

List of contents

No	Subject	Page No.
I	Introduction	1
II	Aim of the work	4
III	Review of literature	5
1	Factors influencing the development of nosocomial infections	12
2	Causative agents of nosocomial infections	14
3	Effect of antibiotics	16
4	Effect of essential oils	19
5	Combination between essential oils and antibiotics	26
6	Effect of radiation	27
7	Effect of essential oils on ultrastructure of bacterial cells	32
IV	Material and Methods	34
1	Collection of samples	34
2	Media used for identification of isolated bacteria	34
3	Identification of isolated bacteria	35
4	Effect of different antibiotics on the identified bacterial strains	45
5	Determination of minimum inhibitory concentrations (MICs) of selected antibiotics	47
6	Determination of minimum bactericidal concentration (MBCs) of selected antibiotics	48
7	Effect of different essential oils on the identified bacterial strains	48
8	Effect of combination between antibiotics and essential oils on the bacterial isolates	49
9	Effect of different types of radiation on the most resistant bacterial	50

	isolates	
9.1	Antibacterial activity of ultraviolet (UV)	50
9.2	Antibacterial activity of gamma irradiation	50
9.3	Antibacterial activity of X rays	51
10	Effect of thyme and jasmine oils on ultrastructure of bacterial cells	51
V	Results	54
1	Isolation of bacterial isolate	54
2	Identification of bacterial isolates	55
3	Effect of antibiotics on the identified bacterial strains	59
3.1	Susceptibility of Gram negative and Gram positive bacterial isolates to antibiotic	63
3.2	Determination (MICs) and (MBCs) of selected antibiotic against the selected clinical bacterial strains	66
4	Effect of different essential oils on the identified bacterial strains	67
5	Effect of combination between antibiotics and essential oils on the bacterial strains	73
6	Effect of different types of radiation on the most resistant bacterial strains	78
6.1	Antibacterial activity of ultraviolet rays	78
6.2	Antibacterial activity of gamma irradiation	83
6.3	Antibacterial activity of X rays	85
7	Effect of essential oils on the ultrastructure of <i>Pseudomonas</i> spp using Transmission Electron Microscope (TEM)	89
7.1	Effect of thyme oil	89
7.2	Effect of jasmine oil	92
VI	Discussion	95

VII	Summary	111
VIII	Recommendations	114
IX	References	116
	الملخص العربي	

LIST OF TABLES

Table no.	Subject	Page No.
1	Zone diameter interpretive chart	46
2	Essential oils used in study	48
3	Total bacterial isolates, source and their origin	54
4	Morphological , physiological and biochemical characters of bacterial isolates	56
5	Antibiotics and sensitivity of Gram negative bacteria	60
6	Antibiotics and sensitivity of Gram Positive bacteria	61
7	Susceptibility of Gram negative bacteria to different antibiotics	64
8	Susceptibility of Gram positive bacteria to different antibiotics	65
9	MIC and MBC for ciprofloxacin	67
10	MIC and MBC for Impinem	67
11	Effect of essential oils on Gram negative bacterial isolates	68
12	Effect of essential oils on Gram positive bacterial isolates	69
13	Effect of combination between antibiotics and essential oils	74
14	Effect of Ultraviolet rays (254 nm) on some bacterial isolates	80
15	Effect of gamma irradiation doses on some bacterial isolates	83
16	Effect of x rays on some bacterial isolates	86

List of Figures

Fig no.	Subject	Page No.
1	Susceptibility of Gram negative bacterial isolates to antibiotic	64
2	Susceptibility of Gram Positive bacterial isolates to antibiotics	65
3	Antibacterial action of different essential oils on G –ve bacteria	71
4	Antibacterial action of different essential oils on G +ve bacteria	72
5	Antibacterial action of combination essential oils with antibiotics on G -ve bacteria	76
6	Antibacterial action of combination essential oils with antibiotics on G +ve bacteria	77
7	Dose survival curve of <i>E.coli</i> viable cells after exposure to UV rays (254 nm) for different periods	82
8	Dose survival curve of <i>Pseudomonas</i> spp viable cells after exposure to UV rays (254nm) for different periods	82
9	Dose survival curve of <i>E.coli</i> viable cells after exposure to different doses of gamma rays .	84
10	Dose survival curve of <i>Pseudomonas</i> spp viable cells after exposure to different doses of gamma rays	84
11	Dose survival curve of <i>E.coli</i> viable cells after exposure to different doses of X rays	88
12	Dose survival curve of <i>Pseudomonas</i> spp viable cells after exposure to different doses of X rays	88
13	Transmission electron micrographs of <i>Pseudomonas</i> spp	90
14	Transmission electron micrographs of <i>Pseudomonas</i> spp sensitive to <i>Thymus Vulgaris</i> L (Thyme) essential oil	91
15	Transmission electron micrographs of <i>Pseudomonas</i> spp (cross section)	93
16	Transmission electron micrographs of <i>Pseudomonas</i> spp resistant to Jasmine essential oil (cross section)	94

List of Photos

Fig no.	Subject	Page No.
1	Citrate utilization test (+ve)	57
2	Voges-Proskauer test (+ve)	57
3	Urease test (+ve).	57
4	Carbohydrate fermentation test (+ve)	57
5	Morphological colony of <i>Escherichia coli</i> colonies on Mac Conkey agar plate	58
6	Morphological colony of <i>Pseudomonas</i> spp colonies on nutrient agar plate showing greenish-blue pigmentation	58
7	Antibacterial activity of antibiotics	62
8	Antibacterial activity of essential oils	70
9	Influence of combination between Imipenem and clove oil on <i>S.aures</i>	75
10	Antibacterial activity of ultraviolet rays on <i>E.coli</i>	79

List of Abbreviations.

Abbreviation	Meaning
CDC	Center for disease control and disease
EOs	Essential oils
FDA	Food and Drug Administration
GRAS	Generally regarded as safe
ICU	Intensive care unit
JCAHO	Joint Commission on accreditation of healthcare organization
<i>K.pneumoniae</i>	<i>Kelbsiella pneumoniae</i>
MDR	Multidrug resistance
MRSA	Multi resistant <i>Staphylococcus aureus</i>
NNIS	National Nosocomial Infection Surveillance
<i>P. aeruginosa</i>	<i>Pseudomonas. aeruginosa</i>
<i>Staph. aureus</i>	<i>Staphylococcus aureus</i>
TEM	Transmission Electron Microscope
VRE	Vancomycin resistant Enterococci
V.P	Voges proskauer
WHO	World health organization