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Literature Review

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# Proof ability of Saudi *Salvia officinalis* L. for getting rid of food poisoning bacteria

## Abstract

*Salvia officinalis* L., had common names (Sage, Meramiah), had medicinal and aromatic activity, it was used as traditional medicines, due to antimicrobial efficiency. The pharma-cological properties were alkaloids, glyco-sidic, phenolic mechanisms, steroids, poly-acetylenes, and terpenes / terpenoids. The importance was to conduct laboratory trail experiment for Saudi *Salvia officinalis* L. essential oil to prove its ability for getting rid of food poisoning bacteria. Methodology was a laboratory trial to using the Folin's test for cell biomass and viable cell count, after interaction to Saudi *Salvia officinalis* essential oil. The results were showed *Escherichia coli*, *Bacillus cereus*, and *Salmonella typhi*, were getting rid at the second day of trial, the Folin's test results were 13.4%, 12.9, and 13.1%. At the third day *Staphylococcus aureus, Clostridium* sp., and *Campylobacter jejuni*, were 13.5%, 13.9, and 13.8%. At the fourth day, *Shigella* sp., *Listeria monocytogenes*, and *Yersinia enterocolitica*, were 13.6%, 13.4, and 13.8%. It was concluded that, Saudi *Salvia officinalis* essential oil active ingredients were proved capability of getting rid of food poisoning bacteria. It was recommended that, the medical using of Saudi *Salvia officinalis* essential oil to getting rid of food poisoning bacteria, will preserve food, and will reduce cases of food poisoning.

**Keywords:** *Salvia officinalis* L., *Escherichia coli*, *Bacillus cereus*, *Salmonella typhi*, *Staphylococcus aureus, Clostridium* sp., *Campylobacter jejuni*, *Shigella* sp., *Listeria monocytogenes*, *Yersinia enterocolitica*

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## Literature review

*Salvia officinalis* L., had common names (Sage, Meramiah), had medicinal and aromatic activity, it was used as traditional medicines, due to antimicrobial efficiency.[1] The pharma-cological properties were alkaloids, glyco-sidic; (flavonoid glycosides, cardiac glycosides, and saponins), phenolic mechanisms; (flavonoids, coumarins, and tannins), steroids, poly-acetylenes, and terpenes / terpenoids; (mono-, di-, tri-, and sesqui-terpenoids).[1] The phyto-chemical were flavonoids, glycosides, phenolic mixes, saponin, coumarin, tannins, resins, steroids, and carbohydrates. It had numerous phenolic and alkaloid mixes. The phenolic mixes were chlorogenic, lignan, eugenol, cinnam-aldehyde, quercitin, 4-hydroxy-lbenzoic acid, catechol, cinnamic, kaempferol, and gallic acid. The alkaloid compounds were caffeine, retro-sine, solanum, pilocarpine, veratrum, tropane, berberine, theobromine, ethyl-benz-hydramine, phencyclidine, gallocatechin, benz-fetamine, and amfe-pramone.[2]

*Salvia officinalis* essential oil had ironic biological energetic phenolic mixes, the chief was 1,8-cineole, camphor, α-thu-jene, β-thu-jone, borneol, and viridi-florol. World Health Organization (WHO) had raised the threat antibiotic resistance, the natural capitals can be a change in medical field as fighting antibiotic resistance due to lipo-philic nature and different mechanisms.[3] People using *Salvia officinalis* as tea to profit from its extract. Biologically it had anti-bacterial and anti-myco-bacterial. It was usually used in folk medicine, anciently, it was aided in herbal treatment.[4]

*Salvia officinalis* essential oil was showed higher anti-bacterial, was indicated the active fraction were alcohols, and phenols as thymol, eugenol, globulol, and spathulenol.[5] It had shown numerous chemical and biological anti-bacterial action.[4] It had their extensive action against pathogenic bacteria.[6] *Salvia officinalis* extract had anti-bacterial effect by 100 mg/mL, and ethyl acetate extract was affected against most tested bacteria.[7]

*Salvia officinalis* extract had anti-bacterial actions 100 mg/mL were assessed bacterial growth, had presented various inhibitory. *Escherichia coli* and *Salmonella typhi* were sensitive to all extracts, *Staphylococcus aureus* was sensitive to all extracts except acetone extract.[8] World Health Organization (WHO) was concerned the anti-bacterial resistance was help to investigate the extract anti-bacterial. Essential oil had action against *Staphylococcus aureus*, *Listeria monocytogenes*, and *Escherichia coli*. That was showed the highest activity against *Escherichia coli*, was showed promising synergistic effect against MDR *Escherichia coli*. It had anti-bacterial activity; they can be used to treat bacterial pathogens infections.[9] It had activity against *Escherichia coli, Shigella sonnei,* and *Bacillus cereus*, due to borneol 9.4%, α-pinene 5.5%, globulol 9.3% and α-humulene 8.4% and It was active against all tested bacteria.[10] It had activity against *Yersinia enterocolitica*, *Escherichia coli*, *Listeria monocytogenes*, *Shigella flexneri*, *Bacillus subtilis*, *Staphylococcus aureus*, and *Salmonella* sp.,[11] was inhibited *Campylobacter jejuni.*[12]

The importance was to conduct a trail laboratory experiment for Saudi *Salvia officinalis* L. essential to prove ability for getting rid of food poisoning bacteria.

## Methodology

### Plant essential oil extract

Saudi *Salvia officinalis* sample was brought from town market, was washed by distilled water, and 70% ethanol. The sample was situated by distilled, deionized water (1000 ml + 75 g dehydrated sample, and 400 ml + 200 g new sample), the essential oil was extracted by water distillation "Modified Clevenger Trap".[13]

### Food poisoning bacteria

The food poisoning bacteria were collected from "Food-Lab.", were *Listeria monocytogenes*, *Escherichia coli*, *Salmonella*

*typhi*, *Clostridium* sp., *Bacillus cereus*, *Campylobacter jejuni*, *Staphylococcus aureus, Shigella* sp., and *Yersinia enterocolitica*. They were cultured on "Nutrient-Broth", were incubated overnight, were subculture on "Nutrient-Agar", were incubated overnight. The pure colony was made suspension by "Peotone-Water".[14]

### Working test

Same amount of Saudi *Salvia officinalis* essential oil and bacterial suspension were located in sterile test tube, was mixed, was incubated at (35-37) °C, and was checked at (1, 2, 3, and 4) days. The bacterial cell biomass was precipitated by "Centrifugation", or was deposited by "Whatman Filter Paper". The cell biomass was washed by distilled water, was dried in "Cell Oven", and was grounded into very fine powder.[15] "Folin's Test Strip" was used to detect the "Protein Quantity". The color was indicated the protein quantity. Increased protein quantity was indicated an increased alive bacterial cell biomass.[16]

### Viable cell count

Viable cell count had an estimate of the total number of living cells. Viable cell count was determined by automated machines and with the use of counting chambers by "Hemocytometer".[17]

### Statistical analyses

The data were resulted in triple trials, were made as mean. These results were intended by "Microsoft Excel Software".[18]

## Results and discussions

Table 1 was showed the Folin's test results after interaction to Saudi *Salvia officinalis* essential oil. The results were showed that food poisoning bacteria *Escherichia coli*, *Bacillus cereus*, and *Salmonella typhi*, were getting rid at the second day of trial, the Folin's test results were 13.4%, 12.9, and 13.1%. That was showed non protein of living cell biomass. *Salvia officinalis* extract had anti-bacterial actions of *Escherichia coli* and *Salmonella typhi* were sensitive to all extracts.[8] Essential oil had action against *Escherichia coli,*[9] it had activity against *Escherichia coli,* and *Bacillus cereus,*[10] had activity against *Escherichia coli*, *Salmonella* sp., and *Bacillus subtilis.*[11]

**Table 1** Folin's test results after interaction to Saudi Salvia officinalis essential oil

| Food poisoning bacteria | Time 1 day | 2 days | 3 days | 4 days |
|---|---|---|---|---|
| *Escherichia coli* | 21.9% ±0.1 | 13.4% ±0.3 | 9.5% ±0.1 | 5.6% ±0.2 |
| *Bacillus cereus* | 22.7% ±0.3 | 12.9% ±0.1 | 9.9% ±0.2 | 5.3% ±0.1 |
| *Salmonella typhi* | 22.0% ±0.1 | 13.1% ±0.2 | 9.1% ±0.1 | 5.8% ±0.3 |
| *Staphylococcus aureus* | 30.5% ±0.2 | 22.2% ±0.3 | 13.5% ±0.1 | 9.8% ±0.1 |
| *Clostridium sp.* | 31.2% ±0.1 | 23.2% ±0.2 | 13.9% ±0.2 | 9.1% ±0.1 |
| *Campylobacter jejuni* | 30.1% ±0.2 | 21.9% ±0.1 | 13.8% ±0.1 | 9.8% ±0.2 |
| *Shigella sp.* | 41.8% ±0.2 | 30.6% ±0.1 | 21.5% ±0.3 | 13.6% ±0.1 |
| *Listeria monocytogenes* | 40.9% ±0.1 | 31.2% ±0.2 | 22.5% ±0.1 | 13.4% ±0.2 |
| *Yersinia enterocolitica* | 41.7% ±0.3 | 30.9% ±0.1 | 21.9% ±0.3 | 13.8% ±0.1 |

At the third day, the food poisoning bacteria were getting rid by Saudi *Salvia officinalis* essential oil. That were *Staphylococcus aureus, Clostridium* sp., and *Campylobacter jejuni*, the Folin's test results were 13.5%, 13.9, and 13.8%. That was cleared non protein of living cell biomass. *Salvia officinalis* extract had anti-bacterial actions were assessed bacterial growth, had presented various inhibitory. *Staphylococcus aureus* was sensitive to all extracts.[8] Essential oil had action against *Staphylococcus aureus,*[10] had activity against *Staphylococcus aureus*, and *Salmonella* sp.,[11] was inhibited *Campylobacter jejuni* growth.[12]

At the fourth day, the food poisoning bacteria were getting rid by Saudi *Salvia officinalis* essential oil. That were included *Shigella* sp., *Listeria monocytogenes*, and *Yersinia enterocolitica*. The Folin's test results were 13.6%, 13.4, and 13.8%. That was indicated the non-present of protein for living cell biomass. Essential oil had action against *Listeria monocytogenes,*[9] had activity against *Shigella sonnei,*[10] had activity against *Yersinia enterocolitica*, *Shigella flexneri*, and *Listeria monocytogenes.*[11]

This was indicated the presence of the active ingredients in Saudi *Salvia officinalis* essential oil.[1] The phyto-chemical were flavonoids, glycosides, phenolic mixes, saponin, coumarin, tannins, resins, steroids, and carbohydrates. It had numerous phenolic and alkaloid mixes. The phenolic mixes were chlorogenic, lignan, eugenol, cinnam-aldehyde, quercitin, 4-hydroxy-lbenzoic acid, catechol, cinnamic, kaempferol, and gallic acid. The alkaloid compounds were caffeine, retro-sine, solanum, pilocarpine, veratrum, tropane, berberine, theobromine, ethyl-benz-hydramine, phencyclidine, gallocatechin, benz-fetamine, and amfe-pramone.[2] *Salvia officinalis* essential oil had higher anti-bacterial,[5] had shown numerous chemical and biological anti-bacterial action,[4] had their extensive action against pathogenic bacteria,[6] had anti-bacterial effect against most tested bacteria.[7]

## Conclusions

It was concluded that, the results were proved the active ingredients of Saudi *Salvia officinalis* essential oil were capable getting rid of food poisoning bacteria.

## Recommendations

It was recommended that, Saudi *Salvia officinalis* essential oil medical using getting rid of food poisoning bacteria, will preserve food, and will reduce cases of food poisoning.

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