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ORIGINAL ARTICLE

Effect Extraction of *Nigella sativa* and *Malricala chamoilla* on Urinary Tract Infection

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ABSTRACT

Objectives: The proposed of current study determined effectiveness of extracts for *Niglle sative* and *Malricia chamoilla* on the Urinary tract infection Bacteria like gram's positive *Staphylococcus aureus*, *streptococcus faecalis* and gram's negative bacteria *Escherichia coli*, *Klebsiella pneumonia*.

Methods: For obtain of crude extract of peat solvents had been used are hot, cold water and ethanol , four types of Pathogenic bacteria which tested effectiveness of plant extract and two gram's positive pathogenic bacteria *Staph. aureus*, *strept. faecalis* and gram's negative bacteria *E. coli*, *K. pneumonia* isolated from urinary tract infection (UTI) patient to detection the most active solvent extraction, and used various methods of extraction alcohol, hot water and cold water, then was used of many dilutions to each powder of extraction , to determine the inhibition zone on the plats using well method and measuring the inhibition zone to determine the sensitivity and resistance for UTI infection bacteria.

Results: The current study results showed best method of extraction solvent is ethanol that appear through inhibition zone of pathogenic bacteria reach to 50mm in diameter in some case near the inhibition zone of antibiotic diameter. The result also showed there is no effect when used *M. chamoilla* extract alone on both gram's negative and positive and there is few effect when used *N. sativa* extract alone on both gram's negative and positive but when mixed the plant extraction of both plant *N. sativa* and *M. chamoilla* the effect of plant extraction on growth of pathogenic bacteria by diameter of inhibition zone increased reach 50mm, 45mm on gram's positive bacteria and this result near the inhibition zone of antibiotic while in gram's negative bacteria reach in range 45mm, 40mm and 35mm diameter of inhibition zone. Result showed there is no effect in cold water extraction.

Conclusion: The best method of extraction ethanol extraction and most effectiveness plant extraction when mixed the of *N. sativa* and *M. chamoilla* produce antimicrobial activity against gram's positive bacteria and gram's negative bacteria when used ethanol extracted method.

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INTRODUCTION

The pathogenic microbial to many antibiotic was serious problems in addition to most antibiotic industry manufacture with high cost and the side effect of these material [1].

Medical plants are gifts of the nature against various infections and diseases parts of the world medical plant are gaining much interest recently because their use in ethno medicine treating common disease such as Fever and cold .are currently in considerable significance view due to their special attributes as a large source of therapeutic phytochemicals that may lead to vova antibiotic [2,3]. The pathogens common causing UTI infection involved *Staph. aureus E. coli, , Proteus mirabilis, Strept. faecalis, Enterococcus faecalis, K. pneumonia* [8].

Matricaria chmomilla (*M. chmomilla*) also called *Matricaria recutita* commonly known as German Chamomile or Chamomile belong to family Asteraceae and is widely used as antibacterial in the worldwide such as in Europe, Africa and Asia [4]. Before 1000 y ago, this medical plant was used in Egypt, Greece and Rome to treat different infections and it is considered as one of nine sacred herbs [5]. The flowers *Matricaria chmomilla* are the most important parts of this plant has been used in many medical treatments like antipyretic and carminative [6].

Urinary Tract Infection (UTI) is one of the most recurrent infections infect individuals especially in women worldwide [7].

Nigella sativa Linn (*N. sativa)* is an annual plant from Ranunculaceae family. Analysis of *N. sativa* seeds has revealed that it contains following ingredients: alkaloids, saponin, proteins, 36-38% fixed oils and 0.4- 2.5% essential oil [9].

The crude extract and essential oil has antibacterial activities versus different clinically isolate. The antibacterial properties of essential oil effect on gram's negative and gram's positive bacteria in manner dose contingent [10].

MATERIALS AND METHODS

Plant material: *Niglle sative* seeds and *M. chamomilla* flowers has been collected from local market. Plant cut and then placed in the oven to dry for week on (45Ċ) before they may be transported cutting and crush by hand or by machine to gotten plant material powder.

Bacterial isolation: Two gram's positive bacteria genus *Staph. aureus, Strept. Faecalis* and two gram's negative bacteria genus *E. coli, K. pneumonia* isolated from patient with UTI infection from (AL-Hussainy hospital). All bacterial identification by bacteriological and biochemical test.

Mueller-Hinton agar: Media had been prepared from weigth 40 gm media and solved in 1L of Distal water based on method of company (Himedia company).

Plant Extract: Plant material prepared by mixture plant powdered with D.W(H2O) in ratio (1:10) of this mixture pot in the shaker for overnight at 37 Ċ. then the suspension was filtered by filter paper. Put the filtration material in the petri dish and incubation overnight at 37 Ċ to evaporate the H2O and become powder [11].

Cold water extraction: Cold water had been mixed with plant powder in ice pieces and put in shaker for one hour . the put mixture in refrigerator overnight with continues shaking if possible [11].

Hot water extraction: Hot water had been mixed with plant powder and put in shaker for one hour, then put the mixture overnight in the shaker [11].

Ethanol extracted method: A quantity of 250 mg of both types of plant had been mixed with 10ml of 70% ethanol and put in the shaker for overnight . then filtration the suspension by filter paper and then put it in the Petri dish for evaporated the alcohol and become powder [11].

Well method procedure: Poured Muller Hinton Agar Medium in plates and punching in depth 4mm. Pathogenic bacteria had been spread in to an ager plates by spreader. After drying the plate at 37 Ċ for 30 minutes , make a well in the plate (several well when used many concentration of a certain antibiotic) by using a sterile crock borer in appropriate diameter 10 mm under aseptic condition. Fill the well with a tested antibiotic. Incubation the plates at 37 Ċ for 18-24 hr. Measure the inhibition zone around the well [12].

RESULTS

In current study has been used two types of plant extraction to treatment UTI infection and these extraction had been collected by three methods to know which among them best methods.

All so used two types of pathogenic bacteria two gram's positive bacteria genus *Staph. aureus, Strept. Faecalis* and two gram's negative bacteria genus *E. coli, K. pneumonia* to studied effected of these plant extraction on the pathogenic bacteria.

Nitrofurantoin wide spectrum antibiotic used to treated UTI infection effected on many types of bacteria and these four type in current study among them as control to compare with plant extracted effectiveness.

The results in Table 1 showed there is no effectiveness of *Malricaia chamoilla* alone Plant extract for gram's negative bacteria according to the inhibition zone compared to the antibiotic in all dilution and also this appear in LSD value and all type of extraction methods.

In Table 2 the result showed there is very little effectiveness of of *Malricaia chamoilla* alone Plant extract for gram's positive bacteria, this appear in inhibition zone for ethanol extracted method in the first four dilution but the LSD. Value remain significant differences.

In the Table 3 results showed effectiveness of *N. sativa* extract alone moderate in ethanol extracted method (18, 15…..3) mm diameter of inhibition zone on bacterial culture compare with antibiotic 55 mm while the hot water extracted method there is no or very little in the first and second dilution, LSD increased to the 1.57 .

Table 1. **Inhibition zone(mm)of *Malricaia chamoilla* extract against Gram's negative bacteria.**

Concentration of extract (mg/ml)	Type of extract Solvent			Mean of concentration	$LSD_{0.05}$ conc.
	Cold	Hot	Alcoholic		
Antibiotic 50µg/ml	52 ± 0.0	52 ± 0.0	52 ± 0.0	52.00 A	
1	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 B	
2	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 C	
3	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 D	
4	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 E	
5	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
6	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 G	**N.S**
7	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 H	
8	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 I	
9	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 J	
10	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 K	
11	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 L	
12	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 M	
Mean of extract Solvent	0 c	0 b	0 a	$LSD_{0.05}$ Interference	
$LSD_{0.05}$ Solvent		**N.S**		**N.S**	

* The numbers refer to mean ± Standard error.
* Various vertically capital letters indicate significant differences (P<0.05) between the concentrations.
*Various Horizontally small letters indicate significant differences(P<0.05) between Solvents.
* N.S No significant differences.

Table 2. **Inhibition zone(mm)of *Malricaia chamoilla* extract against Gram's positive bacteria.**

Concentration of extract (mg/ml)	Type of extract Solvent			Mean of concentration	$LSD_{0.05}$ conc.
	Cold	Hot	Alcoholic		
Antibiotic 50µg/ml	55 ± 0.0	55 ± 0.0	55 ± 0.0	55.00 A	
1	0 ± 0.0	7 ± 0.07	26 ± 0.0	11.00 B	
2	0 ± 0.0	0 ± 0.0	19 ± 0.78	6.30 C	
3	0 ± 0.0	0 ± 0.0	13 ± 0.57	4.33 D	
4	0 ± 0.0	0 ± 0.0	6 ± 0.0	2.00 E	
5	0 ± 0.0	0 ± 0.0	0 ± 1.0	0.00 F	
6	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 G	**N.S**
7	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 H	
8	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 I	
9	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 J	
10	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 K	
11	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 L	
12	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 M	
Mean of extract Solvent	0.0 c	0.0 b	5.3 a	$LSD_{0.05}$ Interference	
$LSD_{0.05}$ Solvent		**N.S**		**N.S**	

* The numbers refer to mean ± Standard error.
* Various vertically capital letters indicate significant differences (P<0.05) between the concentrations.
*Various Horizontally small letters indicate significant differences(P<0.05) between Solvents.
* N.S No significant differences.

The results showed in the Table 4 more effect from *Nigella sativa* extract alone against Gram's positive bacteria this appear clearly in the ethanol extracted methods by bacterial inhibition growth zone (45, 40, 34……4) mm in diameter and in the hot water extract (21, 14, 7, 4) mm and still there is no effect in cold water extracted method and LSD 4.86 value increased.

In Table 5 the result showed clear effect of plants *M. chamoilla* and *N. sativa* mixed extract against gram's negative bacteria in both methods of extraction ethanol appear diameter of inhibition zone near to the antibiotic diameter on agar plate of bacteria growth and there is clear effect of mixed plant extract on gram's negative bacteria but less the first method of extracted, also LSD value increased.

Table 3. **Inhibition zone(mm)of *Nigella sativa extract* extract against Gram's negative bacteria.**

Concentration of extract (mg/ml)	Type of extract Solvent			Mean of concentration	$LSD_{0.05}$ conc.
	Cold	Hot	Alcoholic		
Antibiotic 50µg/ml	52± 0.0	52 ± 0.0	52 ± 0.0	52.00 A	
1	0 ± 0.0	11 ± 0.33	18 ± 0.54	9.66 B	
2	0 ± 0.0	5 ± 0.5	15 ± 0.45	6.66 C	
3	0 ± 0.0	0 ± 0.0	12 ± 0.36	4.00 D	
4	0 ± 0.0	0 ± 0.0	9 ± 0.27	3.00 E	
5	0 ± 0.0	0 ± 0.0	6 ±0.12	2.00 F	
6	0 ± 0.0	0 ± 0.0	3 ± 0.09	1.00 F	**1.57**
7	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
8	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
9	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
10	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
11	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
12	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 F	
Mean of extract Solvent	0.0 c	1.33 b	5.25 a	$LSD_{0.05}$ Interference	
$LSD_{0.05}$ Solvent		**0.45**		**0.90**	

* The numbers refer to mean ± Standard error.
* Various vertically capital letters indicate significant differences (P<0.05) between the concentrations.
*Various Horizontally small letters indicate significant differences(P<0.05) between Solvents.

Table 4. **Inhibition zone(mm)of *Nigella sativa extract* extract against Gram's positive bacteria.**

Concentration of extract (mg/ml)	Type of extract Solvent			Mean of concentration	$LSD_{0.05}$ conc.
	Cold	Hot	Alcoholic		
Antibiotic 50µg/ml	55 ± 0.0	55 ± 0.0	55 ± 0.0	55.00 A	
1	0 ± 0.0	21 ± 0.63	40.6 ± 1.35	22.50 B	
2	0 ± 0.0	14 ± 0.42	32.66 ± 0.20	15.55 C	
3	0 ± 0.0	7 ± 0.21	26 ± 1.02	11.66 C	
4	0 ± 0.0	4 ± 0.12	23 ± 0.90	9.00 C	
5	0 ± 0.0	0 ± 0.0	19 ± 0.22	6.66 C	
6	0 ± 0.0	0 ± 0.0	16.6 ± 0.60	5.53 C	**4.86**
7	0 ± 0.0	0 ± 0.0	15 ± 0.45	5.00 C	
8	0 ± 0.0	0 ± 0.0	4 ± 0.12	1.10 C	
9	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 C	
10	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 C	
11	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 C	
12	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 C	
Mean of extract Solvent	0.00 c	3.83 b	14.73 a	$LSD_{0.05}$ Interference	
$LSD_{0.05}$ Solvent		**1.405**		**2.81**	

* The numbers refer to mean ± Standard error.
* Various vertically capital letters indicate significant differences (P<0.05) between the concentrations.
*Various Horizontally small letters indicate significant differences(P<0.05) between Solvents.

There is significant effect of plants *M. chamoilla* and *N. sativa* mixed extract against Gram's positive bacteria through inhibition zone of bacteria of plant extract (50, 47, 42, 38….7)mm by the ethanol extraction reach near to the antibiotic inhibition zone and this appear in 10 dilution out of 12. Also there is effect in the hot water extraction method (30, 28, 24…4)mm diameter of inhibition zone for pathogenic bacteria and also there is increased in LSD value(Table 6).

Table 5. **Inhibition zone(mm)of *Malricaia chamoilla* and *Nigella sativa* mixed extract against Gram's negative bacteria.**

Concentration of extract (mg/ml)	Type of extract Solvent			Mean of concentration	$LSD_{0.05}$ conc.
	Cold	Hot	Alcoholic		
Antibiotic 50µg/ml	55 ± 0.0	55 ± 0.0	55 ± 0.0	55.00 A	
1	0 ± 0.0	21 ± 1.15	45 ± 0.28	22.00 B	
2	0 ± 0.0	14 ± 0.0	40 ± 0.57	18.00 B	
3	0 ± 0.0	7 ± 0.57	34 ± 0.0	13.66 B	
4	0 ± 0.0	4 ± 0.57	30 ± 0.57	11.33 B	
5	0 ± 0.0	0 ± 0.0	20 ± 1.15	6.66 B	
6	0 ± 0.0	0 ± 0.0	17.3 ± 0.52	5.76 B	**6.097**
7	0 ± 0.0	0 ± 0.0	15 ± 0.28	5.00 B	
8	0 ± 0.0	0 ± 0.0	9 ± 0.43	3.00 B	
9	0 ± 0.0	0 ± 0.0	5 ± 0.0	1.66 B	
10	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 B	
11	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 B	
12	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 B	
Mean of extract Solvent	0.00 c	7.76 b	20.79 a	$LSD_{0.05}$ Interference	
$LSD_{0.05}$ Solvent		**1.76**		**3.52**	

* The numbers refer to mean ± Standard error.
* Various vertically capital letters indicate significant differences (P<0.05) between the concentrations.
*Various Horizontally small letters indicate significant differences(P<0.05) between Solvents.

Table 6. **Inhibition zone(mm)of *Malricaia chamoilla* and *Nigella sativa* mixed extract against Gram's positive bacteria.**

Concentration of extract (mg/ml)	Type of extract Solvent			Mean of concentration	$LSD_{0.05}$ conc.
	Cold	Hot	Alcoholic		
Antibiotic 50µg/ml	55 ± 0.0	55 ± 0.0	55 ± 0.0	55.00 A	
1	7 ± 0.21	30 ± 0.90	50 ± 1.150	29.00 B	
2	3.7 ± 0.11	28 ± 0.87	47 ± 1.37	26.23 B	
3	0 ± 0.0	24 ± 0.76	42 ± 0.26	22.00 B	
4	0 ± 0.0	19 ± 0.57	38 ± 1.14	19.00 B	
5	0 ± 0.0	8 ± 0.24	34 ± 0.67	14.00 B	
6	0 ± 0.0	6.5 ± 0.19	30 ± 0.90	12.16 B	**8.03**
7	0 ± 0.0	4 ± 0.12	26 ± 0.78	10.00 B	
8	0 ± 0.0	0 ± 0.0	22 ± 0.66	7.37 B	
9	0 ± 0.0	0 ± 0.0	16 ± 0.48	5.33 B	
10	0 ± 0.0	0 ± 0.0	7 ± 0.21	2.33 B	
11	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 B	
12	0 ± 0.0	0 ± 0.0	0 ± 0.0	0.00 B	
Mean of extract Solvent	0.89 c	9.95 b	26.00 a	$LSD_{0.05}$ Interference	
$LSD_{0.05}$ Solvent		**2.31**		**4.638**	

* The numbers refer to mean ± Standard error.
* Various vertically capital letters indicate significant differences (P<0.05) between the concentrations.
*Various Horizontally small letters indicate significant differences(P<0.05) between Solvents.

DISCUSSION

M. chmomilla is one of the best medical plants were used to treat different infections before 1000 year ago in different countries. According to the best of our knowledge, the current study in Iraq aimed to evaluate the antibacterial activity of cold-water, boiling-water and ethanol extracts of *M. chmomilla* flowers and *N. sativa* against pathogenic bacteria isolated from UTI patient [5].

Gram-negative bacteria belong to Enterobacteriaceae family is one of the most etiological agents of UTI with percentage in-between 80% to 90% [13]. While, gram positive bacteria comes in the second degree, for example, *Strept. Faecalis* and *Staph. aureus* is the second most common cause UTI with percentage between 30% to 40% [14]. Most gram-negative bacteria as well as some of gram-positive bacteria have different virulence factors such as fimbriae, biofilms and capsule that enabling these pathogens to attachment, persistence

and colonization in the bladder epithelium of urinary tract and cause infection effect by these plant extract [15].

Matricaria chamomilla is an important medicinal plant was used in treatment of many infections such as respiratory tract infections, urinary tract infection and gastrointestinal tract infections in many countries. *M. chamomilla* flowers was used as antipyretic and carminative, in addition, flowers oil has been used in colic, flatulence and rheumatism [16]. One of the most abundant components of the essential flowers oil, apart from it is spasmolytic effects on intestinal smooth muscle [17]. Also, has been reported to have antibacterial, antipyretic, antifungal and anti-inflammatory as well as ulcer protective effect [18].

The alternative approach to over come multi antibiotic resistance through used natural product like bioactive substance from plant, essential oil and plant extract. In current study seeking antibacterial activity by cold , hot and ethanol extraction of *N. sativa* seed to investigation effectiveness of these extract against different UTI pathogen like *Staph. aureus, Strept. Faecalis* , *E. coli* and *K. pneumonia*. The ethanol extract effect method against these pathogenic bacteria and in less degree hot water extracted methods [19,20].

The *Nigella sativa* seeds (essential oil) contain antimicrobial effects as Emeka *et al.* [21] proved. The (MIC) was 2% versus *K. pneumonia* and 1% versus *Staph. aureus*. For both gram's positive and gram's negative bacteria There is proofs of effectiveness *N. sativa* seed oil. The traditional cure used for a very long time is *N. sativa*. The research proof that effectiveness antibacterial restraint of *N. sativa* compare with different ordinarily obtainable antibiotics and best on these depend conventional medicinal plant That contain very little side effects in addition prevent of developed resistance impedance traditional used antibiotics [22].

The bioactive constituent of *N. sativa* involved strong antimicrobial action as Singh *et al.* [24] documented , allusion *N. sativa* seeds extraction contain of effectiveness bio-active material accountable for cell divided and prevent growth of microbial strains which assist to take off pathogens. In addition, differences in *N. sativa* antibacterial activity might be due to differences in bioactive substances of the oils/extract collect from different area as well as the various picture of clinical isolate pathogens collect from various region of the world [24].

The antibacterial action of ethanol extraction of *N. sativa* seed exert through its action of thymol (phenolic alcohol) and phytoconstituents of thymoquinone. *N. sativa* seeds ethanol extraction contain secondary metabolites can inhibit cell wall synthesis and caused altering changes in membrane structure, disconnect the peptidyl transferase action and through bind/inhibit protein synthesis by binding to 50S subunit ribosomal molecules [25].

The current study is most beneficial in check and analyze the antibacterial activity of *N. sativa* extraction versus clinically isolates MDR UTI pathogens. The result of the current study are most concern. The infectious pathogenic are well known for their drug resistance many antibiotics classes and tolerate in nosocomial regulation. The current study proof the antimicrobial action of *N. sativa* extraction versus a broad range MDR nosocomial bacteria, antifungal and antiviral activities [23].

CONCLUSION

The best method of extraction ethanol extraction and most effectiveness plant extraction when mixed the of *N. sativa* and *M. chamoilla* produce antimicrobial activity against gram's positive bacteria and gram's negative bacteria when used ethanol extracted method.

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