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Original Research Article

Gold nanoparticles that are protective for complexes of fenugreek and clove extract and assess their impact on isolated bacteria from diabetic foot

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Abstract

Diabetes is a very common disease that led researchers to pay attention to diabetes as it accompanies the events of many secondary diseases associated with diabetes such as cardiovascular diseases, visual diseases, general weakness, and health problems. The current study was completed in Samarra, Salah al-Din province, from 15 October 2020 to 2021/7/15. The incidence of diabetes in males was 62.5%, 37.5%, respectively, while for the age groups where the highest incidence was in the 51-60 age group. It gave 28 bacterial growth samples and 70% while 12 samples did not give bacterial growth and by 30%. The inhibition effect of two types of hot and cold aquatic plant extracts for cloves and the fenugreek was studied on isolated bacteria at 200, 100, 50, 25, 12.5, 6.25 mg/ml Inhibition rates for extracts with inhibition diameters of gold nanoparticles were based on the same bacterial species at 200, 100, 50, 25, 12.5, 6.25 mg/ml, It is also compared with a combination of gold nanoparticles and extracted at 6.25mg/ml clove with + 1mm nanoparticles and mg/ml 0 20 circuit With +1 mM nanoparticles). The results of the current study also showed that hot and cold clove water extracts outperformed hot and cold-water ring extracts in inhibiting the growth of bacterial insulation causing diabetic foot injury ulcers, and clove extracts outperformed gold nanoparticles, which did not give any inhibition effectiveness. in inhibiting bacterial growth compared to ring plant and gold nanoparticles.

Keywords plant extract, clove, fenugreek, diabetic foot

Introduction

It is still common to use medicinal plants and herbs in the process of medicine as a source of treatment and the healing of many diseases suffered by man or as a medical source. The use of medicinal plants is due to the beginning of human knowledge of food plants that he mistakenly and rightly knew without knowing the right of these plants and their components, this discovery urged scientists to take care of plants and study their components and look for rare ones, where these plants can be an important source as a treatment or enter into the training of components. Plants are known to have little side effects, so they have taken a big lead in the process of using them as a beneficial therapeutic source unlike chemical compounds (Kaushik et al., 2010). The importance of medicinal herbs lies in the fact that they can reduce exposure to the side effects that usually accompany

chemical drugs, and an important feature of medicinal plants that have encouraged their cheap use, availability, and security use and can be cultivated at low costs, making them high-end therapeutically important (Morsy et al., 1998). According to reports, many of the world's population still depends directly or secondarily on the use of plants as a reliable therapeutic, medical and nutritional source in many countries, with 25% of modern medical medicines originally from medicinal plants (Ikpefan and Ayinde, 2013) wounds are easy places for infection and provide a suitable place for the spread and reproduction of germs, and their transmission to the rest of the body, negative and positive bacteria when present cause rot of wounds (Bowler et al., 2001). The wound is a crack or rupture of the skin or mucous membranes, the wound sites provide an environment suitable for the growth

of germs and the reduction of the vital flow of food suitable for resistance (Bowler et al., 1999). Therapeutic ointments are important for the temporary preservation of wounds, the purpose is to control the non-spread of bacterial, some plants are used directly on wounds, and others are used in solutions to be treated, diabetes has the bulk to use as a treatment because of its therapeutic importance and the absence of effects Sideways, where the use of medicinal plants showed an effective effect in treatment (Benny and Adithan, 2000; Chakrabarti et al., 2003).

Diabetes is a very common disease that led researchers to pay attention to diabetes as it accompanies the events of many secondary diseases associated with diabetes such as cardiovascular diseases, visual diseases, general weakness, and health problems (Hermansen et al., 2003).

The recent development of science and research has necessitated the creation of useful and important means of producing guaranteed therapeutic drugs and have a positive impact on health and reduce the chances of using antibiotics as they cause resistance to bacteria in addition to their use a lot of causes side effects unlike medical plants with light effect and appropriate therapeutic strength. The study aimed at isolating and diagnosing bacterial types of patients with diabetic foot injuries from Samarra General Hospital and auditors to some private clinics and detecting the inhibition efficacy of plant extracts under study (cloves and fenugreek) on some bacterial species that have been isolated and finding out how gold nanoparticles of plant extract affect the growth of isolated microbiology.

Materials and Methods

Specimens collection

Collecting 40 samples using sterile cotton swabs container on the middle of gel swab conveyor from patients with diabetic foot injuries coming to the surgical lobby lounge of Samarra General Hospital and auditors of private clinics for the period of 1/1 8 2019/1 until 2 2020/6/2 after the condition was clinically diagnosed by the competent doctor and the samples were transferred directly to the laboratory using a sterile and cool box to keep the sample from pollution for the necessary tests and tests.

Samples Culture

The samples collected were cultured on the special culture media for the initial isolation, which are blood agar, nutrient broth, and MacConkey agar. Then incubated the dishes at a temperature of 37 m for 24-48 hours.

Identification of bacterial isolates

Developing colonies were initially diagnosed on the surface of the culture media of the first culture based on the growth

qualities in terms of form, size, color, texture, smell, and blood lysis and fermenting by lactose sugar on macconky agar, and the phenomenon of Swarming as well as the characteristics of bacterial cells through microscopic examination and then after dyeing with Gram Stain. (Forbes et al., 2007).

Collecting and preparing plants

The fenugreek and clove plant were purchased from the local markets of Samarra, the items were confirmed by Dr. Omar Khalil Jassim /Plant Classification/Research and Development Authority General Company for the Pharmaceutical Industry, and the Grass of the Faculty of Science at Tikrit University. Then it was transferred to the laboratory, then well-milled using the electric mill, and kept in sterile and sealed containers in moisture-free conditions until plant extracts began to be prepared.

Preparation of plant extracts

The hot water extract for the plants under study was prepared according to the method (Al-Fartusie et al., 2019; Goyal et al., 2008), or 10g dry powder per plant and added 100 ml of hot distilled water) to the hot extract (and from cold distilled water) to the cold extract and left the water models for 24 hours in the refrigerator, then on the shaking device for 24 hours as well, filter the extract by several layers of gauze to get rid of the large parts of the plant and then using whatman No.1 filter paper afterward Concentrate the extract by steaming the water using a rotary evaporator at a temperature of not more than 40 m until a concentrated extract is obtained. The extract then was stored in a sterile and dark bottle in the refrigerator until use.

Preparing secondary gold concentrations

The gold nanomaterial was purchased from one of the offices equipped with nanomaterials, laboratory, and 1 mm concentration, which was considered Stock and with a concentration of 10% and attended the rest of the 1 ml stacks The concentration of 75% by taking 750 microliters from the original focus and adding 250 microliters of distilled water. 50% concentration by taking 0 50 microliters from the original focus and adding 0 50 microliters of distilled water. The concentration of 25% by taking 250 microliters from the original focus and adding 750 microliters of water. The concentration of 12.5% by taking 125 microliters from the original focus and adding 875 microliters of distilled water

Statistical Analysis

The data were analyzed statistically using the SPSS statistical analysis program to show the difference between the study totals, which include the effect of fenugreek and clove plant extract and nanoparticles. Significance was at the probability level of 0.05 $p \geq$.

Results

40 Samples of diabetics with foot ulcers were collected in the surgical lobby room of Samarra General Hospital and the auditors of some private clinics, within a period of time from 1/08 2020/1 to 2020/20 6/22. Samples were taken from diabetic foot ulcers and wounds, with the results showing that 28 (70%) samples gave a positive result of bacterial growth in culture media, while 12 (30%) samples of the total number gave a negative result.

Table (1) shows the numbers and percentages of samples of diabetics and people with foot ulcers by age group, with the highest incidence of the age group (51-60) years and 13 samples 32.5% of males compared to 9 samples 2.5 2 % of females, in the case of the age group (61-70) years and 8 samples 20% of males, while the number of samples in the same age group ranged from 5% samples to 12.5% of females, and in the case of the age group (41-50) years, the number of the samples were 1 sample of 2.5% of males, with the lowest incidence of the total number of samples of patients under study.

Table 1. Distribution of the number of d of yeast infections and their percentage by sex and age groups

Source of infection Age groups	Dietetic foot	
	Male	Female
	No. (%)	No. (%)
41-50	0 (0)	1 (2.5)
51-60	9 (22.5)	13 (32.5)
61-70	5 (12.5)	8 (20)
> 70	1 (2.5)	3 (7.5)
Total	15 (37.5)	25 (62.5)

Table (2) shows that there were no significant differences in the effect of nanoparticle concentrations on all bacteria insulation under study and found that all concentrations gave little effectiveness to all insulation under study.

Table 2: The effect of gold nanoparticles on some types of the isolated bacteria

Concentration Bacteria	6.25 %	12.5 %	25 %	50 %	75 %	100 %	Average bacteria
<i>S.aureus</i>	0	0	0	0	0	0	0.0 a
<i>E.coli</i>	0	0	0	0	0	0	0.0 a
<i>K.pneumonia</i>	0	0	0	0	0	0	0.0 a
<i>P.mirabilis</i>	0	0	0	0	0	0	0.0 a
<i>P.aeruginosa</i>	0	0	0	0	0	0	0.0 a
Average focus	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	0.0 A	

Table (3) also showed the ineffectiveness of gold nanoparticles when mixed with the fenugreek and cloves, where the lowest inhibitory concentration of the extract when combined with gold nanoparticles gave the effectiveness of inhibition equivalent to the inhibition effect of the extract alone at the same concentration, demonstrating the ineffectiveness of gold nanoparticles against bacteria.

Table 3: the effect of gold nanoparticle+ extracts on some types of isolated bacteria.

Concentration Bacteria	6.25 mg/ml clove + nanoparticles 1 mM	200 mg/ml fenugreek + nanoparticles 1mM	Average bacteria
<i>S.aureus</i>	10	0	0.0 A
<i>E.coli</i>	0	0	0.0 A
<i>K.pneumonia</i>	0	0	0.0 A
<i>P.mirabilis</i>	0	0	0.0 A
<i>P.aeruginosa</i>	10	0	0.0 A
Extract avarege	0.0 A	0.00 A	

Discussion

Samples were taken from diabetic foot ulcers and wounds, with the results showing that 28 (70%) samples gave a positive result of bacterial growth in culture media, while 12 (30%) samples of the total number gave a negative result. The lack of growth in these samples may be due to excessive use of antibiotics or the use of sterile types to clean the wound, which reduces bacterial growth or maybe the cause of innate or viral diseases (Morse et al., 1998). many studies indicate that males are more likely to develop diabetic foot ulcers than females (Boulton and Connor, 1998), most of this may be due to the fact that men often leave the house by the nature of their work more than women who spend at home. The foot gets traumatized, such as bruises and wounds, as well as being less committed to taking treatment and lack of care for the cleanliness of the foot, which is consistent with our findings in our study. Our results are also consistent with those obtained by Almobarak et al., (2017) and Jupiter et al., (2016), which show more males at risk of diabetic foot ulcers than females. As for age groups, Our results are consistent with those obtained by Elane al et., (2019), as research results showed that 60-year-olds with diabetes had an amputation of the lower limbs, resulting in a large number of bruises and external trauma, difficulty healing, and infection, most of whom were male. The patient suffered from damage to the nerves of the limbs due to the lack of access to blood through the arteries that feed them.

Table (2) shows that there were no significant differences in the effect of nanoparticle concentrations on all bacteria insulation understudy and found that all concentrations gave little effectiveness to all insulation under study. This finding is consistent with the results (Morales-Avila et al., 2017),

which showed that gold nanoparticles are ineffective towards *E. coli* and *S. aureus* as well as their findings (Mohamed et al., 2017). The results of their study showed that there was no inhibition effectiveness of gold nanoparticles at a concentration of 50 mg/ml against *K. pneumoniae*, *E. coli*, *P. aeruginosa* and *S. aureus* due to the lack of effect due to the thickness of the bacterial wall which reduces the penetration rate of these particles into the bacterial cell although the most research has shown the inhibition effectiveness of gold nanoparticles against much bacterial strain the findings of this study were on the contrary and may be due to the difference in its effect from bacterial strain to another or as a result of a change in the characteristics of bacteria that earns them resistance either as a result of a genetic mutation or due to external environmental factors, making them more resistant (Mohamed et al., 2017).

Conclusions

Males are more likely to develop diabetic foot ulcers than females. The most common bacterial species found in the most common bacterial species in the most severe wounds that isolated 35.7% of all isolations causing diabetic foot injury. The results of the current study also showed that hot and cold clove water extracts outperformed hot and cold water ring extracts in inhibiting the growth of bacterial insulation causing diabetic foot injury ulcers, and clove extracts outperformed gold nanoparticles, which did not give any inhibition effectiveness. in inhibiting bacterial growth compared to ring plant and gold nanoparticles.

Consent for publication

The author declares that the work has consent for publication.

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References

Al-Fartusie F.S. (2019). Characterizations of Lavender Flowers Extracts and Study of their effects on peroxidase activity and some microorganisms. *Journal of Global pharma technology*, (11), 181-191.

Almobarak, A. O., Awadalla, H., Osman, M., & Ahmed, M. H. (2017). Prevalence of diabetic foot ulceration and associated risk factors: an old and still major public health problem in Khartoum, Sudan?. *Annals of translational medicine*, 5(17).

Benny, A. K., & Adithan, C. (2000). Review of endocrine pharmacology. *Indian Journal of Pharmacology*, 32(4), 67.

Boulton, A. J. M. and Connor, H. (1998). The diabetic foot *Diabetic Med.* 5, 796-798.

Bowler, P. G., Duerden, B. I., & Armstrong, D. G. (2001). Wound microbiology and associated approaches to wound management. *Clinical microbiology reviews*, 14(2), 244-269.

Bowler, P.G., Davies, B.J. & Flintshire, C.W. (1999) A microbiology of acute and chronic wounds. *Wounds*. Vol 11:72-78. *Indian J. pharmacology* (32), 67-80.

Chakrabarti, S., Biswas, T. K., Rokeya, B., Ali, L., Mosihuzzaman, M., Nahar, N., ... & Mukherjee, B. (2003). Advanced studies on the hypoglycemic effect of *Caesalpinia bonducella* F. in type 1 and 2 diabetes in Long Evans rats. *Journal of Ethnopharmacology*, 84(1), 41-46.

da Silva, E. D. S. J., Salgueiro, A. C. F., Brito, V. B., Júnior, J. G. P., de Castro, A. A. M., & Folmer, V. (2020). Predictive factors for amputations: knowing the problem to seek prevention strategies. *Research, Society and Development*, 9(2), e66922017-e66922017.

Forbes, B. A., Sahm, D. F., & Weissfeld, A. S. (2007). *Diagnostic microbiology*. St Louis: Mosby.

Goyal, P., Chauhan, A., & Kaushik, P. (2009). Laboratory evaluation of crude extracts of *Cinnamomum tamala* for potential antibacterial activity. *Electronic journal of Biology*, 5(4), 75-79.

Goyal, P., Khanna, A., Chauhan, A., Chauhan, G., & Kaushik, P. (2008). In vitro evaluation of crude extracts of *Catharanthus roseus* for potential antibacterial activity. *International Journal of Green Pharmacy*, 2(3), 176.

Gupta, P. C., Batra, R., Chauhan, A., Goyal, P., & Kaushik, P. (2009). Antibacterial activity and TLC bioautography of *Ocimum basilicum* L. against pathogenic bacteria. *Journal of Pharmacy Research*, 2(3), 407-9.

Hermansen, K., Dinesen, B., Hoie, L. H., Morgenstern, E., & Gruenwald, J. (2003). Effects of soy and other natural products on LDL: HDL ratio and other lipid parameters: a literature review. *Advances in therapy*, 20(1), 50-78.

Ikpefan, E. O., & Ayinde, B. A. (2013). Comparative growth inhibitory assay of the methanol extract of the leaf and seed of *Persea americana* mill (Lauraceae). *Journal of Pharmacognosy and Phytochemistry*, 1(6).

Jupiter, D. C., Thorud, J. C., Buckley, C. J., & Shibuya, N. (2016). The impact of foot ulceration and amputation on mortality in diabetic patients. I: From ulceration to death, a systematic review. *International wound journal*, 13(5), 892-903.

Kaushik, P., & Chauhan, A. (2008). In vitro antibacterial activity of laboratory grown culture of *Spirulina platensis*. *Indian Journal of Microbiology*, 48(3), 348-352.

Kaushik, P., Goyal, P., Chauhan, A., & Chauhan, G. (2010). In vitro evaluation of antibacterial potential of dry fruit extracts of *Elettaria cardamomum* Maton (Chhoti Elaichi). *Iranian journal of pharmaceutical research: IJPR*, 9(3), 287.

Mohamed, M. M., Fouad, S. A., Elshoky, H. A., Mohammed, G. M., & Salaheldin, T. A. (2017). Antibacterial effect of gold nanoparticles against *Corynebacterium pseudotuberculosis*. *International Journal of veterinary science and medicine*, 5(1), 23-29.

Morales-Avila Enrique Guillermina . Antibacterial Efficacy of Gold and Silver Nanoparticles Functionalized with the Ubiquicidin Antimicrobial Peptide Received 21 December 2016; Accepted 6 March 2017; Published 26 March 2017.

Morsy, T. A., Shoukry, A., Mazyad, S. A., & Makled, K. M. (1998). The effect of the volatile oils of *Chenopodium ambrosioides* and *Thymus vulgaris* against the larvae of *Lucilia sericata* (Meigen). *Journal of the Egyptian Society of Parasitology*, 28(2), 503-510

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