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Study of the effect of aqueous extract of black tea (*Camellia sinensis*) on some bacterial isolates contaminated by wounds

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Abstract

The study dealt with the use of the aqueous extract of black tea (*Camellia sinensis*) inhibiting the growth of some contaminated bacterial isolates. We prepared five different concentrations for this extract (10%, 20% , 30%, 40% & 50%) The study detected antimicrobial activity by using well diffusion in agar technique against all the bacteria: *Staphylococcus aureus , Pseudomonas aeruginosa and Streptococcus pyogenes*. The study showed highest antibacterial activity of aqueous extract of black tea which attained the highest present of inhibition (27 mm) against Staphylococcus aureus when using (50%) concentration. While attained lowest percent of inhibition (8mm) against *P. aeruginosa* when using (10%).

Keywords: black tea, extract, contaminated bacterial, agneous, concentration.

Introduction

Tea is one of the drinks widely used around the world. It is made from the leaves of the Chinese camellia plant in English (*Camellia sinensis*). Black tea is also popular in Europe and North America regions. Black tea is made of using oxidized tea leaves after fermentation and turns its color to brown, where the oxidation process leads to the composition of tavlans (Theaflavins) and thearubigins, which are responsible for their distinctive taste, color, and the many health benefits.

In fact, one study examined the role of thiflavin in tea and the risk of diabetes, obesity and high cholesterol. The results showed that thiflavin lowered cholesterol in blood sugar levels. Another study found that those who drank three cups of black tea per day had an 11% lower risk of heart disease. Many people are susceptible to scratches and cuts due to the use of sharp instruments such as knives, or when using razors when removing hair, when exposed to broken glass pieces, or due to accidents, God forbid, So find out the causes and types of wounds, treat wounds and scratches naturally at home and treat deep wounds, and the risks of leaving them untreated.

A type of bacteria called pseudomonas, including *Pseudomonas aeruginosa*, is found in soil, water and around the world. Especially humid areas, these bacteria can cause infection in several areas of the body in addition to wounds (such as burns, injuries, or surgical incisions). *Pseudomonas aeruginosa* infection ranges from being a simple external infection to being

a serious life-threatening disorder. We promise that a person will be infected by the bacteria, which can be contaminated by the bacteria, causing sores or burns and requiring urgent treatment with antibiotics .

Staphylococcus aureus is a Gram-positive coccid in the form of non-moving clusters that spores, live in symbiotic equilibrium with the body, and are present on the skin and mucous membranes in large proportions and act as opportunistic bacteria that cause infection in damaged tissues. Some strains of *S. aureus* have a portfolio that is also found abundantly on the skin of healthy people and has the ability to cause infection when it succeeds in penetrating into damaged skin or deep tissue in the body and is characterized by its ability to coagulate blood plasma by the action of an enzyme (Coagulase) where it turns (fibrinogen) to (Fibrin) and produces an enzyme Catalase and infection with these bacteria causes what is known as the accumulation of white blood cells, which results in the formation of pus, as well as the occurrence of local inflammation.

It was found that some of plant extracts can be used to kill these bacteria or completely inhibit their growth in easy and inexpensive ways if they are contaminated by pests. We find that black tea leaves contain active ingredients that help get rid of those bacteria, as studies have proven that black tea contains polyphenols groups, including catechins, flavin and thiropigens, are the main sources of antioxidants in black tea leaves and may enhance overall health.

The benefits of black tea

Black tea is one of the most consumed drinks in the world., It has a strong flavor and contains more caffeine than other teas, but it contains less caffeine in coffee. Black tea also offers a variety of health benefits because it contains antioxidants and compounds that. It can help reduce inflammation in the body, including (Jerzy, 2011):

- Has antioxidant properties - Antioxidants are known to provide a range of health benefits. It helps the body remove free radicals and reduce cell damage in the body.

Ultimately, this helps reduce the risk of chronic disease. Polyphenols are a type of antioxidant found in some foods and drinks, including black tea.

Polyphenols groups, including catechins, flavin and thiropigen, are the main sources of antioxidants in black tea and may enhance overall health. In fact, one study examined the role of thiflavin in tea and the risk of diabetes, obesity and high cholesterol. The results showed that thiflavin lowered cholesterol and blood sugar levels. While many supplements contain antioxidants, the best way to consume them is through food and drinks. In fact, some research has found that taking antioxidants as a dietary supplement may harm your health.

Black tea contains another group of antioxidants called flavonoids, which benefit heart health. Regular consumption of it may help reduce many heart disease risk factors, including high blood pressure, high cholesterol, high levels of fat and obesity.

A study found that drinking black tea for 12 weeks significantly reduced the fat level by 36%, and lowered blood sugar levels by 18%.

Another study found that those who drank three cups of black tea per day had a lower risk the incidence of heart disease increased by 11%.

- Reduces harmful cholesterol, harmful cholesterol builds up in the arteries and causes waxy deposits called plaques. This can lead to problems such as heart failure or stroke.

Some studies have found that drinking tea may help reduce harmful cholesterol.

One randomized study found that drinking five servings of black tea per day reduces harmful cholesterol by 11% in individuals with slightly or moderate high cholesterol levels.

- Improves the health of the digestive system Studies have found that the type of bacteria in your gut plays an important role in your health. Because the intestine contains large numbers of bacteria, it accounts for 70-80% of the immune system. In fact, some studies have indicated that the type of bacteria present in your gut plays an important role as it reduces the risk of some health conditions, such as inflammatory bowel disease, diabetes, heart disease, blood vessels, obesity and even cancer.

The polyphenols found in black tea help maintain your bowel health by promoting the growth of good bacteria and inhibiting the growth of bad bacteria, such as salmonella Helps lower blood pressure. High blood pressure affects nearly a billion people worldwide. It can increase your risk of heart and kidney failure, stroke, blindness and heart attack. Changes in your diet and lifestyle can lower your blood pressure.

A randomized controlled study looked at the role of black tea in lowering blood pressure. Participants drank three cups of black tea a day for six months. The results showed that those who drank black tea had a significant decrease in blood pressure, compared to the placebo group.

- Among the benefits of black tea helps reduce the risk of heart attack. A stroke can occur when the blood vessels in the brain are either blocked or torn. It is the second leading cause of death worldwide. Fortunately, 80% of strokes are preventable. For example, managing your diet, being physically active, blood pressure and not smoking can help reduce the risk of stroke. Studies have found that drinking tea may also help reduce the risk of stroke.

One study followed 74,961 people for more than 10 years. It was found that those who drank four cups or more black tea a day were 32% less likely to have a stroke than those who did not drink tea.

- Reducing blood sugar levels

High blood sugar levels may increase the risk of health complications, such as diabetes, obesity, cardiovascular disease, kidney failure and depression. Consuming large amounts of sugar, especially sweetened drinks, has been shown to increase blood glucose levels and risk of diabetes. When you consume sugar, the pancreas secretes a hormone called insulin to transport sugar into the muscles for energy. If you consume more sugar than your body needs, excess sugar will be stored as fat.

Black tea helps promote insulin use in the body. One study conducted on a test tube looked at the properties of insulin enhancement in tea and its ingredients. The results showed that black tea increased insulin activity more than 15 times.

- Reducing the risk of cancer

There are more than 100 different types of cancer, some of which are not preventable.

However, the polyphenols present in tea may help prevent the survival of cancer cells.

A study found the effects of polyphenols in black tea on breast cancer. It has been shown that black tea can help overcome the spread of hormone dependent breast tumors. Although tea should not be considered an alternative treatment for cancer, some research has shown that black tea may help reduce cancer cell surviva.

- It helps to focus

Black tea contains caffeine and an amino acid called L - theanine, which can improve Mindfulness and focus. L - theanine increases brain activity, which leads to relaxation and better focus. Studies have found that drinks containing L-theanine and caffeine have a significant effect on concentration due to the effects of L - theanine on the brain. This may be the reason why many individuals report more stable energy after drinking tea, compared to other caffeinated drinks such as coffee. This makes tea a great drink if you are looking to improve energy and focus without consuming too much caffeine.

Research problem:

The research problem is concentrated in the following questions:
1- Does the aqueous extract of black or red tea leaves inhibit the growth of false bacteria1.
2- What are the active substances in the leaves of the black tea plant?
3- What are the ways in which these extracts are prepared?

Objectives of the study:

1 - Study the effect of the aqueous extract of black tea leaves on inhibiting the growth *of Pseudomonas aeruginosa, Staphylococcus aureus* and *Streptococcus pyogens.*
2 - Knowing the active substances in black tea leaves and how sensitive to bacteria.
3 - Reaching results and making recommendations to help researchers in the future to further research on the subject of the research.

Research Methodology:

The researcher used the experimental method, where laboratory experiments were prepared that produced results which helped in achieving the goals of the research and answered the research questions. This study included methods for collecting materials and working methods.

Materials and Methods

1 - Collection of plant samples

Black tea leaves were collected from the market, and then crushed to get the powdered leaves and put in a clean dry glass flasks in the refrigerator for preservation.

2 – Bacterial isolates

Bacterial isolates from *Pseudomonas aeruginosa* and *Staphylococcus aureus* and Strep bacteria were isolated; Pyogens from the General Hospital in Bisha were transferred to the Microbiology Laboratory, College of Science, and were placed on a nutritional medium containing significant agar for the purpose of studying the effect of the extract on them.

3- Prepare the aqueous extract of black tea leaves

Take (100) g of dry powder and mix (1000) ml of distilled water in a 500-ml glass beaker, then shake the mixture using the electric mixer and leave for 24 hours to soak at room temperature, then centrifuge quickly (3000) cycles / 1 minute for (15) minutes, then filter the extract using filter paper No. (1) to obtain a clear solution that was kept in the refrigerator until it was used. (Sabah, 2010).

4- Preparing the aqueous extract concentration:

For the purpose of preparing the stock solution for the aqueous extract, store (1) gm of plant powder and dissolve in (10) ml distilled water, so we have storage solutions with a concentration of (200) ml / g. Sterilize the solution by filtration using a membrane filter and filter papers (what man No. 10) to get rid of the bacterial pollutants in it and get a sterile storage solution, use this solution as a source to make the concentrations (10, 20, 30, 40 and 50).

5- Effect of aqueous vegetable extract on inhibiting the growth of bacterial species

The Agar well diffusion method. The study of the effect of the plant extract on bacterial growth was carried out using the method of spread in pits, and the reading period for the results was determined after (24) hours by measuring the diameters of the inhibition zone As follows:-

1 - made a number (5) holes in the cultivated media using a sterile cork bovver.

2 - Add (1) ml of each of the above concentrations to tubes each containing 100 tablets of filter paper (Watman No.1) and a diameter of (5) mm sterilized by the sterilizer), and made control pits by adding distilled water.

3- Inoculate a number of dishes containing the medium of Nitrite Agar with 0,1 ml of bacterial suspension and spread it on the surface of the food suspension.

4- Then, in each dish, a disk was placed for each concentration of the plant extract and the dishes were placed in an incubator at a temperature of (37 ° C) for a period of (24) hours. The result is read by measuring the diameters of the inhibition zone.

Results and Discussion

The results of the current study indicate that the aqueous extract of black tea leaves possesses high antibacterial activity under study. This killer effect is caused by the active substances present in the plant and spread in the medium, which helped kill bacteria and inhibit the growth of living cells.

The study demonstrated that the aqueous extract of tea leaves was given the largest inhibition regions if they reached (27 mm) at concentration (50%) towards *Staphylococcus aureus* and the lowest inhibition levels when *Pseudomonas aeruginosa* bacteria reached (8 mm) when using the concentration (10%). As shown in Table No. (1) and figure No. (1)

Table No. (1) Antimicrobial activity of black tea extracts (*Camellia sinensis*)

inhibition areas mm					Types of Bacteria
50%	40%	30%	20%	10%	
23	20	16	12	08	*Pseudomonas aeruginosa*
27	22	18	15	10	*Staphylococcus aureus*
21	16	20	17	12	*Streptococcus pyogens*

The results agreed with the (Nariman and Shana, 2015) study that green tea extract had a noticeable effect in preventing the development of chemical changes and the growth of microorganisms when added in high concentrations of 900 parts per million.

Also study of (Balasubramanian,2017) Green tea and black tea extracts are safe and can be a supplement for other systems of medicines for the treatment of intestinal diseases caused by bacteria. The results of the study also agreed with the (Al-Anzi study, 2008) that showed that black tea extract worked on *Staphylococcus aureus* is completely inhibited (100%) at concentration (100 mm) and (82%).On other hand study of (Nada, 2017) showed that The highest antimicrobial activity of black tea were against *Streptococcus* species; in *Streptococcus agalagtia* was with inhibition zone (33) mm then *Streptococcus pneumonia*, *Streptococcus mutans* with (30) mm inhibition zone and *Streptococcus faecalis* was (28) mm.

Christine and professor of perimetric tissue research at the University of Illinois and the researcher who led one part of the study, said that black tea can prevent or stop the growth of bacteria that lead to decay and affect their ability to adhere to the surface of the tooth, as agree with a study (T.S.Yam, 1997) Black and green tea extract reduces the activity of the aforementioned bacterial species because they contain thiflokines.

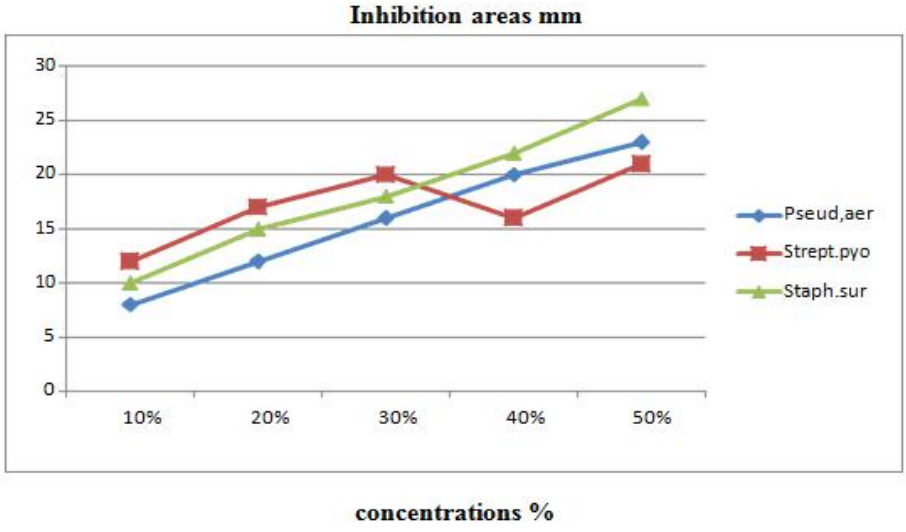

Figure No (1): Antimicrobial activity of black tea extract (*Camellia sinensis*)

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