PHYTOCHEMICAL AND BIOLOGICAL STUDIES ON CERTAIN PLANTS BELONGING TO FAMILY CRASSULACEAE

A thesis Submitted

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In partial fulfillment of the requirements
For the degree of
Master in Pharmaceutical Sciences
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2011

دراسة فيتوكيميائية و بيولوجية لبعض النباتات التابعة لعائلة الكراسيولاسى

رسالة مقدمة
من

سالى سعد فكرى

بكالوريوس في العلوم الصيدلية
كلية الصيدلة جامعة عين شمس 2005
معيدة, قسم العقاقير

و ذلك لإستكمال متطلبات الحصول على
درجة الماجستير في العلوم الصيدلية (عقاقير)
قسم العقاقير
كلية الصيدلة – جامعة عين شمس
العباسية – القاهرة
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2011

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LIST OF ABBREVIATIONS

µm	**Micrometer**
^{0}C	**Centigrade**
^{13}C-NMR	**Carbon-13-Nuclear Magnetic Resonance**
^{1}H-NMR	**Proton Nuclear Magnetic Resonance**
bp	**Base pair**
CC	**Column Chromatography**
cm	**Centimeter**
Conc.	**Concentrated**
CTAB	**Hexadecyl trimethyl-ammonium bromide**
DMSO-d_6	**Dimethylsulfoxide-d_6**
DNA	**Deoxyribonucleic acid**
DNTP	**Deoxyribonucleotide triphosphate**
DTH	**Delayed-type hypersensitivity**
ECG	**Electrocardiogram**
EDTA	**Ethylene diamine tetra acetic acid**
FBS	**Fetal Bovine Serum**
Fig.	**Figure**
g	**Gram**
GS	**Genetic similarity**
hr.	**Hour**
Hz	**Hertz**

IC_{50}	**Inhibitory Concentration**
IL	**Interleukin**
in.	**Inch**
IR	**Infra-red**
***J* value**	**coupling constant**
Kg	**kilogram**
KMC	**Kalanchosine dimalate**
L	**Liter**
MBC	**Minimum Bactericidal Concentration**
mg	**Milligram**
MIC	**Minimum Inhibitory Concentration**
min.	**minute**
ml.	**milliliter**
O.D.	**Optical density**
PC	**Paper Chromatography**
PCR	**Polymerase Chain Reaction**
PPC	**Preparative paper chromatography**
ppm	**Part per million**
RAPD	**Random Amplified Polymorphic-DNA**
RNA	**Ribonucleic acid**
RPMI-1640	**Rosewell Park Memorial Institute**
SRB	**Sulphorhodamine-B**

SX	**Selectivity Index**
TCA	**Trichloroacetic acid**
TLC	**Thin Layer Chromatography**
TMS	**Trimethylsilane**
TPO	**Thyroid peroxidase**
UV	**Ultraviolet**
v/v	**Volume per volume**
w/v	**Weight per volume**
δ	**Chemical shift**
λ	**Wave length**

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INTRODUCTION

During the last decade, the use of traditional medicine has expanded globally and is gaining popularity. It has continued to be used not only for primary health care of the poor in the developing countries, but also in countries where conventional medicine is predominant in the national health care system. Medicinal plants have been used as sources of medicine in virtually all cultures.

The power of herbs cannot be denied as their therapeutic values have been proven and attested to by billions of people around the world. The World Health Organization estimates that 80% of the world's population relies on herbs and traditional herbal medicine for their primary health care.

Family crassulaceae is a large family, widely distributed in cosmopolitan, especially southern Africa, except Australia and West pacific. It comprises about 35 genera and 1500 species (Boulos, **1999**). Genera includes: *Aeonium, Crassula, Cotyledon, Esheveria, Sedum, Rosularia, Prometheum, Tylecodon and Kalanchoe* (Trease and Evans, **2009**).

Kalanchoe, a genus of approximately one hundred species, is native to tropical Africa but has been naturalized throughout the tropics (Chopra *et al*, **1956** *and* Gaind *et al*, **1981**). Other names of genus *Kalanchoe* are *Bryophyllum* and *Cotelydon* (Maurice, **1993**).

In traditional medicine the juice of *Kalanchoe* is used for the local treatment of periodontal disease, cheilitis, cracking lips in children, bruises, wounds, boils (Mourao *et al*, **1999**), insect bites (Rossi-Bergmann *et al*, **1994**), ear infection, dysentery (Akinpelu, **2000**), fever, abscesses, coughs,

skin diseases (Kuo *et al*, **2008**), cholera, urinary diseases, whitlow (Siddiqui *et al*, **1989**), tissue injuries (Liu *et al*, **1989**), arthritis and gastric ulcers (Rossi-Bergmann *et al*, **1994**). Crushed leaves are rubbed on or tied to the head to bring relief for headache (Akinpelu, **2000**), rheumatism (Supratman *et al*, **2001** [A]), treatment of pulmonary infection, rheumatoid arthritis and gastric ulcer (Cruz *et al*, **2008**).

A literature survey revealed that the different extracts of *Kalanchoe* species had been reported to possess antibacterial, antifungal (Pal & Nag Chaudhuri, **1991**), analgesic (Nguelefack *et al*, **2004** and Nguelefack *et al*, **2006**), anti-inflammatory (Pal & Nag Chaudhuri, **1991**; Costa *et al*, **2006** and De Paiva *et al*, **2008**), antiviral (Shirobokov *et al*, **1981**), sedative (Wagner *et al*, **1985**), antiulcer (Pal & Nag Chaudhuri, **1991**), immunomodulatory (Rossi-Bergmann *et al*, **1994**; Costa *et al*, **1994** and Cruz *et al*, **2008**), antilieshmanial (Da Silva *et al*, **1995**; Muzitano *et al*, **2006** [B] and Muzitano *et al*, **2009**), CNS depressant (Pal *et al*, **1999**), thyroid peroxidase inhibitor (Ferreira *et al*, **2000**), cytotoxic activity (Yamagishi *et al*, **1989**; Supratman *et al*, **2001** [B]; Wu *et al*, **2006** and Kuo *et al*, **2008**), hepatoprotective (Yadav & Dixit, **2003** and Harlalka, **2007**), antimoicrobial (Akinpelu, **2000**; Tadeg *et al*, **2005**; Monthana & Lindequist, **2005**; Akinsulire *et al*, **2007** and Nahar *et al*, **2008**), inhibition of B cell development (De Paiva *et al*, **2008**), cardiovascular effects (Nguelefack *et al*, **2008**), antihyperglycemic (Kamgang *et al*, **2008**), larvicidal (Trevisan *et al*, **2006**) and insecticidal activities (Supratman *et al*, **2000** and Supratman *et al*, **2001** [A]).

Earlier studies on different *Kalanchoe* species reported the isolation of polysaccharides, flavonoids (Siddiqui *et al*, **1989** and Liu *et* al, **1989**), sterols (Siddiqui *et al*, **1989** and Kalinowska *et al*, **1990**), ascorbic acid,