6.25	25	6.25	12.5	25	Nil	3.12	12.5	Nil	Nil	Nil	Nil

III. DISCUSSION

Bacterial resistance to antibiotics has been a recognized and dangerous, resistant strains occurred with a disturbing regularity (12), leading increased death rate (13) and high cost due to unnecessarily prescribed antibiotics (14-15). Thus effective antimicrobials were no longer available which could cure virtually all bacterial infections. This optimism was shaken further by the emergence of resistance to multiple antibiotics amidst enteric pathogens, *Pseudomonas aeruginosa*, *Streptococcus pneumonia*, *S. aureus* and *Mycobacterium tuberculosis* (16-14-18). It has been searching of some novel antimicrobial molecules which have a broad spectrum of activity against both bacteria without having many or any side effects and exploring the variety of medicinal plants (19). Medicinal plants have continued to receive a lot of attention from researchers due to their pharmacological effects such as anti-inflammatory and antibacterial properties (20). In this study, the aim was to ensure about the effectiveness of garden cress *L. sativum* on most popular bacteria in the community with recurrent of infection leading to the concept that they were resistant to prescribed medications, so focusing of *E. coli*, *S. aureus*, *E. faecalis*, *K. pneumoniae*, *P. aeruginosa*, *S. paratyphi* and a fungal *C. albicans*. Using seeds of *L. sativum* extract diluted in several concentrations, using different solvents, and off course culturing in Mueller Hinton agar as a base media. High sensitivity determined with clear zone diameters, it presented with *E. coli* in crude and *k. pneumoniae* in hexane with 16mm, while 15mm in plate of *S. aureus* in chloroform and *E. coli* in water dilution, while 14 mm by *s. aureus* in ethanol dilution, *E. coli* in hexane dilution and *P. aeruginosa* in chloroform, 13 mm by *E. faecalis* in crude and *P. aeruginosa* in hexane. *Candida albicans* has 12mm for growth in both water and chloroform. MIC and MBC for each organism were ranged from 50 to nill. Many studies concerned about *L. sativum* effect on microorganisms, one of the conducted in Sudan as well, it has a partial agreement with this study, as they both conducted on mutual organisms included *E. coli*, *P. aeruginosa* and *candida albicans*, sensitivity presented at concentration of extract (2.5%) 2.5mg/ml while in this study it was on (5%)50mg/ml (21). While other Iraqis study conducted assessing antibacterial effect of ethanolic and aqueous extracts of *Lepidiumsativum*, also has a partial agreement with this study, it investigated on Gram negativeand Gram positive bacteria (*Klebsiella pneumoniae*, *Proteus*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*,and *Streptococcus mutans*). All bacteria under this study were obtained from human infections from by using the well diffusion technique. It was observed that the extracts ofthe plant had an inhibitory effect on all the bacteria under study, except *Klebsiella pneumoniae*. The minimum inhibitory concentration (MIC) of*L. sativum* extracts was determined and it was 3% for *Klebsiella pneumoniae* (22). Other study conducted to investigate the chemical composition, antioxidant properties and antibacterial effects of nbutanol extract of *Lepidium sativum* seed. Theantimicrobial activity of the extract was tested against five strains of pathogenic microorganisms, *Staphylococcus aureus* ATCC 25923, *Staphylococcus aureus* ATCC 43300, *Enterococcus feacalis*ATCC 29212, *Escherichia coli* ATCC 25992 and *Pseudomonas aeruginosa* ATCC 27852. The effect of *L. sativum* approved that the use of *Lepidium sativum* in traditional medicine (23).

REFERENCES

- Firenzuoli F, Gori L, Crupi A, Neri D. Flavonoids: risks or therapeutic opportunities? RecentiProg Med. 2004;95:345-5
- N Bhatt.Ayurvedic drug industry proceeding of the first national symposium of ayurvedic drug industry organized by (ADMA).Ayurvedic, New Delhi sponsored by Department of Indian System of Medicine of HOM, Ministry of Health, Govt. of India; 1998-1999

- [3] Kaushik, P. and A.K. Dhiman, 2002. Medicinal Plants and Raw Drugs of India, P. XII+623. Retrieved from: <http://www.vedicbooks.net/medicinal-plants-andrawdrugs-of-india-p-13886.html>
- [4] Eddouks, M., M. Maghrani, A. Lemhadri, M.L Ouahidi and H. Jouad, 2002. Ethnopharmacological survey of medicinal plants used for the treatment of diabetes mellitus, hypertension and cardiac diseases in the South-East region of Morocco (Tafilalet). *J. Ethnopharmacol.*, 82: 97-103.
- [5] Jansen PCM: Spices, Condiments and Medicinal Plants in Ethiopia: their Taxonomy and Agricultural Significance. Centre for Agricultural Publishing and Documentation, Wageningen, Agri. Res. Rep 1981; 906: 216-224
- [6] Ermias D: Natural Data Base for Africa (NDA) on CD-ROM, Version 2, Addis Ababa, Ethiopia 2011
- [7] Qudamah A. Dictionary of Food and Treatment by Plants. Beirut: Dar Alnafaes; 1995. pp. 241–244
- [8] SK, Tariq M, Ageel M, Al-Yahya MA, Shah AH. Studies on some herbal drugs used in fracture healing. *Int J Crude Drug Res.* 1989;27:235–239.
- [9] Ben-Erik van Wyk: Food Plants of the World: Identification, Culinary Uses and Nutritional Value. Briza Publications, Pretoria 2005; p. 22
- [10] Burghardt H, Brunner H, Oelmüller R, Lottspeich F, Oster U, Rudiger W. Natural inhibitors of germination and growth, VII synthesis of Ribulosebisphosphate carboxylase in darkness and its inhibition by Coumarin. *Z Naturforsch [C]* 1994;49:321–326
- [11] The Plant List: A Working List of All Plant Species, retrieved 8 May 201
- [12] Appelbaum PC. 2012 and Beyond: Potential for the Start of a Second Pre-antibiotic Era? *J Antimicrob Chemother.* 2012;67(9):2062–8.
- [13] Center for Disease Control and Prevention Achievements in Public Health 1900–1999: Control of Infectious Diseases. [Accessed December 20, 2013]
- [14] Center for Disease Control and Prevention World Health Day: Media Fact Sheet. [Accessed December 20, 2013].
- [15] European Medicine Agency The bacterial challenge: time to react. A call to narrow the gap between multidrug-resistant bacteria in the EU and the development of new antibacterial agents. [Accessed: December 20, 2013]. Available at
- [16] F.D. Lowy Antibacterial resistance: the example of *Staphylococcus aureus* *J Clin Invest*, 111 (2003), pp. 1265-1273.
- [17] D. D'Souza, N.F. Mistry, T. Vira, Y. Dholakia, S. Hoffner, G. Pasvol, et al. High levels of multidrug resistant tuberculosis in new and treatment-failure patients from the revised national tuberculosis control programme in an urban metropolis (Mumbai) in Western India *BMC Public Health*, 9 (2009), p. 21
- [18] Close M. Ballal, S. Devadas, R. Chakraborty, V. Shetty Emerging trends in the etiology and antimicrobial susceptibility pattern of enteric pathogens in rural coastal India *Int J Clin Med*, 5 (2014), pp. 425-43
- [19] Venkateswaran P.S., Millman I., Blumberg B.S. Effect of an extract from *Phyllanthus niruri* on hepatitis B and woodchuck hepatitis viruses: In vitro and in vivo studies. *Proc. Natl. Acad. Sci. USA.* 1987;84:274–278
- [20] Traoré Y, Ouattara K, Yéo D, Doumbia I, Coulibaly A. Recherche des activités antifongique et antibactérienne des feuilles d'*Annonas negalensis* Pers. (Annonaceae). *J Applied Biosci* 2012; 58: 4234–424
- [21] Shama .Y. Adam, Shayma A.M. Salih and Warda S. Abdelgadir. In vitro Antimicrobial Assessment of *Lepidium sativum* L. Seeds Extracts. *Asian Journal of Medical Sciences* 3(6): 261-266, 201
- [22] Hero F. S. Akrayi and Jwan D. Tawfeeq. Antimicrobial antibacterial activity of *lepidium sativum* and *allium porrum* extract and juice against some gram positive and gram negative bacteria. *Medical Journal of Islamic World Academy of Sciences* 20:1, 10-16, 2012.
- [23] Ouahiba Ait-yahia, François Perreau, Samia-Aichouche Bouzroua, Yamina Benmalek, Tahar Dob, Aicha Belkebir. Chemical composition and biological activities of nbutanol extract of *Lepidium sativum* L (Brassicaceae) seed. *Tropical Journal of Pharmaceutical Research* May 2018; 17 (5): 891-896.

10.22214/IJRASET

45.98

IMPACT FACTOR:
7.129

IMPACT FACTOR:
7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)