

Evaluation of *Sesuvium Portulacastrum* Ethanolic Extract on Growth of *Salmonella Typhi* in Vitro

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Abstract: An alcohol extract of *Sesuvium portulacastrum* (Sea Purslane) was tested for antibacterial efficacy against the human pathogenic bacteria *Salmonella*; the plant was prepared, dried, and then extracted by Soxhlet system diffusion method was used in pits on culture medium. *Sesuvium portulacastrum* extract was introduced into the pit (10, 20, 30, 40 and 50%) and 5 inoculations were made with *Salmonella* 5 x 10 ml/CFU bacterial suspensions and incubated at 37°C for 2 days.

The results showed clear significant differences between the groups treated with the plant extract and the control group, where group No. 5 with the concentration 50% achieved 12.95 ± 0.66 the best results, while the group No. 4 with the concentration 40% 10.88 ± 0.55 b showed the least success, which is growth with Minimum inhibitory concentration (MIC)

Keywords: *Sesuvium*, *portulacastrum*, alcohol, extract, *Salmonella*, antibacterial

1. Introduction

There are approximately 200,000 natural products of plant origin known, with many more being discovered in higher plants and microorganisms. Plant-based medicines have been used form hundreds of years ago and are still considered important medicines today 1, 2. According to the WHO conventional medicine is utilized by more than 80% of the world's population due to the immense medicinal potential of these substances, which are more accessible and assured than chemicals produced by humans 3,4. New antibacterial and antifungal agent research is a real and timely challenge for this century, particularly given the contemporary contexts for pathogenic agent management in biomedicine, agriculture, and the feed sector[1], [5]. The spread of multidrug-resistant bacteria, for which common antibiotics have become ineffective, is posing a problem in the fight against human infections. The entry of this plant is not limited to the field of medicine, but goes beyond it to several fields. An example is the *Sesuvium Portulacastrum* plant, which is considered one of the most important plants because of its many and important benefits, which we will discuss later 7. *Sesuvium Portulacastrum* It is a plump creeping plant with a persistent herbaceous spread that infiltrates the ground through rooting joints and forms mats or ground cover. Humidity, sandy locations,

beaches, areas with high salt concentrations, and swamp edges are all good places for the plant to grow 8. *S. portulacastrum* is a member of the Aizoaceae family, and it is a halophyte that can withstand high salinity because the salt is concentrated in its cells and tissues. These plants are known for their rapid growth, which is important because they are used as animal fodder. They also have aesthetic value because they are among the plants that bloom all year in arid areas, and this is an important feature 9. *Sesuvium Portulacastrum* has secondary properties economically, and studies have shown that it may be a viable alternative to certain raw materials used in the fruit, perfume, cosmetics, and pharmaceutical industries

1. 1. Plants parts:

- [1]. The leaves are narrow and simple, resembling a spoon or paddle in shape. Their length varies from 0.5 to 2 inches, with a smooth, green base.
- [2]. Pink or purple flowers
- [3]. The fruits are tiny, oval, and have many black, shiny seeds. 4- The trunk \ Its fleshy trunk ranges from 8 to 20 cm. 10,11

1.2. Plant distribution:

In the northern, western, and central sections of the globe, the plant grows and is dispersed in sandy loam soils, coastal limestone, and sandstone, As well as in intertidal zones, salt marshes, and other locations. 12

1.3. Plant composition:

The genus *S. portulacastrum* contains twelve species that are found in various parts of the world. ¹³

After a chemical analysis of the plant's stems and leaves, it was discovered that it contains alkaloids Saponins and tannins, as well as hydroxyecdysone, which can influence several biochemical and physiological processes during different stages of insect development with a small amount of Ecdysone, and fatty acids, which are composed of Palmitic acid (31.18%), oleic acid (21.15%), linoleic acid (14.18%), linoleic acid (10.63%) and myristic acid (6.91%)¹⁴.

The leaf oil was analyzed, and the results revealed alpha-pinene, campin, beta-benene, alpha-terpene, O- cymene, limonene, cineole, alpha-terpinene, bornyl acetate, tridecane, caryophyllene, and alpha-humulene 1

1.4. The Pharmaceutical uses of the plant and medicinal properties include:

It was used as a medication for epilepsy, conjunctivitis, dermatitis, hematoria, leprosy, and analgesic for teeth, as well as an antimicrobial agent. It has anti-oxidant properties.

The plant has a long tradition in traditional medicine, as it was used in the authorities due to its salty taste and the benefits it provides to the body through its mineral components and elements. It is also used to treat fevers, kidney problems, and a variety of infections 16.

The possible efficacy of ethanolic extracts derived from medicinal plants against the agents and

pathogens that cause indigestion, dysentery, and diarrhea has been demonstrated. Furthermore, this extract has been shown to be effective against the bacteria that cause infections like *Staphylococcus aureus*, *salmonella typhi* and *Escherichia coli* 17, 18.

The plant has broad spectrum, activity against the positive and negative bacteria as well as anti-fungi and antioxidant activity, according to studies performed on the plant.^{19,20}

Salmonella:

Contamination with *Salmonella* is still a major public health issue around the world due to the costs of disease control, prevention and care imposing financial pressures on both developed and developing countries 21. *Salmonella* is a frequent foodborne pathogen that can be prevalent in poultry, eggs, dairy products, and fresh fruits and vegetables²².

The public has been concerned by the advent of foodborne pathogens and antibiotic resistance because these bacteria pathogens are extremely harmful and virulent, resulting in a higher mortality rate among infected patients

23. Antibiotics are often used in animal feed to help animals to grow and develop faster, as well as in veterinary care to treat diseases caused by bacterial infections in animals 24.

Annual sick trips due to a *Salmonella* infection are expensive; it was projected to be \$ 2.71 billion in 2010 for 1.4 million cases. Over the last decade, wildlife has been linked to 70% of human salmonellosis in the United States, with poultry serving as a major reservoir portion; high cases infection occurred between 1998 and 2008 and were not caused by infected chicken, turkey, or eggs 25.

Antimicrobial resistance in non-typhoid *salmonella* is one of the most serious public health concerns in the food and animal production industries, particularly the poultry meat chains processing production 26.

2. Material and method:

Plant extract:

After collecting plant paper samples from the AL-Kahla nursery in Misan city, they were washed and cleaned, and the excess that we didn't need was cut off except for the leaves that are the basis of the extraction process, and they were dried in the oven at 60 °C degrees until they were completed drying , the plant then ready for extraction in a Soxhlet system, 75 ml methanol alcohol to 25 ml water to 20 grams of plant where used a ratio and place the mixture in the Soxhlet device for 10 hours before the results come out and we get the plant extract. After that, the drying is done in an electric oven and the concentrations used in the experiment were determined 27.



Picture (1): Examination of *sensitivity to sesevium* plant extract by drilling method shows the inhibitory effect on salmonella bacteria on the culture media.

Evaluation the effectiveness of the *Sesuvium portulacastru*:

The method of diffusion in the pits was accompanied by a method diffusion well to estimate the efficacy of the *Sesuvium portulacastru* extract, where the diameter of the pit was 8 mm and 1.0 ml of the *Sesuvium portulacastru* plant extract was inserted in the hole (10,20,30,40 and 50)% and done 5 Inoculating with salmonella 5 x 10.mL/ CFU bacterial suspensions and incubate at 37c for 2 day 26.

Table No. (1) Shows the effect of the extract of *Sesuvium portulacastru* plant, and the perimeter of inhibition is observed around the *salmonella* colony

| Diameter of bacterial colonies Mean ± standard error | Concentrations | The number of samples | Groups |
|---|----------------|-----------------------|--------|
| 1.10±0.57 e | 10 | 5 | 1 |

| | | | |
|--------------|----|---|---|
| 3.35±0.47 d | 20 | 5 | 2 |
| 7.65±0.64 c | 30 | 5 | 3 |
| 10.88±0.55 b | 40 | 5 | 4 |
| 12.95±0.66 a | 50 | 5 | 5 |

2. Result:

The data Table No. 1 displays the results of the sensitivity test performed on the salmonella bacteria using the alcoholic extract of the *Sesuvium portulacastru* plant. The findings revealed clear substantial variations between the groups treated with the plant extract and the control group, with group No. 5 achieving the best results and group No. 4 exhibiting the least successful that is represent the growth with minimum inhibitory concentration (MIC).

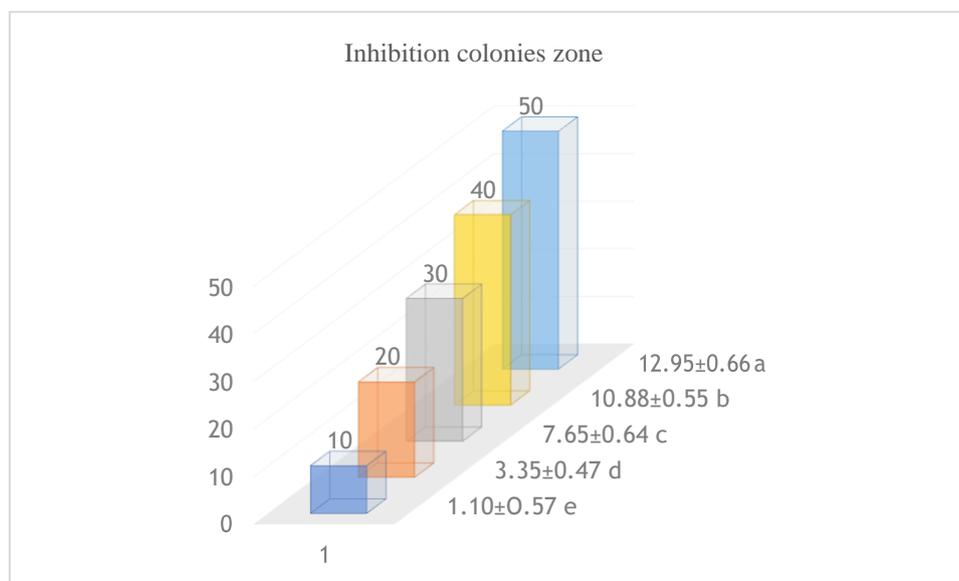


Diagram (1) showing the effect of different concentrations of *sesevium portulacastru* Extract on salmonella bacteria.

4. Discussion:

The presence of 22, 23-dihydrostigmasterol, 3-benzoic acid, 4-trihydroxy, epicatechin, and capsaicin was detected during a phytochemical study of *S. portulacastrum*. Antibacterial activity has been shown in both of these compounds 28. Magwa, et al have report that *Sesuvium portulacastru* plant has an impact on salmonella paratyphi, and a variety of bacteria, including *E. coli* and staph 15. shella, et al mentioned that the sesuvium plant extract has an effect on salmonella paratyphi and *E. coli* 29. The toxic effects of these chemical components on these microorganisms are caused by the disruption of bacterial or fungal membrane integrity. The ability of –pinene and 2-pinene, can degrade cellular integrity and kill cells that is lead to inhibit respiration and ion transport processes has been demonstrated 30, 31 In yeast

cells and isolated mitochondria, they also increase membrane permeability 32. The existence of *O*-cymene, 2-pinene, α -pinene, 1,8-cineole, limonene, β -terpinene, β -terpinolene, and camphene in *Sesuvium portulacastrum* may be responsible for these activities. Antibacterial behavior of enantiomers of α -pinene, 2--pinene, and limonene 33, 34. The findings of a report on the impact of various essential oil components on Gram-negative bacteria's outer membrane permeability back this up 35. Other essential oil elements, such as trans-caryophyllene, limonene, camphene, (-)-bornylacetate, tridecane, and β -humulene, have yet to be studied for their potential mechanisms 36.

To protect themselves against pathogen penetration, some tree species, such as pines and spruces, as well as

Sesuvium portulacastrum, develop resin-like materials containing monoterpenes 37. Trans-caryophyllene, L- (β -bornylacetate, tridecane, and β -humulene (Volatile compound) are likely to be precursors to complex menthols or resins that have been believed to also have antibacterial, antifungal, or antiviral and antioxidant properties 38, 39, 40

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