

**Antibacterial inhibition of three medical herbal extracts
against
Staphylococcus aureus and *Escherichia coli***

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Abstract:

This study includes the antibacterial activity of *Thymus vulgaris*, *Ricinus communis* and *Myrrha comiphora* extracts against *Staphylococcus aureus* and *Escherichia coli*. The ethanolic extract showed inhibitory effect against *Staphylococcus aureus* of (15mm, 10.5mm, 16mm) diameter for *Thymus vulgaris*, *Ricinus communis* and *Myrrha comiphora* respectively, while (10.5mm, 12.5mm, 16.5mm) diameter for *Thymus vulgaris*, *Ricinus communis* and *Myrrha comiphora* respectively against *Escherichia coli*. Moreover, aqueous extract effects of *Thymus vulgaris*, *Ricinus communis* and *Myrrha comiphora* against *Staphylococcus aureus* by range (14mm, 0, 11.5mm) diameter respectively, while (12.5mm, 0, 10mm) diameter for *Thymus vulgaris*, *Ricinus communis* and *Myrrha comiphora* respectively against *Escherichia coli*.

الفعالية التثبيطية لمستخلصات ثلاث أعشاب طبية ضد جرثومتي *Staphylococcus aureus* and *Escherichia coli*

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ملخص البحث:

تضمنت الدراسة اختبار الفعالية المضادة للجراثيم لمستخلصات نبات الزعتر والخروع ومرة مكي ضد نوعين من الجراثيم *Staphylococcus aureus* و *Escherichia coli*. أظهر المستخلص الكحولي تأثيرا تثبيطيا ضد جرثومة *Staphylococcus aureus* و كان قطر التثبيط (16mm,10.5mm,15mm) لنبات الزعتر والخروع ومرقمكي على التوالي ، بينما بلغ قطر منطقة التثبيط(16.5mm,12.5mm,10.5mm) لتأثير المستخلص الكحولي لنبات الزعتر والخروع ومرقمكي على التوالي ضد جرثومة *Escherichia coli*. كذلك أظهر المستخلص المائي تأثيرا وبقطر تثبيط بلغ (11.5mm, 0 ,14mm) لنبات الزعتر والخروع ومرقمكي على التوالي ضد جرثومة *Staphylococcus aureus* ، بينما بلغ قطر التثبيط (10mm, 0 ,12.5mm) لنبات الزعتر والخروع ومرقمكي على التوالي ضد جرثومة *Escherichia coli*.

Introduction

Natural products especially *Thymus vulgaris* , *Ricinus communis* and *Myrrha comiphora* have long been prescribed in traditional medicine for treating various diseases (Ashley et al ., 2007; Suwanna et al ., 2006), and the subject of natural preservatives is one that probably has more academic interest than practical or economic virtue . However , it dose have a wonderful marketing angle which may justify the higher raw material costs (Ghaleb et al ., 2006). Beside that had indications of mild toxic side effects when used as traditional medicine. Thus, it should also

hold true for the development of local plant based best management products (Fabricand and Farnsworth , 2001; Jeffrey *et al.* ,1993).

Two different bacterial species were used to investigate the possible antibacterial activities from the chosen *Thymus vulgaris* , *Ricinus communis* and *Myrrha comiphora* . Common thyme (*Thymus vulgaris*) is a member of the lamiaceae family which is distributed in different areas of the mediteranean and Asia ,and is cultivated in all over the world . The common thyme contains volatile oil consisting of highly variable amount of phenols , monoterpene hydrocarbons and alcohols , chemical constituent, essential oil(mainly thymol and carvacrol) flavonoids , tannins and triterpenes (Naghdi and Makkizadeh , 1998 ; Gislene *et al.* , 2000) .

The green part of *thymus vulgaris* is the most popular herbal medicine and spice used world wide . Thyme phylochemicals have been used as antioxidant, antibacterial agent ,antifungal agent for treatment of respiratory disease ,wound healing, carminative ,diuretic ,urinary disinfectant and vermifuge(Dursun *et al.* ,2003;Kitajima *et al.* , 2004) .

Ricinus communis is cultivated in tropical countries . It showed excellent activity as antibacterial agent , the isolated flavonoids showed potential antimicrobial activity against microorganism ,Ricin is a potent protein toxin found in the seeds of the castor bean plants . Several reports indicate that ricin can be detoxified by thermal treatment , however the conditions required for inactivation are not well characterized. The residual cytotoxicity of ricin – containing infant formula after treatments was determined in an anchorage – dependent transformed macrophage cell line (Shripad *et al.* , 2003) .

Myrrha comiphora is a resin that has a bitter taste ; its name is derived from herbrew murr or maror , meaning bitter . Myrrha is emotionally strengthening and empowering .It contains antiseptic and

anti-inflammatory compounds . It has traditionally been used for therapeutic properties . The primary chemical constituents of Myrrha include the gum , resin and furanosesquiterpene , pinene up to 17 volatile oil (including m-cresol , eugenol , formic and heerabolone) up to 40 resine including commiphoric acid (David , 2007) .

Material and method

1- preparation of the herbal extracts :

Thymus vulgaris, *Ricinus communis* and *Myrrha comiphora* were obtained from private markets as powder . Aqueous , ethanol extracts of them were prepared according to (Grand et al ., 1988) . 40 gm of each of the herbs were suspended in of 100 ml of distilled water , 95% ethanol macerated for 24 hr . , then filtered through Whatman No.2 filter paper , ethanol was evaporated using the rotary vacume evaporated.

2-Test of Antibacterial activity :

Antibacterial activity was tested according to (Nccls , 1993) . Briefly , Petri plates containing 20 ml of nutrient agar medium were inoculated with a fresh culture of the reference strain(*Staphylococcus aureus* , *E. coli*). They are obtained from Al-salam hospital from different cases that diagnosed from October to December 2007 , inoculated on nutrient agar , incubated in 37°C for 24 hr , and then stored in arefrigerattor up to use .Filter paper discs impregnated with each type of extracts (*Thymus vulgaris*, *Ricinus communis* and *Myrrha comiphora*) were distributed on the surface of the nutrient agar with the two species of bacteria mentioned above and standard antibiotic was also used (Chloramphenicol).The plates were incubated at 37°C for 24hr. The

antibacterial activity was assessed by measuring the diameter of the inhibition zone formed around the disc.

Results and discussion

In our study, the data showed that these herbal extracts have antibacterial activity against *Staphylococcus aureus* and *Escherichia coli* as shown in table (1).

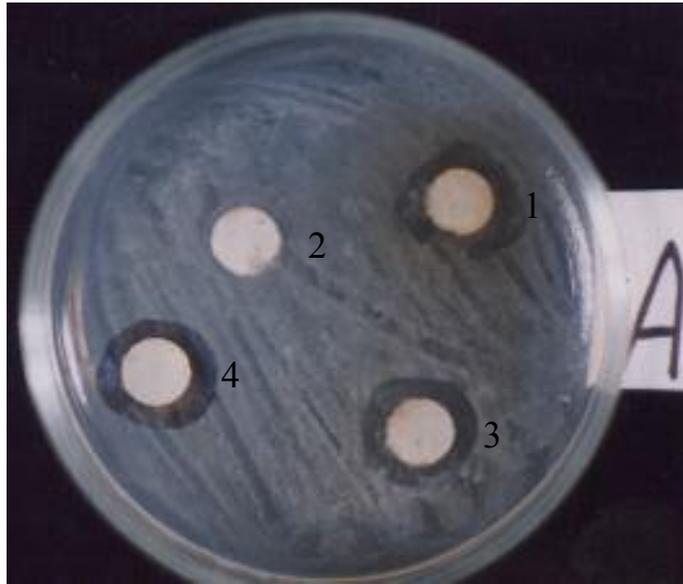
Table (1) Inhibitory properties (inhibition zone diameter in mm) of each extract against strain *Staphylococcus aureus* and *Escherichia coli*

Test agent	<i>Staphylococcus aureus</i>		<i>Escherichia coli</i>	
	aq.	E.	aq.	E.
<i>Thymus vulgaris</i>	14	15	12.5	10.5
<i>Ricinus communis</i>	0	10.5	0	12.5
<i>Myrrha comiphora</i>	11.5	16	10	16.5
Chloramphenicol	14	0	12	0

aq: distilled water extract .

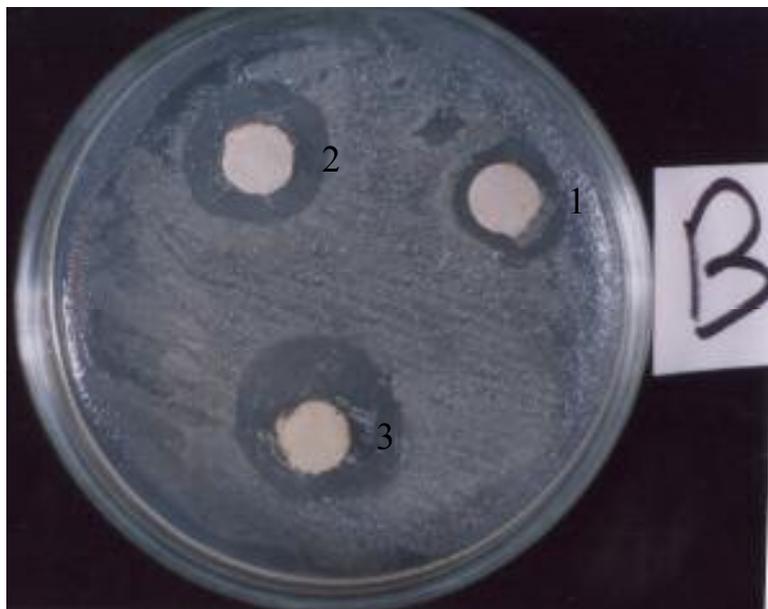
E : ethanol extract .

The average of extracts has been calculated as picture (A),(B), (C) ,(D).



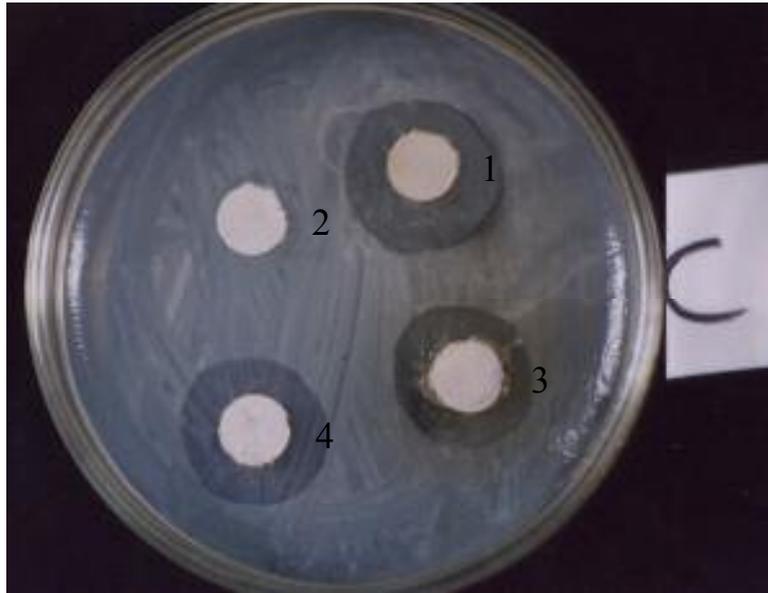
A: *Escherichia coli* (aqueous extract).

1. *Thymus vulgaris*
2. *Ricinus communis*
3. *Myrrha comiphora*
4. Chloramphenicol



B: *Escherichia coli* (ethanol extract) .

1. *Thymus vulgaris*
2. *Ricinus communis*
3. *Myrrha comiphora*



C: *Staphylococcus aureus* (aqueous extract) .

1. *Thymus vulgaris*
2. *Ricinus communis*
3. *Myrrha comiphora*
4. Chloramphenicol



D: *Staphylococcus aureus* (ethanol extract) .

1. *Thymus vulgaris*
2. *Ricinus communis*
3. *Myrrha comiphora*

The medical herbs would be the best source to obtain a variety of drugs. About 80 % of individuals from developed countries use traditional medicine, which has compounds derived from medical herbs . Therefore such herbals should be investigated to better understand their properties , safety and efficiency (Elastal *et al .*, 2005) .

Many herbals have been used because of their antimicrobial traits , which are due to its components synthesized in the secondary metabolism of the herbs .These herbals are known by their active substances , for example , the phenolic compounds which are part of the essential oils (mainly thymol and carvacrol) , flavonoid , tannins and triterpenes (Gislene *et al .*, 2000) .

Thus, herbal extracts have great potential as antimicrobial compounds against microorganisms . They can be used in the treatment of infectious diseases caused by resistant microbes (Khider , 2006) .

The hydrophobic nature of thymol means that it can approach ion channel proteins through the lipid phase of the membrane , alter the local environment of calcium channels and thus inhibit capacitative calcium entry .

In brief , thymol inactivates calcium channels machinery . Thus, triggering a corresponding reduction in elastase. Elastase a serine proteinase released by activated human neutrophils can degrade a wide variety of biomacromolecules including elastin , and is considered a marker of inflammatory diseases . As the logical strategy to protect tissue is to inhibit excessive elastase activity , experimental and clinical researches have concentrated on trying to find efficient elastase inhibitors . As thymol , one of the major components of thymol oil with a phenolic structure has been credited with a series of pharmacological properties that include antimicrobial and antioxidant effects. These two latter

characteristics make thymol a molecule that can have helpful effects in controlling the inflammatory processes in many infections (Braga *et al.* , 2006).

Striking parallels exist between plant compounds that inhibit or kill microbes . A chemical found in lichens , has both antimicrobial properties and a potent inhibitory effect on the growth (Jennings *et al.* , 2001) .

Thus , medical plants used as antimicrobial agents caused pathologies may provide promising lead for microbe best management (Ojo *et al.* , 2007) .,

Myrrha is one of the oldest medicines in the world. It is one of the ingredients of the famous magic-inducing incense used for treating infections . Myrrha was an important trade item for more than a thousand years . It was a primary ingredient in incenses and holy oils used to inspire prayer , deepen meditation , and revitalize the spirit. It was used to fumigate the body to promote cleanliness and stimulate immunity , and continues to have an important role in cosmetics and perfumery . It is an effective antimicrobial agent. It stimulates the production of white blood corpuscles, and increases resistance to infection . It is one of the most effective of all known disinfectants from the plant kingdom. It is a rejuvenating tonic and is reputed to enhance of the intellect (Anthony , 2002 ; Mekonen *et al.* , 2003) .

The Dekebo in 2002 describes the therapeutic properties of Myrrha. As follows, "this agent has always been highly" esteemed as a stimulant although its influence is more in local than general character .It exercises the characteristic influence of most of the stimulants upon the excretion and secretions acting as a diaphoretic, expectorants ,sialagogue and to a certain extent emmenagogue. As a most active general stimulant in stimulant in ulcerative,engorged and flabby,it stimulates the capillary circulation ; restores tone and normal secretion and causes the healing of

ulcerations . In its influence upon the digestive apparatus myrrh is direct in its action.

It quickly increases the power of the digestive function, stimulating the peptic glands to extreme action .It increases the appetite and promotes the absorption and assimilation of nutrition.

It is given in a tonic dyspepsia in the absence of inflammatory action ,especially if there is excessive mucous discharge from the bowels. Below , is a brief list of the most important therapeutic application of myrrh.

This study has been performed to improve the existence of synergism phenomenon between medical herbs and antibiotics especially *Thymus vulgaris* , this is in accordance with (Khider , 2006) .

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