Sys Rev Pharm 2021;12(2):145-147
A multifaceted review journal in the field of pharmacy

Chemical Composition And Antibacterial Activity Of Linum Usitatissimum L. (Flaxseed)

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ABSTRACT

Linum usitatissimum L.is one of dietary sources including different types of phenolics such as phenolic acid, flavonoids, lignans and tannins. The present study was carried out to estimate the antibacterial activity of Linum usitatissimum L.extracts against three species of illness bacteria were obtained from stock cultures. We performed the agar diffusion method and indicated the bactericidal .action

The results of Microbiological tests were displayed some difference between the effect of Linum usitatissimum L. on the declining of the bacterial species growth. Aqueous extract of Linum usitatissimum L. showed inhibition zone against bacteria ranged from 16 to 25 mm, while alcoholic extract achieved inhibition zone against bacteria ranged from 17.5 to 27 mm. In present study we indicate that extracts derived from Flaxseed might be the active source of antibacterial compounds and the hopeful alternate to antibiotic therapy.

Keywords: Limum usitatisimum, Flaxseed, antibacterial activity, chemical composition.

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INTRODUCTION

In the past several decades plant placed products have played an important role in either preventing or reducing the progression of diseases [1]. Plants have been widely adopted as the source of all drugs; this field has gradually broadened in developing countries where traditional medicine severs an essential function in health care [2].One of the major topics to be investigated in this field is focused on identifying antibiotics from natural sources. This is due to rise of resistance in pathogenic bacteria against common antibiotics [3].

Flaxseed is the seed from the plant *Linum usitatissimum* , is an annual plant , this plant had attracted man 's attention for it is advantage for human health[4]. Chemical analysis of flaxseed averaged 30 – 40 % oil , 20 – 25 % protein , 20 – 28 % fiber , 4 – 8 % moisture and 3 – 4 % ash[5]. Researches on flaxseed composition suggest that lignans within flaxseed have a potential role of antimicrobial and antioxidants agent [6]. Recent studies suggest that Lignan extracts was most efficient antibacterial against the Gram positive bacteria [7].

The overall goal of this work was to investigate new natural compounds with promising antibacterial activities.

MATERIALS AND METHODS

Extraction procedure

Linum usitatissimum seeds were purchased from local market , the seeds were ground into fine powder, after that aqueous and alcoholic extracts were gained by soaking 100 g of *Linum usitatissimum L.* in 500 ml distilled water and ethanol 96 % respectively at room temperature, then blending it by incubator shaker for 48 hours. The solvents were discarded using a rotary vacuum evaporator at 40 ° C to yield concentrated extracts and refrigeration until used [8].

Chemical detection of active compounds

Detection of Tannins : Used the method in [9].
Detection of Phenols : Used the method in[10] .
Detection of Alkaloides: Used the methods in [10].
Detection of Saponines : Used the method in[11].
Detection of Flavonoides : Used the method in[9].
Detection of Glycosides: By used Fehling reagent.

Microorganism strains

The microorganisms that used in this study were to type Grame-negative bacteria (*Shigella flexneri, Salmonella typhimurium and Escherichia coli*) all microorganisms were obtained from stock cultures of the Laboratory of Microbiology in central child hospital in Baghdad city.

Antibacterial activity

Antibacterial activity was estimated by using agar –well diffusion method according to [12]. Petri plates containing 20 ml of Nutrient agar medium were seeded with a 24 h culture of bacterial strains. Well (6 mm) diameter were cut into the ager and 50 µl of the plant extracts were tested in a concentration of (50, 75,100) mg/ml. The inoculum size was adjusted so as to deliver a final inoculum of approximately 10^8 colony-forming units CFU/ml .Incubation was performed at 37 ^{0}C for 24 h. The determined of antibacterial activity was based on measurement of diameter of the inhibition zone formed around the well. Minimum inhibitory concentration (MIC) was estimated by the micro-dilution method using serially diluted (2-fold) plant extracts according to [12].

A final concentration from 10 to 30 mg/ml was utilized for each plant sample. The following ethanol extracts were tested Flaxseed. Bacteria inocula were adjusted to contain approximately 105 CFU/ml. The test plates were incubated at 37^{0}C for 18h [12].

RESULTS AND DISCUSSION

The present study confirmed the finding about active compounds in *Linum usitatissimum L.* and the results summarized in Table (1).

Table (1): Chemical detection of active compounds in *Linum usitatissimum L.*

Test	Result
Tannins	+ ve
Phenols	+ ve
Alkaloids	+ ve
Saponins	+ve
Flavanoids	+ ve
Glycosides	

The results from Table (1) showed the existence of phytochemicals such as Tannins , Phenols , Alkaloids , Saponins and Flavanoids in alcoholic and aqueous extracts , On the other hand Glycosides was lack in both extracts. This results tie well with previous study [13], notified that alcoholic extract include Tannins, phenols and Flavonoids, While Saponins and Glycosides were absent.

Table (2) Inhibitory properties (inhibition zone diameter in mm) of plant aqueous extract on different type of bacteria.

Inhibitory effects of aqueous extract of *Linum usitatissimum L* against bacteria			**Concentration of aqueous extract of *Linum usitatissimum L* (mg/ml)**
Shigella flexneri	***Salmonella typhimurium***	***E. coli***	
Inhibition zone diameter in mm			
18	17	16	50
21	20	19	75
25	24	23	100

From the table (2) results demonstrated that the aqueous extract of *Linum usitatissimum L* screened showed various inhibitory effects against all bacterial species. The largest zone of inhibition was observed against *Shigella flexneri* with the concentration 100 mg / ml, while the smallest zone of inhibition was 16 mm with the concentration 50 mg/l agains *E-coli*. This analysis found evidence for that alcoholic extract of *Linum usitatissimum L* showed inhibitory effects with all bacterial species as assumed in table(3).

Table (3) Inhibitory properties (inhibition zone diameter in mm) of plant alcoholic extract on different type of bacteria.

Inhibitory effects of alcoholic extract of *Linum usitatissimum L* against bacteria			**Concentration of alcoholic extract of *Linum usitatissimum L* (mg/ml)**
Shigella flexneri	***Salmonella typhimurium***	***E. coli***	
Inhibition zone diameter in mm			
20	19	17.5	50
23	21	20	75
27	26	25	100

The largest zone of inhibition was showed against *Shigella fexneri*, while the smallest zone of inhibition was obtained against *E-coli*. The finding are directly in line with previous findings suggested that both aqueous and alcoholic extracts of *Linum usitatissimum L* were effective source of antibacterial compounds against *Salomonella typhimurium* and *E-coli* [14]. The results now provides evidence to that the inhibition effect of both aqueous and alcoholic extract against all bacterial species increased with increasing the concentration of the extract.

It is important to highlight the fact that the presences of natural phenolic compound, as well as lignans and fatty acids have an essential role in antibacterial activity of *Linum usitatissimum L* [6, 15].

The roles of phenolic compound found in *Linum usitatissimum L* is stimulate degradation of bacterial DNA as well as deny the glyraseativity [16].The second reason for antibacterial activity of *Linum usitatissimum L* is the lignans with bacterial cell wall thus, fight bacterial growth [6].

Previous studies point that linoleic acid selectively inhibits as essential component of bacterial fatty acid synthesis recognized as enoyl- acyl carrier protein reeducates (FabI) , an important component of bacterial fatty acid synthesis .Another unsaturated fatty acids such as linolenic acid and oleic acid also exhibited the inhibition of (FabI) [17].

The main conclusion can be drawn is that *Linum usitatissimum L*. extracts have antibacterial activity against three types of Gram negative bacteria *(Shigella flexneri , Salmonella typhimurium and E. coli*) and these extracts exhibit maximum zone of inhibition against *Shigella flexneri*. This may be considered a promising aspect of propagating the use of natural based product as antibiotics.

Future researches should consider the potential effects of natural herbal products to have equal effects as antibiotics with chemical synthetic products, while negating the undesirable side effects.

REFERENCES

1. Al-Bishri, W.M.(2013).Favorable effects of Flaxseed supplemented diet on liver and kidney in Hypertensive Wister rats. Journal of Oleo Science, 62(9) : 709-715.
2. Liggins , J. , Grimwood , R. and Bingham , S.A. (2000). Extraction and quantification of lignan phytoestrogens in food and human samples. Analytical Biochemistry , 287:102-109.
3. Kajla , P. , Sharma , A. and Sood , D.R. (2015).Flaxseed a potential functional food source. Journal of Food Science and Technology,52 :1857-1871.
4. Hanaa , M.H. , Ismail , H.A. , Mahmoud , M.E., et.al. (2017). Antioxidant activity and phytochemical analysis of Flaxseed (*Linum usitatissimum L.)*Minia Journal of Agricultural Research and Development, 37(1) : 129- 140.
5. Gaafar , A.A. , Salama , Z.A. , Askar , M.S. ,et.al. (2013).In vitro antioxidant and antimicrobial activities of lignan Flaxseed extract (*Linum usitatissimum L.)*.International Journal of Pharmaceutical Sciences Review and Research, 23(2): 291- 297.

6. Barbary, O.M., EL- Sohaimy , S. , EL-Saadni , M. , et.al.(2010). Antioxidant, Antimicrobial and Anti – HCV activities of lignan extracted from Flaxseed. Research Journal of Agriculture and Biological Sciences, 6(3): 247 – 256.
7. Al- Mathkhury , H.J. , Al-Dahamin , A.S. and Al-Taie , K.L.(2016). Antibacterial and Antibiofilm activity of Flaxseed oil. Iraqi Journal of
8. Science, 57(2B): 1086 – 1095.
9. Hussien , Z.G.(2018). The effect of alcoholic extract of Borage officinalis on Monoamine oxidase (MAO) and Acetylcholinesterase (AChE) in human serum in vitro. Iraqi Journal of Market Research and Consumer Protection , 10(2) : 147 – 153.
10. Hossain , M.A. , Al-Raqmi,K.A. , Al-Mijizy , Z.H. , et.al.(2013). Study of total phenol , flavonoids contents and phytochemical screening of various leaves crude extracts of locally grown Thymus Vulgaris . Asian Pacific Journal of Tropic Biomedicine ,3(9) : 705 – 710.
11. Pandey,A. & Tripathi , S. (2014). Concept of standardization screening strategies for herbal drug. Journal of Pharmacognosy and phytochemistry , 2(5) : 115 – 119.
12. Saleh , G.S. (2015). Compounds in eggplant (Solamum Melongena) callus as compared with fruit and root contents. International Journal of Current Microbiology Applied Sciences, 4(5) : 160 – 165.
13. Aziz , R.A. , Hasan , E.J. and Hussein , Z.G. (2012).Chemical composition and antimicrobial activity of *Artemisia monosperma* and *Salvia officinalis L.* plants. Journal of The College of Basic Education, 18(73): 97 – 104.
14. Amin, T. & Thakur , M. (2014). A comparative study on proximate composition , phytochemical screening , antioxidant and antimicrobial activities of *Linum Usitatisimum L.* (flaxseed). International Journal of Current Microbiology and Applied, 3(4): 465 – 481.
15. 14-Narender, B.R. ,Tejaswini , S. ,Sarika , M. , et.al. (2016). Antibacterial and antifungal activities of *Linum usitatissimum* (Flax seeds). International Journal of Pharmacy Education and Research, 3(2): 4-8.
16. Zhang , W.B. ,Xu , S.Y.(2007). Microwave assisted extraction of secoisolariciresinoldiglucoside from Flax seed hull. Journal of the Science of Food and Agriculture, 87:1455 – 1462.
17. Zuk , M. , Dorotkiewicz-Jach , A. , Drulis – Kawa , Z., et.al.(2014). Bactericidal activities of GM flax seed cake extract on pathogenic bacteria clinical strain.BMC Biotechnology, 14 :70.
18. Fadzir, U.A. , Darnis , D.S. , Mustafa, B.E. ,et.al.(2018).*Li*num *usitatissimum* as an antimicrobial agent and a potential natural healer: A review. Archives of Orofacial Sciences, 13(2):55-62.