

# Contents

Page

1. INTRODUCTION.....	1
2. REVIEW OF LITRATURE.....	5
2.1. <b>Wrapping of fresh products</b> .....	6
2.2 .Drying systems .....	13
2.3. Packaging systems.....	18
2.4. Storage systems.....	20
2.5.Total Microbes Count (TMC ).....	24
3. MATERIALS AND METHODS.....	27
4. RESULTS AND DISCUSSION.....	33
4.1.Effect of packaging type, keeping conditions and their interactions on fresh herb shelf life of sage ( <i>Salvia officinalis</i> L.) during 2011- 2012 and 2012-2013 seasons.....	33
4. 1.1 Fresh herb shelf life.....	33
4. 1.2. fresh weight loss.....	34
4. 1.3. Chlorophyll (a) and (b) mg/g F.W.....	37
4. 1.4. Essential oil percentage.....	38
4. 1.5. The main components of sage volatile oil.....	39
4. 1.6. Respiration rate (mg CO <sub>2</sub> /kg <sup>-1</sup> / h <sup>-1</sup> ) .....	40
4.2. Effect of packaging type, keeping conditions and their interactions on shelf life, fresh weight loss, chlorophyll a & b and essential oil percentage of <i>Rosmarinus officinalis</i> L. herb during 2011-2012 and 2012-2013 seasons.....	41
4. 2.1 Fresh herb shelf life.....	41
4. 2.2. fresh weight loss.....	43
4. 2.3. Chlorophyll (a) and (b) mg/g F.W.....	45
4. 2.4. Essential oil percentage.....	46

4. 2.5. The main components of rosemary volatile oil.....	47
4. 2.6. Respiration rate (mg CO <sub>2</sub> /kg <sup>-1</sup> / h <sup>-1</sup> ) .....	48
4. 3. Effect of drying methods, storage packaging and storage period on TMC (million/g.), Volatile oil percentage and the active ingredients of sage.....	49
4. 3.1. Total microbes count (TMC) average million/g.....	49
4. 3.2. Volatile oil percentage.....	51
4. 3.3. The active ingredients' percentage.....	55
4. 4. Effect of drying methods, storage packaging and storage period on TMC (million/g.), Volatile oil percentage and the active ingredients of rosemary.....	60
4. 4.1. Total microbes count (TMC) average million/g.....	60
4. 4.2. Volatile oil percentage.....	62
4. 4.3. The active ingredients' percentage .....	65
5. SUMMARY:.....	71
6. REFERENCES:.....	74
7. ARABIC SUMMARY:.....	84

## LIST OF TABLES

Table No.	Title	Page
Table (1)	Effect of packaging type, keeping conditions and their interactions on <i>Salvia officinalis</i> L. fresh herb shelf life during 2011-2012 and 2012-2013 seasons	33
Table (2)	Effect of packaging type, keeping conditions and their interactions on fresh weight loss, chlorophyll a & b and essential oil percentage of <i>Salvia officinalis</i> L. herb during 2011-2012 and 2012-2013 seasons.	35
Table (3)	Effect of packaging type, keeping conditions and their interactions on <i>Salvia officinalis</i> L. main components of essential oil.	39
Table (4)	Effect of packaging type, keeping conditions and their interactions on respiration rate (mg CO <sub>2</sub> /kg/h) of <i>Salvia officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons	40
Table (5)	Effect of packaging type, keeping conditions and their interaction on <i>Rosmarinus officinalis</i> L. fresh herb shelf life during 2011-2012 and 2012-2013 seasons	42
Table (6)	Effect of packaging type, keeping conditions and their interactions on fresh weight loss, chlorophyll a & b and essential oil percentage of <i>Rosmarinus officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons	43
Table (7)	Effect of packaging type, keeping conditions and their interactions on main components of <i>Rosmarinus officinalis</i> L. essential oil	47
Table (8)	Effect of packaging type, keeping conditions and their interactions on respiration rate (mg CO <sub>2</sub> /kg/ h) of <i>Rosmarinus officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons	48
Table (9)	Effect of drying methods, packaging and storage period and their interactions on Total Microbes Count (TMC) average of sage	50
Table (10)	Effect of drying methods, packaging and storage period and their interactions on Volatile oil percentage of sage	53
Table (11)	Effect of Drying methods on main components of sage essential oil in zero time.	55
Table (12)	Effect of drying methods and packaging and their interactions on main components of sage essential oil after 4 months from storage.	56
Table (13)	Effect of drying methods and packaging and their interactions on main components of sage essential oil after 8 months from storage	58
Table ( 14)	Effect of drying methods packaging type and their interactions on main components of sage essential oil after one year from storage	59
Table (15)	Effect of drying methods, storage packaging and storage period on Total Microbes Count (TMC) average of rosemary	61
Table (16)	Effect of drying methods, storage packaging and storage period on volatile oil percentage of rosemary	63
Table (17)	Effect of Drying methods on main components of rosemary essential oil on zero time	65
Table (18)	Effect of Drying methods, packaging and their interactions on main components of rosemary essential oil after 4 months from storage.	66
Table (19)	Effect of Drying methods, packaging and their interactions on main components of rosemary essential oil after 8 months from storage	69
Table (20)	Effect of Drying methods, packaging and their interactions on main components of rosemary essential oil after one year from storage	70

## LIST OF Figures

Table No.	Title	Page
Fig. (1)	Effect of packaging type, keeping conditions and their interactions on <i>Salvia officinalis</i> L. fresh herb shelf life during 2011-2012 and 2012-2013 seasons.	34
Fig. (2)	Effect of packaging type, keeping conditions and their interactions on fresh weight loss of <i>Salvia officinalis</i> L. herb during 2011-2012 and 2012-2013 seasons.	36
Fig. (3)	Effect of packaging type, keeping conditions and their interactions on chlorophyll a & b of <i>Salvia officinalis</i> L. herb during 2011-2012 and 2012-2013 seasons.	36
Fig. (4)	Effect of packaging type, keeping conditions and their interactions on respiration rate (mg CO <sub>2</sub> /kg/ h) of <i>Salvia officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons.	40
Fig. (5)	Effect of packaging type, keeping conditions and their interactions on <i>Rosmarinus officinalis</i> L. fresh herb shelf life during 2011-2012 and 2012-2013 seasons.	42
Fig. (6)	Effect of packaging type, keeping conditions and their interactions on fresh weight loss of <i>Rosmarinus officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons.	44
Fig. (7)	Effect of packaging type, keeping conditions and their interactions on chlorophyll a & b of <i>Rosmarinus officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons.	44
Fig. (8)	Effect of packaging type, keeping conditions and their interactions on respiration rate (mg CO <sub>2</sub> /kg <sup>-1</sup> / h <sup>-1</sup> ) of <i>Rosmarinus officinalis</i> L. fresh herb during 2011-2012 and 2012-2013 seasons.	48

**ABSTRACT**

Two consecutive field Experiments were conducted during the 2011/2012 and 2012/2013 seasons at Experimental Research Station of the Agriculture Research Center, El-Arish, North Sinai. The main objectives of this study were to study the effects of the packaging pattern and the conditions of keeping the herb on the shelf of the sage and rosemary, and to evaluate the best method of drying and packing and its effect on the microbial load and the content of the essential oil and the percentage of active ingredients in the oil of the sage and rosemary. Results indicated that for first experiment the packaging of sage and rosemary fresh herb in foam dishes covered with cellophane or sharnk - film and storing in the refrigerator at  $5 \pm 1$  ° C and 70-80% relative humidity maintained the quality of the herb and increased the duration of shelf life. For second experiment The best method of drying was the drying in the shade and the best type of packaging during storage were carton boxes. On the other hand, the results showed that the volatile oil and active ingredients were decreased when storage period was increase and there was a steady increase in rate of microbial load with increase storage period