UNIVERSITI PUTRA MALAYSIA

CONTROL OF GRAY MOLD ROT DISEASE OF TOMATO CAUSED BY Botrytis cinerea WITH EMULSION FORMULATED FROM Moringa oleifer Lam. CRUDE EXTRACT

TIJJANI AHMADU

FP 2018 46

CONTROL OF GRAY MOLD ROT DISEASE OF TOMATO CAUSED BY *Botrytis cinerea* WITH EMULSION FORMULATED FROM *Moringa oleifer* Lam. CRUDE EXTRACT

By

TIJJANI AHMADU

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirements for the Degree of Doctor of Philosophy

December 2017

DEDICATION

The work in this thesis is dedicated to the memory of my late father Haji Ahmad T. Yusuf (30/01/1928-15/10/1969), to my beloved Mom Juwairiyya Haji Idris and my entire family.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement of the degree of Doctor of Philosophy

CONTROL OF GRAY MOLD ROT DISEASE OF TOMATO CAUSED BY *Botrytis cinerea* WITH EMULSION FORMULATED FROM *Moringa oleifer* Lam. CRUDE EXTRACT

By

TIJJANI AHMADU

December 2017

Chairman : Assoc. Prof. Khairulmazmi Ahmad, PhD
Faculty : Agriculture

Series of laboratory experiments were conducted with emphasis on the preparation of nano-emulsion formulations from active compounds in *Moringa oleifera* crude extracts and *in vitro* and *in vivo* evaluation of their bio-efficacy against *Botrytis cinerea* causing gray mold rot disease on tomato. In total, nine isolates were successfully isolated from infected tomato sampled from Cameron Highlands, Pahang, Malaysia in 2015. The isolates were identified based on morpho-cultural characteristics such as mycelial texture, conidia shapes and sizes, and sclerotia forms. Conidia (n=40) measured 9.7-17.1 × 6.6-10.5 µm, were smooth one-celled, ellipsoidal, globose or ovate and borne in clusters on branching tree-like conidiophores. To confirm the morphological identification, the primer pair ITS4/ITS5 (ITS region) of rDNA and part of Glyceraldehyde-3-phosphate dehydrogenase gene (G3PDH) were used for amplification and sequencing of the isolates (BCH01 to BCH09). The sequences obtained (GenBank Accession No. KU992692-KU992700 for ITS and KY201456-KY201464 for G3PDH) showed 99-100% homology with *B. cinerea* isolates in the GenBank nucleotides database. Based on the pathogenicity assay, the isolates showed variations in their levels of severity. In ripen tomato fruits, the per cent disease severity ranged from 36 to 97%, with maximum per cent observed in BCH07 (97%) and minimum in BCH04 (36%). Among the organic solvents used in the extraction of the bioactive compounds, methanol gave the highest (14.16%) percentage extraction yield compared to ethanol (10.23%), ethyl acetate (5.24%), hexane (2.3%) and distilled water (1.71%). SEM and TEM micrographs on the effect of the crude extracts of *M. oleifera* on the conidia and mycelium of *B. cinerea* treated with MIC concentration revealed irreversible surface and ultra-structural changes that include lysis, shrinkage, pore formation, aggregation and vacuolation compared to the controls. The results of GC-MS led to the identification of 67 volatile chemical compounds with n-Hexadecanoic acid, Malonic acid, 6-decanoic acid, (Z)-, .beta.-l-Rhamnofuranoside,5-O-acetyl-thio-octyl-, 2-Dimethyl (trimethylsilylmethyl) silyloxymethyl tetrahydrofuran, and 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- as the predominant in the extract. Further chemical elucidation of the crude extracts performed with LC-MS/MS showed the presence of phenylvaleric acid, caffeic acid derivative, quinic acid, apigenin-6,8-di-C-β-D-glucopyranoside (Vicenin II) , Apigenin 6 C glucoside, quercetin-3-O-glucoside dimer and kaempferol 3-o glucoside dimer as the major non-volatile chemical compounds, which are mostly flavones, flavonois and phenolic acids. The results on the characterization of the formulations showed that all formulations were stable at 25°C for two months and 54°C for one month. All formulations have particle size of less than 100 nm, PDI from 0.108-0.415, surface tension below 30 mN/m, viscosity less than 60 mPas, zeta potentials less than 40 mV and pH less than 6.00. TEM micrographs of the formulations confirmed the spherical shape of nano-emulsions and the particle size of less than 100 nm as measured with Malvern Zsizer instrument. The results of SEM and TEM micrographs on the effect of the formulations on the conidia and mycelium of *B. cinerea* confirmed the irreversible surface and ultra-structural alterations such aggregation, abnormal growth, lysis, reduced hyphal diameter and length, destruction of the organelles and irregular cell wall shape compared to the controls. *In vivo* evaluation was conducted with healthy tomato fruits via preventive and curative treatments. The results on *in vivo* indicated 93.3% to 100% disease reduction in treated fruits under preventive method compared with 0% in the negative controls. Results on the effects of the formulations on the post-harvest quality of the fruits showed that % weight loss was as low as 0.72%, loss in firmness (3.09%) and CIE values (L*=37.72, a*=29.15, b*=19.98) for colour, on tomatoes treated with F13 the formulations under preventive method. Similarly, chemical analysis of the F13 formulations treated fruits showed that the final percent TSS was 4.18%, AA (20.95 mg/ml), TA (0.34%) and pH (4.05). Mineral content analysis revealed that tomatoes treated with F13 formulations gave the best results on mineral contents with K (201.96 mg/ml), Ca (28.29 mg/ml), Mg (20.56 mg/ml) and Zn (0.42 mg/ml).

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KAWALAN PENYAKIT REPUT KULAT PERANG TOMATO YANG DISEBABKAN OLEH *Botrytis cinerea* DENGAN FORMULASI EMULSI DARI EKSTRAK MENTAH *Moringa oleifera*

Oleh

TIJJANI AHMADU

Disember 2017

Pengerusi : Prof. Madya Khairulmazmi Ahmad, PhD
Fakulti : Pertanian

Eksperimen makmal telah dilakukan berterusan dengan memberi fokus terhadap langkah penyediaan formulasi nano-emulsi sebatian aktif daripada ekstrak mentah *Moringa oleifera* dan penilaian terhadap keberkesanan produk terhadap *Botrytis cinerea* yang menyebabkan penyakit reput kulat kelabu pada tomato secara *in vitro* dan *in vivo*. Kesemua sembilan pencilan berjaya disisihkan daripada sampel buah tomato terjangkit dari Cameron Highland, Pahang, Malaysia pada tahun 2015. Pencilan telah dikenalpasti berdasarkan ciri-ciri morfo-kultur seperti tekstur miselia, bentuk dan saiz konidia, serta bentuk sklerotia. Ukuran konidia (n=40) adalah 9.7-17.1 × 6.6-10.5 µm, licin dan mempunyai satu sel, elipsoid, globos atau ovat dan terhasil secara berkelompok pada konidiofor yang bercabang seperti pokok. Untuk mengesahkan pengecaman morfologi, sepasang primer ITS4/ITS5 (kawasan ITS) daripada rDNA dan sebahagian gen Glyceraldehyde-3-phosphate dehydrogenase (G3PDH) digunakan untuk tujuan amplifikasi dan penjujukan pencilan tersebut (BCH01 - BCH09). Jujukan yang diperolehi (Number kemasukan GenBank KU992692-KU992700 untuk ITS dan KY201456-KY201464 untuk G3PDH) menunjukkan 99-100% homologi dengan pencilan *B. cinerea* dalam pangkalan data nukleotida GenBank. Berdasarkan ujian patogenisiti, pencilan-pencilan tersebut menunjukkan variasi tahap keparahan penyakit. Peratus keparahan penyakit adalah di antara 36-97% pada buah tomato yang masak, dengan peratus maksimum dicatatkan oleh BCH07 (97%) dan minimum oleh BCH04 (36%). Di kalangan pelarut organik yang diuji dalam pengekstrakan sebatian bioaktif, metanol menunjukkan peratus hasil pengekstrakan tertinggi (14.16%) berbanding pelarut yang lain. Mikrograf SEM dan TEM oleh ekstrak mentah *M. oleifera* terhadap konidia dan miselia *B. cinerea* yang dirawat pada kepekatan MIC menunjukkan kerosakan kekal permukaan dan stuktur ultra seperti lisis, pengecutan, pembentukan liang, penggumpalan dan pemvakulan berbanding dengan rawatan kawalan. Dapatan dari GC-MS telah membawa kepada pengenalpastian 67 sebatian kimia meruap dengan asid n-Hexadecanoik, asid Malonik, asid 6-decanoik, (Z) -, .beta.-l-Rhamnofuranoside, 5-O-asetil-thio- oktil, 2-Dimetil (trimethylsilylmethyl) silyloxymethyl tetrahydrofuran, dan 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl- sebagai pradominan dalam ekstrak. Penjelasan kimia selanjutnya mengenai ekstrak mentah yang dijalankan oleh LC-MS/MS menunjukkan kehadiran asid fenilvalerik, derivatif asid caffeic, asid quinik, apigenin-6,8-di-C-β-D-glucopyranoside (Vicenin II), Apigenin 6 C glucoside, dimensi quercetin-3-O-glucoside dan kaempferol 3-o glucoside dimer sebagai sebatian kimia utama yang tidak meruap, yang kebanyakannya flavon, flavonois dan asid fenolik. Keputusan pencirian formulasi menunjukkan semua formulasi adalah stabil pada 25°C selama dua bulan dan 54°C selama satu bulan. Semua formulasi mempunyai saiz zarah kurang daripada 100 nm, PDI dari 0.108-0.415, ketegangan permukaan di bawah 30 mN/m, kelikatan kurang daripada 60 mPas, potensi zeta kurang daripada 40 mV dan pH kurang daripada 6.00. Mikrograf TEM dari formulasi tersebut mengesahkan nano-emulsi berbentuk sfera dan saiz zarah kurang dari 100 nm telah diukur menggunakan alat Malvern Zsizer. Dapatan mikrograf SEM dan TEM ke atas kesan formulasi terhadap konidia dan miselia *B. cinerea* mengesahkan terdapat kesan kerosakan kekal terhadap permukaan dan struktur ultra seperti penggumpalan, pertumbuhan tidak normal, lisis, pengecilan diameter dan panjang hifa, kerosakan pada organel, bentuk dinding sel yang tidak sekata berbanding dengan rawatan kawalan. Penilaian *in vitro* telah dilakukan pada buah tomato yang sihat melalui kaedah pencegahan dan pemulihan. Keputusan *in vivo* menunjukkan pengurangan penyakit 93.3-100% pada buah-buahan yang dirawat dengan kaedah pencegahan berbanding 0% pada rawatan kawalan negatif. Keputusan kesan formulasi F13 menggunakan kaedah pencegahan terhadap kualiti selepas tuai tomato menunjukkan peratusan kehilangan berat adalah serendah 0.72%, kehilangan ketegangan (3.09%), nilai CIE warna buah tomato terawat (L*=37.72, a*=29.15, b*19.98). Begitu juga dengan analisis kimia terhadap formulasi F13, buah yang dirawat menunjukkan bahawa peratusan akhir TSS adalah 4.18%, AA (20.95 mg/ml), TA (0.34%) dan pH (4.05). Analisa kandungan mineral mendedahkan bahawa formulasi tersebut mampu meningkatkan kandungan mineral K (201.96 mg/ml), Ca (28.29 mg/ml), Mg (20.56 mg/ml), dan Zn (0.42 mg/ml).

ACKNOWLEDGEMENTS

Alhamdulillah, Glory be to Allah the most beneficient and most merciful. I thank Al-mighty Allah for his continuous guidance and for giving me strength, patient and determination to complete the study. Actually this thesis represents tireless efforts by many people and the support of various institutions of which I would like to extend my appreciations.

First, I wish to express my profound appreciation and gratitude to my chairman supervisory committee Assoc. Prof. Dr. Khairulmazmi Ahmad for the dedication, guidance, hospitality, encouragement and scientific training he gave me throughout the period of the research. I also wish to express my sincere appreciation to my co-supervisor Dr. Siti Izera Ismail for her guidance, tireless support, suggestions, tenacious assistance, patience and outstanding function as a never failing mentor throughout my study. I am also indebted to my co-supervisor Prof. Dzolkifli Omar for his fatherly and scholarly advice throughout the period of this research. Their scientific intuition have inspired me and enriched my growth as a student and a researcher. Words alone cannot express my feelings for everything they have done for me. However, may Al-mighty Allah bless and reward you abundantly for your efforts. I am looking forward for future collaboration.

I am also grateful to Dr. Nor-Ayu Asib for her suggestions and assistance with materials in the Toxicology Laboratory. My special thanks go to Pn Nor hayati Yusuf of the *Laboratori Bioubutan Molekul, Institut Biosains* and the staff of Mycology 1 & 2 Laboratories, Molecular Laboratory, Bacteriology Laboratory, Toxicology Laboratory, Food Science Laboratory and Post-harvest Laboratory for their valuable help and support. Just needful to offer my sincere gratitude to some of the staff viz: Mrs. Junaina, Mr. Shamsuddeen, Mr. Muhammad Nazri, Mrs. Asmalina, Mr. Johari and Mr. Rozali for their assistance during the conduct of my research.

My appreciations also go to Tertiary Education Trust Fund (TETFund) of Nigerian government and the management of Abubakar Tafawa Balewa University, Bauchi for the study fellowship given to me to comfortably and successfully complete my study. Special and warm thanks also go to Prof. S.A. Ibrahim the Vice Chancellor Abubakar Tafawa Balewa University, Bauchi for his encouragement and speedy approvals to all my financial requests throughout the period of this study.

During my study, I have a number of excellent friends and colleagues, but just to mention few that include Malam Gambo Abdullahi, Muhammd Naseer, Ali Zagi Al-bahely all PhD students in Entomolgy; Osamah Zaid, Habu Musa, Saidu A. Paiko, Abdul-Azeez Bashir Kutawa, Wael Sultan, M. Ibrahim Mahmud, M. Tahir Shittu and Muhammad Buhari. I am also tempted and indebted to personally thank my friends in the Institute of Tropical Agriculture (ITA) Usman Magaji and Sulaima Babura for their guidance in some of my laboratory works and data analysis. I also thank Mr Agada and Mr Azhaar of Postharvest Laboratory for their guidance and assistance to conduct postharvest quality and chemical analysis of my samples under their supervision in their Laboratory.

To my family, I would like to thank to all my wives (Saudat, Hajara and Halimat) and my lovely children (Abdulmannan, Abdussamad, Abdullahi, Abdurrahman, Alqasim, Ammar, Uwais, Yunus, Amatul-hakeem, Asma'u, Juwairiyya, Aminatu, Mu'azatu and Maimunatu) for their inseparable support, dedication in prayers, love and persistent confidence in me. I also thank my brother Ahmad Ubandi for overseeing my family while I am away for this study. Finally, I thank all those that have contributed to the successful completion of this thesis and my due apologies to those that I could not mention them here.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Khairulmazmi Ahmad, PhD
Associate Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Chairman)

Siti Izera Ismail, PhD
Senior Lecturer
Faculty of Agriculture
Universiti Putra Malaysia
(Member)

Dzolkifli Omar, PhD
Professor
Faculty of Agriculture
Universiti Putra Malaysia
(Member)

____
ROBIAH BINTI YUNUS, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

Declaration by Graduate Student

I hereby confirm that:

- This thesis is my original work;
- Quotations, illustrations and citations have been duly referenced;
- This thesis has not been submitted previously or concurrently for any other degree at any other institutions;
- Intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- Written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and Innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- There is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software.

Signature: ________________________ Date: ________

Name and Matric No.: Tijjani Ahmadu (GS41575) __

Declaration by Members of Supervisory Committee

This is to confirm that:

- The research conducted and the writing of this thesis was under our supervision
- Supervision responsibilities as stated in Rules 41 in Rules 2003 (Revision 2012-2013) were adhered to.

Signature: ______________________________
Name of Chairman of Supervosory Committee: Assoc. Prof. Dr. Khairulmazmi Ahmad

Signature: ______________________________
Name of Member of Supervosory Committee: Dr. Siti Izera Ismail

Signature: ______________________________
Name of Member of Supervosory Committee: Dr. Dzolkifli Omar

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF MICROGRAPHS

LIST OF ABBREVIATIONS

±SD	Standard deviation of means
a.i	active ingredient
AA	Ascorbic Acid
ANOVA	Analysis of variance
AUDPC	Area Under Disease Progress Curve
Bp	Base Pair
Ca	Calcium
CIE	Commission Internationale de l'E- clairage
CMA	Corn Meal Agar
cm	Centimeter
CRD	Complete Randomize Design
DAI	Days after Inoculation
DNA	Deoxyribonucleic acid
DS	Disease Severity
DSI	Disease Severity Index
ED	Edonol
EDTA	Ethylene Diamine Tetraacetic Acid
FAO	Food and Agricultural
GC-MS/MS	Gas Chromatography-Mass Spectrophotometry/ Mass Spectrophotometry
g	grams
ISSR	Inter Simple Sequence Repeats
Kb	Kilo base
LBC	lactophenol-cotton blue
LCB	Lactophenol-cotton blue
LC-MS/MS	Liquid Chromatography- Mass Spectrophotometry/Mass Spectrophotometry
MEA	Malt Extract Agar
Mg	Magnesium
Min	Minutes
MLDW	*Moringa* Leaves Distilled Water extracts
MLE	*Moringa* Leaves Ethanol extracts
MLEA	*Moringa* Leaves Ethyl Acetate extracts
MLH	*Moringa* Leaves Hexane extracts
ML	Millilitres
MLM	*Moringa* Leaves Methanol extracts
Mm	millimetre
mN/m	millinewtons per meter
mPas	Millipascal-second
NICB	National Centre for Biotechnology Information
Nm	Nanometer
No.	Number
PBD	Potato Dextrose Broth
PCR	Polymerase Chain Reaction
PDA	Potato dextrose agar
PDI	Polydispersity Index
pH	Logarithm of hydrogen ion activity
PIRG	Percentage Inhibition Radial Growth

PSGI	Percentage Spore Germination Inhibition
RAPD	Random Amplified Polymerase DNA
RNA	Ribonucleic acid
Rpm	revolution per minute
SEM	Scanning Electron Microscopy
spp	species
SSR	Simple Sequence Repeats
TA	Titrable Acidity
TEM	Transmission Electron Microscopy
Ter.	Termul
TSS	Total Soluble Solids
Tw	Tween 20
UPM	Universiti Putra Malaysia
Uv	Ultraviolet
Ver.	Version
Viz	*videlicet*, that is, namely
V	Volt

CHAPTER 1

INTRODUCTION

Tomato (*Solanum lycopersicum Syn Lycopersicon esculentum Mill.*) is an herbaceous plant that belongs to the family *Solanaceae*, a nightshade family that originated from South America (Agrios, 2005). The fruits are rich in minerals, vitamins and lycopene (Etebu *et al*., 2013; Borghesi *et al*., 2016). Farmers at all levels of production including small scale, medium and large commercial farmers were attracted by tomato because of its quick maturity and high yielding potentials. Moreover, the crop has some peculiar economic importance that includes domestic trades, exports and development of local food and agro-allied industries (Borghesi *et al*., 2016).

Highlands of Peru with good climatic conditions especially the temperature of below 25°C, is believed to be the centre of diversity for tomato (Smith, 1994) and this explains the reason why tomato production is highly successful in Cameron Highlands of Pahang in Malaysia. Currently production of tomato in Malaysia is increasing due to demand of continuous supply of the crop. In Malaysia, fresh tomato fruits were produced in open-fields or under greenhouse conditions. The yield in an open-field cultivation is about 100-120 ton/ha while the greenhouse yield is about 300-500 tons/ha (FAO, 2012; Ismail *et al*., 2015). The yield of the crop is generally far below its potentials due to the activities of large number of pests and diseases (Ana *et al*., 2003). About 200 known diseases affecting tomato were reported by Agrios (2005), out of which 70 % has been caused by bacterial and fungal pathogens (Janisiewiez *et al*., 2001; Wani, 2011). In Malaysia postharvest rot diseases caused by fungal pathogens are perhaps the most common and most widely distributed disease of tomato and this can cause a significant reduction in postharvest yield potential of the crop. One of such diseases is gray mold rot caused by *B. cinerea*. The occurrence of the disease is worldwide, particularly widespread in Malaysia, around areas of Cameron Highlands in Pahang, northern part of Malaysia. Enyiukwu *et al*. (2014) and Kader (2005) reported that the estimated postharvest losses of tomato due to postharvest diseases worldwide range between 30-40%. In Malaysia, occurrence of *B. cinerea* caused gray mold rot disease on tomato in the greenhouses particularly in the Cameron Highlands area of Pahang. This resulted in severe damages at both pre- and post-harvest periods with subsequent yield losses and economic downfall. At present, the pathogen (*B. cinerea*) causing gray mold rot have not been extensively studied in Malaysia despite its ranking as second most destructive or aggressive fungal pathogen in the top 10 devastating fungal plant pathogens worldwide (Dean *et al.*, 2012; Kim *et al.*, 2016).

For sustainable tomato production there is need to search for remedies to this incessant problem threatening tomato production in Malaysia and worldwide. In a bid to control these fungal pathogens causing losses to valuable crops at present, several phytosanitary measures such as chemical control, physical, cultural and use of resistant varieties have been adopted to reduce the menace of diseases on the crop but each method was found to be associated with some drawbacks. For instance, chemical fungicides has been recognized as the most common, popular, potent and primary method for managing postharvest fungal decay of fruits and vegetables but their use has been regulated or limited due to their teratogenicity, carcinogenicity, acute and high residual toxicity, long period of degradation, environmental pollution and possible side effects or outcomes on human health through food chain (Ai-ying *et al*., 2011; Enyiukwu *et al*., 2014). In line with the public opinions and concerns related to the environmental and human safety, development of resistance by plant pathogens due to progressive use of chemicals and increasing regulations on chemical pesticides use (Elliott *et al*., 2009), it is imperative to explore new alternatives that will reduce the use of synthetic chemicals.

In recent time, plant-based pesticides as a form of biological control that are enabling and instrumental to manage postharvest decay of fruits and extend their shelf life without pollution to the environment and risk to the public health were investigated as an alternative to chemical pesticides for controlling diseases in fruits and vegetable incited by plant pathogenic fungi. The plants contain natural phytochemicals which could be exploited for use as biopesticides (Satish *et al*., 2007). For example medicinal plants like *Moringa oleifera* (Pereira *et al*., 2015) extracts containing a quantum of crucial phytochemicals rich in phenolic compounds, flavonoids, tannins, saponins and alkaloids are now emerging as secure, safer and more compatible way to manage plant pathogens. *Moringa oleifera* also known as a miracle plant, all plant parts having diverse range of medicinal uses and other purposes such as water purification, fertilizer, biogas and biopesticides (Stohs and Hartman, 2015). The flowers, roots, bark, leaves, stem, and seeds of *M. oleifera* have antimicrobial qualities and/or properties (Dwivedi and Enespa, 2012; Arora *et al*., 2013), antifungal (Kadhim and AL-Shamma, 2014; Batista *et al*., 2014), antioxidant (Verma *et al*., 2009), antibacterial, antiulcer (Arora and Onsare, 2014; Belay and Sisay, 2014), anti-inflamatory, diuretic (Caceres *et al*., 1992; Krishnamurthy *et al*., 2015) and anticancer (Pinto *et al*., 2015).

The active ingredients in these valuable medicinal plants need to be upgraded or enhanced into plant-based pesticides in order to compete with the commercial synthetic pesticides in the market. This therefore, necessitate the need for the inclusion of pesticide formulation which will ease the handling of the active ingredients, extend their shelf life, assist in application and increase their effectiveness on the target organisms (Asib *et al*., 2015; Ribeiro *et al*., 2015). Emulsion is the most common commercial formulation and currently, nano-emulsion has been introduced. Nano-emulsion is an important delivery technology for chemical compounds that comprises a small droplet size ranging from 5 nm to 100 nm (Ranjan *et al*., 2014; Asib *et al*., 2015), low surface tension, low viscosity and good appearance (Ribeiro *et al*., 2015). It composes of a surfactant, an oil phase and an aqueous phase in appropriate proportions or ratios (Changez and Varshney, 2000). The nano-emulsion has a very good stability at storage over a wide range of temperatures (-10°C to 55°C). It has an excellent long term dilution characteristics in water since it is water based and highly capable of solubilizing lipophilic and hydrophilic compounds leading to the use of minimal inert ingredients. Additionally, nano-emulsions can carry active compound to the desired site of action, protect it against adverse environmental conditions and enhance efficacy (Asib *et al*., 2015; Ribeiro *et al*., 2015).

Despite the efficacy and environmental compatibility of nano-emulsion delivery technology and the quantum of crucial and diverse phytochemicals in *M. oleifera,* there is no report regarding its formulation as nanomulsion biopesticide against plant pathogens. Hence, this research aimed at the formulation of *M. oleifera* crude extracts as nano-emulsion for controlling *B. cinerea* causing gray mold rot on tomato. Thus, it is hoped that this work will provide new information that could be used as a phytosanitary measure for the control of gray mold disease globally especially in Malaysia.

The objectives of this study were:

1. To identify *B. cinerea* associated with gray mold disease of tomato based on their morpho-cultural and molecular properties.
2. To extract and profile phytochemical compounds from *M. oleifera* crude extracts and determine their MIC, MFC and antifungal activities against *B. cinerea* isolates.
3. To formulate *M. oleifera* crude extracts as nanoemulsions and evaluate their physical characteristics.
4. To validate the effectiveness of the formulations on selected isolate of *B. cinerea in vitro* and *in vivo* and their effects on the postharvest qualities of the tomato.

.

REFERENCES

Abd-Alla, M. A. and Haggag, W. M. (2010). New safe methods for controlling anthracnose disease of mango (*Mangifera indica* L.) fruits caused by *Colletotrichum gloeosporioides* (Penz.). *Journal of American Science*, 8(8): 361-366.

Abhishek, T., Sharma, N., Sharma, V and Afroz, A. (2013). A review on conventional and non-conventional methods to manage postharvest diseases of perishables. *Researcher,* 5(6): 6–19.

Abuhamdah, S., Abuhamdah, R., Al-Olimat, S. and Chazot, P. (2013). Phytochemical Investigations and Antibacterial Activity of Selected Medicinal Plants from Jordan. *European Journal of Medicinal Plants.* 3(3): 34-404.

Adebisi-Adelani, O., Olajide-Taiwo, F. B., Adeoye, I. B. and Olajide-Taiwo, L. O. (2011). Analysis of Production Constraints Facing Fadama Vegetable Farmers in Oyo State, Nigeria. *World Journal of Agricultural Sciences*, 7(2): 189–192.

Adegoroye, A. S., Jolliffe, P. A. and Tung, M. A. (1989). Texture characteristics of tomato fruits (*Lycopersion esculentium*) affected by sunscald. *Journal of Science Food Agriculture*. 49: 95–102.

Adjebli, A., Leyronas, C., Aissat, K. and Nicot, P. C. (2015). Comparison of *Botrytis cinerea* populations collected from tomato greenhouses in Northern Algeria. *Journal of Phytopathology*, 163(2): 124-132.

Afroz, M., Ashrafuzzamani, M., Ahmed, M. N., Ali, M. and Azim, M. (2008). Integrated managemnt of major fungal diseases of tomato. *International Journal of Sustainable Crop Production*, 3(2): 54–59.

Agati, G., Azzarello, E., Pollastri, S. and Tattini, M. (2012). Flavonoids as antioxidants in plants: location and functional significance. *Plant Science*, 196: 67–76.

Agrios, G.N. (2005). *Plant Pathology* (6^{th} Ed). New york: Elsevier Academic Press. 922pp.

Aguayo, C., Riquelme, J., Valenzuela, P. D. T., Hahn, M. and Moreno, E. S. (2011). Bchex virulence gene of *Botrytis cinerea*: characterization and functional analysis. *Journal of General Plant Pathology*, 77(4): 230-238.

Ahlem, H., Mohammed, E., Badoc, A. and Ahmed, L. (2012). Effect of pH, temperature and water activity on the inhibition of *Botrytis cinerea* by *Bacillus amyloliquefaciens* isolates. *African Journal of Biotechnology*, 11(9): 2210-2217.

Ahmed, D. and Hamada, W. (2005). Genetic diversity of some Tunisian *Botrytis cinerea* isolates using molecular markers. *Phytopathologia Mediterranea* 44: 300-306.

Ai-ying , W. Y., Lou, B. G., Xu, T., and Lin, C. (2011). Defense responses in tomato fruit induced by oligandrin against *Botrytis cinerea*. *African Journal of Biotechnology*, *10*(22): 4596-4601.

Ajibade, T. O., Arowolo, R. and Olayemi, F. O. (2013). Phytochemical screening and toxicity studies on the methanol extract of the seeds of *Moringa oleifera*. *Journal of Complementary and Integrative Medicine*, 10(1):11-16.

Aktaruzzaman, M., Afroz, T., Kim, B. S. and Shin, H. D. (2016). First Report of Gray Mold Disease of Sponge Gourd (*Luffa cylindrica*) Caused by *Botrytis cinerea* in Korea. *Research in Plant Disease*, 22(2):108.

Aktaruzzaman, M., Kim, J.Y., Xu, S.J. and Kim, B.S. (2014). First Report of Postharvest Gray Mold Rot on Carrot Caused by *Botrytis cinerea* in Korea. *Research in Plant Disease*, 20(2): 130.

Albertini, C., Thébaud, G. Fournier, E. and Leroux, P. (2002). Eburicol 14α-demethylase gene (cyp51) polymorphism and speciation in *Botrytis cinerea*. *Mycological Research*, 106: 1171–1178.

Alhakmani, F., Kumar, S. and Khan, S. A. (2013). Estimation of total phenolic content, *in–vitro* antioxidant and anti–inflammatory activity of flowers of *Moringa oleifera*. *Asian Pacific Journal of Tropical Biomedicine*, 3(8): 623-627.

Ali, A., Maqbool, M., Ramachandran, S. and Alderson, P.G. (2010). Gum arabic as a novel edible coating for enhancing shelflife and improving postharvest quality of tomato (*Solanum lycopersicum* L.) fruit. *Postharvest Biology and Technonology*, 58(1):42-47.

Aljouni, S., Kremer, S. and Masih, L. (2001). Lycopene content in hydroponic and non-hydroponic tomatoes during post harvest storage. *Food Australia*, 53(5): 195-196.

Allen, D.J. and Lenné, J.M. (1998). *The Pathology of Food and Pasture Legumes*. CAB International, Wallingford, UK.

Al-Mahmooli, I. H., Al-Fahdi, A. R., Al-Sadi, A. M. and Deadman, M. L. (2015). First Report of Root Rot and Crown Necrosis Caused by *Pythium aphanidermatum* on *Phaseolus vulgaris* in Oman. *Plant Disease*, 99(3): 419-419.

Amadi, J.E., Nwaokike, P. and Olahan, G.S. (2014). Isolation and idntification of fungi involved in the post-harvest spoilage of guava (*Psidium guajava*) in Awka Metropolis. *International Journal of Engineering and Applied Sciences*, 4(10): 7–12.

Amadioha, A.C. (2002). Fungitoxic effects of extract of *Azadirachta indica* against *Cochliobolus miyabeanus* causing brown spot disease of rice. *Archieveof Phytopathology and Plant Protection*, 35(1): 37-42.

Aminifard, M. H. and Mohammadi, S. (2013). Essential oils to control *Botrytis cinerea in vitro* and *in vivo* on plum fruits. *Journal of the Science of Food and Agriculture*, 93(2): 348-353.

Ana, M. V., Abdurabi, S. and Benhard, L. (2003). A Guide to Integrated Pest Management in Tomato Production in Eastern and Southern Africa. ICIPE Science Press, Nairobi, Kenya. 144pp.

Andrea, J.A. (2013). *Biosecurity guidelines for postharvest greenhouse tomatoes: Prevention of postharvest and storage rot.* 29pp.

Angajala, G., Ramya, R. and Subashini, R. (2014). *In-vitro* antiinflammatory and mosquito larvicidal efficacy of nickel nanoparticles phytofabricated from aqueous leaf extracts of *Aegle marmelos* Correa. *Acta Tropica*, 135: 19-26.

Anwar, F., Ashraf, M. and Bhanger, M. I. (2005). Interprovenance variation in the composition of *Moringa oleifera* oilseeds from Pakistan. *Journal of the American Oil Chemists' Society*, 82(1): 45-51.

Anwar, P, Latif, S, Ashraf, M and Gyan, A. (2007). *Moringa oleifera*. Afood plant with multiple medicinal uses. *Phytotherapy Research*, 21: 17–25.

AOAC (2000). Official methods of analysis of AOAC International, (17th Ed.), Gaithersburg, MD, USA: AOAC (*Association of Analytical Communities).*

Araújo, L. C. C., Aguiar, J. S., Napoleão, T. H., Mota, F. V. B., Barros, A. L. S., Moura, M. C. and Paiva, P. M. G. (2013). Evaluation of cytotoxic and anti-inflammatory activities of extracts and lectins from *Moringa oleifera* seeds. *PloS one*, 8(12): 81973.

Arora, D. S. and Onsare, J. G. (2014). In vitro antimicrobial evaluation and phytoconstituents of *Moringa oleifera* pod husks. *Industrial Crops and Products*, 52: 125-135.

Arora, D.S., Onsare, J.M. and Kuar, H., (2013). Bioprospecting of Moringa (Moringaceae): microbiological perspective. *Journal of Pharmacognosy Phytochemistry*, 1(6): 193–215.

Arteca, R. N. (2013). *Plant growth substances: principles and applications*. Springer Science & Business Media. 331pp.

Arya, A. (2010). Recent advances in the management of plant pathogens: Botanicals in the fungal pest management. In A. E. (Eds) Arya, A and Perello (Ed.), *In: Management of fungal plant pathogens* (pp. 1–25). CAB International, UK.

Asadollahi, M., Fekete, E., Karaffa, L., Flipphi, M., Árnyasi, M., Esmaeili, M. and Sándor, E. (2013). Comparison of *Botrytis cinerea* populations isolated from two open-field cultivated host plants. *Microbiological Research*, 168(6): 379-388.

Asare, G. A., Gyan, B., Bugyei, K., Adjei, S., Mahama, R., Addo, P. and Nyarko, A. (2012). Toxicity potentials of the nutraceutical *Moringa oleifera* at supra-supplementation levels. *Journal of Ethnopharmacology*, 139(1): 265-272.

Asghari, G., Palizban, A.and Bakhshaei, B. (2015). Quantitative analysis of the nutritional components in leaves and seeds of the Persian Moringa peregrina (Forssk.) Fiori. *Pharmacognosy Research*, 7(3): 242-248.

Asib, N., Omar, D., Rita, M. A. and Abdullah, N.P. (2015). Preparation, Characterization and Toxicity of Nano-Emulsion Formulations of Rotenone Extract of *Derris elliptica. Journal of Chemical, Biological and Physical Sciences.* 5(4): 3989-3997.

Asiedu-Gyekye, I. J., Frimpong-Manso, S. A. M. U. E. L., Awortwe, C., Antwi, D. A. and Nyarko, A. K. (2014). Micro-and macroelemental composition and safety evaluation of the nutraceutical *Moringa oleifera* Leaves. *Journal of Toxicology*, 2014:1-13.

Asif, M. (2015). Chemistry and antioxidant activity of plants containing some phenolic compounds. *Chemistry International*, 1(1): 35-52.

Atwell, S., Corwin, J. A., Soltis, N. E., Subedy, A., Denby, K. J. and Kliebenstein, D. J. (2015). Whole genome resequencing of *Botrytis cinerea* isolates identifies high levels of standing diversity. *Frontiers in Microbiology*, 6: 996-1010.

Baboota, S., Al-Azaki, A., Kohli, K., Ali, J., Dixit, N. and Shakeel, F. (2007). Development and evaluation of a microemulsion formulation for transdermal delivery of terbinafine. *PDA Journal of Pharmaceutical Science and Technology*, 61(4): 276-285.

Bakr, M. A., Rahman, M. L., Hossain, M. S. and Ahmed, A. U. (1998). Steps towards management of *Botrytis* gray mold of chickpea in Bangladesh. In *4. Working Group Meeting to Discuss Collaborative Research on Botrytis Gray Mold of Chickpea, Joydebpur, Gazipur (Bangladesh), 23-26 Feb 1998*. ICRISAT.

Bali, V., Ali, M. and Ali, J. (2010). Study of surfactant combinations and development of a novel nanoemulsion for minimising variations in bioavailability of ezetimibe. *Colloids and Surfaces B: Biointerfaces*, 76(2): 410-420.

Bali, V., Ali, M. and Ali, J. (2011). Nanocarrier for the enhanced bioavailability of a cardiovascular agent: in vitro, pharmacodynamic, pharmacokinetic and stability assessment. *International Journal of Pharmaceutics*, 403(1): 46-56.

Banso, A., Adeyemo, S.O. and Jeremiah, P. (1999). Antimicrobial properties of *Vernonia amygdalina* extract. *Journal of Applied Science and Management*. 3: 9-11.

Bardin, M., Decognet, V. and Nicot, P. C. (2014). Remarkable predominance of a small number of genotypes in greenhouse populations of *Botrytis cinerea*. *Phytopathology*, 104(8): 859-864.

Baris, O., Gulluce, M., Sahin, F., Ozer, H., Kilic, H., Ozkan, H., Sokmen, M. and Ozbek, T. (2006). Biological activities of the essential oil and methanol extract of *Achillea Biebersteinii* Afan. (Asteraceae). *Turkish Journal of Biolology,* 30(2): 65-73.

Barth, M., Hankinson, T.R., Zhuang, H. and Breidt, F. (2009). Food Microbiology and Food safety. In: Sperber WH, Doyle MP, editors, Compendium of the Microbiological Spoilage 135 of Foods and Beverages. Springer Science+Business, LLC.

Basim, E and Sağdiccedil, O. (2012). Antibacterial activity of the methanol extracts of two endemic Sideritis species of Turkey against plant pathogenic bacteria. *Scientific Research and Essays*, 7(48): 4146-4150.

Bastiaans, L., Paolini, R. and Baumann, D.T. (2008). Focus on Ecological Weed Management: what is hindering adoption? *Weed Research*, 48: 481-491.

Batista, A. B., Oliveira, J. T., Gifoni, J. M., Pereira, M. L., Almeida, M. G., Gomes, V. M. and Lopes, J. L. S. (2014). New Insights into the Structure and Mode of Action of *Mo*-CBP$_3$, an Antifungal Chitin-Binding Protein of *Moringa oleifera* Seeds. *PloS one*, 9(10): 111427.

Beever, R.E. and Weeds, P.L. (2007). Taxonomy and genetic variation of *Botrytis* and *Botryotinia*. *pp*. 29-52 In: Elad, Y., Williamson, B., Tudzynski, P. and Delen, N.(eds). Botrytis, Biology, Pathology and Controls. Kluwer Academic Publisher. Netherland.

Belay, K. and Sisay, M. (2014). Phytochemical Constituents and Physicochemical Properties of Medicinal Plant (*Moringa Oleifera*) Around Bule Hora. *International Journal of Innovation and Scientific Research*, 8(1): 88-98.

Ben Salem, H. and Makkar, H. P. S. (2009). Defatted *Moringa oleifera* seed meal as a feed additive for sheep. *Animal Feed Science and Technology*, 150(1): 27-33.

Benyon, F., Summerell, B. A. and Burgess, L. W. (1996). Association of *Fusarium* species with root rot of Cymbidium orchids. *Australasian Plant Pathology*, 25(4): 226-228.

Bhatnagar, D.K., Singh, G.P., Singh, J.P. and Singh, B.P. (2006) Studies on the storage behaviour of different tomato cultivars. *Haryana Agricultural University Journal of Research* 10: 5-9.

Bhattacharjee, R. and Dey, U. (2014). An overview of fungal and bacterial biopesticides to control plant pathogens/diseases. *African Journal of Microbiology Research*, 8(17): 1749-1762.

Bindschedler, L. V., Whitelegge, J. P., Millar, D. J. and Bolwell, G. P. (2006). A two component chitin-binding protein from French bean–association of a proline-rich protein with a cysteine-rich polypeptide. *FEBS letters*, 580(6): 1541-1546.

Borghesi, E., Ferrante, A., Gordillo, B., Rodríguez-Pulido, F. J., Cocetta, G., Trivellini, A. and Heredia, F. J. (2016). Comparative physiology during ripening in tomato rich-anthocyanins fruits. *Plant Growth Regulation*, 8(2): 207-214.

Broekaert, W.F., Marien, W., Terras, F.R.G., De Bolle, M.F.C. and Proost, P. (1992) Antimicrobial peptides from *Amaranthus caudatus* seeds with sequence homology to the cysteine/glycine-rich domain of chitin-binding proteins. *Biochemistry*, 31: 4308–4314.

Broekaert, W. F., Terras, F. R., Cammue, B. P. and Vanderleyden, J. (1990). An automated quantitative assay for fungal growth inhibition. *FEMS Microbiology Letters*, 69(1-2), 55-59.

Buck, J.W. and Jeffers, S.N. (2004) Effect of pathogen aggressiveness and vinclozolin on efficacy of *Rhodotorula glutinis* PM4 against *Botrytis cinerea* on geranium leaf disks and seedlings. *Plant Disease*, 88:1262-1268.

Bugel, S. (2003). Vitamin K and bone health. *Proceedings of the Nutrition Society*, 62: 839–843.

Burges, H. D. (1998). Formulation of mycoinsecticides. In Formulation of microbial biopesticides Benificial Microorganisms, Nematodes and Seed Treatments (H.D. Burges, Ed.), pp. 131-185. Kluwer Academic Publishers, Dordrecht, Springer. The Netherlands.

Burton, W. G. (1982). Ripening and senescence of fruits. In W. G. Burton (Ed.), Post-harvest physiology of food crops (pp. 181–198). Logman Group Ltd

Cáceres, A., Saravia, A., Rizzo, S., Zabala, L., De Leon, E. and Nave, F. (1992). Pharmacologie properties of *Moringa oleifera*. 2: Screening for antispasmodic, antiinflammatory and diuretic activity. *Journal of Ethnopharmacology*, 36(3): 233-237.

Cakir, A., Mavi, A., Yıldırım, A., Duru, M. E., Harmandar, M. and Kazaz, C. (2003). Isolation and characterization of antioxidant phenolic compounds from the aerial parts of *Hypericum hyssopifolium* L. by activity guided fractionation. *Journal of Ethnopharmacology*, 87(1): 73-83.

Camele, I., Altieri, L., de Martino, L., de Feo, V., Mancini, E. and Rana, G. L. (2012). *In vitro* control of post-harvest fruit rot fungi by some plant essential oil components. *International Journal of Molecular Sciences*, 13(2): 2290–2300.

Campia, P., Venturini, G., Moreno-Sanz, P., Casati, P. and Toffolatti, S. L. (2017). Genetic structure and fungicide sensitivity of *Botrytis cinerea* populations isolated from grapevine in northern Italy. *Plant Pathology*, 66(6):890-899.

Carisse, O., Tremblay, D. M. and Lefebvre, A. (2014). Comparison of *Botrytis cinerea* airborne inoculum progress curves from raspberry, strawberry and grape plantings. *Plant Pathology*, 63(5): 983-993.

Carmona, M., Sautua, F., Perelman, S., Gally, M and Reis, E. M. (2015). Development and validation of fungicide scoring system for manaement of late season soy bean diseases in Argentina. *Crop Protection*, 70: 83-91.

Celis, C. Z., Gerardo, M., Luis, G. S., Andrea, G. C., Diana, M. and Luz, B. C. (2014). Determining the effectiveness of *Candida guilliermondii* in the biological control of *Rhizopus stolonifer* in postharvest tomatoes. *Universas Scientiarum*, 19(1): 51–62.

Chandler, D., Bailey, A., Tatchell, G.M., Davidson, G.,Greaves, J. and Grant, W.P. (2011). The Development, Regulation and Use of Biopesticides for Integrated Pest Management. *Philosophical Transaction of The Royal Society B*, 386: 2-13.

Changez, M. and Varshney, M. (2000). Aerosol-OT microemulsions as transdermal carriers of tetracaine hydrochloride. *Drug Development and Industrial Pharmacy*, 26(5): 507-512.

Charles, M. T., Makhlouf, J. and Arul, J. (2008). Physiological basis of UV-C induced resistance to *Botrytis cinerea* in tomato fruit. II. Modification of fruit surface and changes in fungal colonization. *Postharvest Biology and Technology*, 47(1): 21–26.

Chaurasia, A., Chaurasia, S. and Chaurasia, S. (2013). Studies on development of fruit rot of tomato caused by *Alternaria solani* (Ellis & Mart) Jones & Grout. *International Journal of Pharmacy and Biolife*, 4(6): 2713–2716.

Chen, F., Wang, Y., Zheng, F., Wu, Y. and Liang, W. (2000). Studies on cloud point of agrochemical microemulsions. *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 175(1): 257-262.

Cheour, F., Willemot, C., Arul, J., Desjardins, Y., Makhlouf, J., Charest, P. M. and Gosselin, A. (1990). Foliar application of calcium chloride delays postharvest ripening of strawberry. *Journal of the American Society for Horticultural Science*, 115(5): 789-792.

Choi, H., Cho, J., Jin, Q., Woo, E. R. and Lee, D. G. (2012). Antifungal property of dihydrodehydrodiconiferyl alcohol 9′-O-β-d-glucoside and its pore-forming action in plasma membrane of *Candida albicans*. *Biochimica et Biophysica Acta (BBA)-Biomembranes*,18(7): 1648-1655.

Choquer, M., Fournier, E., Kunz, C., Levis, C., Pradier, J. M., Simon, A. and Viaud, M. (2007). *Botrytis cinerea* virulence factors: new insights into a necrotrophic and polyphageous pathogen. *FEMS Microbiology Letters*, 277(1), 1-10.

Chuang, P. H., Lee, C. W., Chou, J. Y., Murugan, M., Shieh, B. J. and Chen, H. M. (2007). Anti-fungal activity of crude extracts and essential oil of *Moringa oleifera* Lam. *Bioresource Technology*, 98(1): 232-236.

Commenil, P., Belingheri, L. and Dehorter, B. (1998). Antilipase antibodies prevent infection of tomato leaves by *Botrytis cinerea*. *Physiological and Molecular Plant Pathology*, 52:1–14.

Cordell, G. A. and Colvard, M. D. (2005). Some thoughts on the future of ethnopharmacology. *Journal of Ethnopharmacology*, 100(1): 5-14.

Corwin, J. A., Subedy, A., Eshbaugh, R. and Kliebenstein, D. J. (2016). Expansive Phenotypic Landscape of *Botrytis cinerea* shows Differential Contribution of Genetic Diversity and Plasticity. *Molecular Plant-Microbe Interactions*, 29(4): 287-298.

Cos, P., Hermans, N., De Bruyne, T., Apers, S., Sindambiwe, J. B., Berghe, D. V. and Vlietinck, A. J. (2002). Further evaluation of Rwandan medicinal plant extracts for their antimicrobial and antiviral activities. *Journal of Ethnopharmacology*, 79(2): 155-163

Cowan, M.M. (1999). Plant products as antimicrobial agents. *Clinical Microbiology Reviews*, 12(4): 564-582.

Cushnie, T. T. and Lamb, A. J. (2005). Antimicrobial activity of flavonoids. *International Journal of Antimicrobial Agents*, 26(5): 343-356.

Cutler, H.G., Jacyno, J.M., Harwood, J.S., Dulik, D., Goodrich, P.D. and Roberts, R.G. (1993). Botcinolide: a biologically active natural product from *Botrytis cinerea*. *Bioscience Biotechnology and Biochemistry*, 57:1980–1982.

Cutler, K. (1998). *From Wolf peach to outer Space: Tomato history and lore. www.bbg.org/gardening/kitchen/tomatoes /cutler.html/.*

Da Costa, S., Basri, M., Shamsudin, N. and Basri, H. (2014). Stability of positively charged nanoemulsion formulation containing steroidal drug for effective transdermal application. *Journal of Chemistry*, 2014: 1-8.

da CR Rodrigues, E., Ferreira, A. M., Vilhena, J. C., Almeida, F. B., Cruz, R. A., Florentino, A. C. and Fernandes, C. P. (2014). Development of a larvicidal nanoemulsion with Copaiba (*Copaifera duckei*) oleoresin. *Revista Brasileira de Farmacognosia*, 24(6): 699-705.

Dalmais, B., Schumacher, J., Moraga, J., Le Pecheur, P., Tudzynski, B., Collado, I. G. and Viaud, M. (2011). The *Botrytis cinerea* phytotoxin botcinic acid requires two polyketide synthases for production and has a redundant role in virulence with botrydial. *Molecular Plant Pathology*, 12(6): 564-579.

Das, K., Tiwari, R.K.S. and Shrivastava, D.K. (2010) Techniques for evaluation of medicinal plant products as antimicrobial agent: Current methods and future trends. *Journal of Medicinal Plants Research*, 4: 104-111.

Davidson, J. A., Pande, S., Bretag, T. W., Lindbeck, K. D. and Krishna-Kishore, G. (2007). Biology and management of *Botrytis spp*. in legume crops. In *Botrytis: biology, pathology and control* (pp. 295-318). Springer Netherlands.

de Bem, B. P., Bogo, A., Everhart, S., Casa, R. T., Gonçalves, M. J., Marcon Filho, J. L. and da Cunha, I. C. (2015). Effect of Y-trellis and vertical shoot positioning training systems on downy mildew and *Botrytis* bunch rot of grape in highlands of southern Brazil. *Scientia Horticulturae*, 185: 162-166.

De Bon, H., Huat, J., Parrot, L., Sinzogan, A., Martin, T., Malézieux, E. and Vayssières, J. F. (2014). Pesticide risks from fruit and vegetable pest management by small farmers in sub-Saharan Africa. A review. *Agronomy for sustainable development*, 34(4): 723-736.

De Miccolis Angelini, R. M., Rotolo, C., Masiello, M., Gerin, D., Pollastro, S. and Faretra, F. (2014). Occurrence of fungicide resistance in populations of

Botryotinia fuckeliana (*Botrytis cinerea*) on Table grape and strawberry in southern Italy. *Pest Management Science*, 70(12): 1785-1796.

De, A., Bose, R., Kumar, A. and Mozumdar, S. (2014). *Targeted delivery of pesticides using biodegradable polymeric nanoparticles*. New Delhi: Springer India. 98pp.

Dean, R., Van Kan, J. A., Pretorius, Z. A., Hammond-Kosack, K. E., Di Pietro, A., Spanu, P. D. and Foster, G. D. (2012). The Top 10 fungal pathogens in molecular plant pathology. *Molecular Plant Pathology*, 13(4): 414-430.

Decognet, V., Bardin, M., Trottin-Caudal, Y. and Nicot, P. C. (2009). "Rapid change in the genetic diversity of *Botrytis cinerea* populations after the introduction of strains in a tomato glasshouse." *Phytopathology,* 99(2): 185-193.

Delcour, I., Spanoghe, P., and Uyttendacle, M. (2015). Literature review: Impact of climate change on pesticide use. *Food Research International*, 68: 7-15.

Dellavalle, P. D., Cabrera, A., Alem, D., Larrañaga, P., Ferreira, F. and Dalla Rizza, M. (2011). Antifungal activity of medicinal plant extracts against phytopathogenic fungus *Alternaria* spp. *Chilean Journal of Agricultural Research*, 71(2): 231.

Derkach, S.R. (2009). Rheology of emulsions. *Advances in Colloid and Interface Science*, 151: 1-23.

Droby, S., and Lichter, A. (2007). Post-harvest Botrytis infection: etiology, development and management. In *Botrytis: Biology, pathology and control* .Springer Netherlands. pp. 349-367.

Droby, S., Wisniewski, M., Teixidó, N., Spadaro, D. and Jijakli, M.H. (2016). The science, development and commercialization of postharvest biocontrol products. *Postharvest Biology and Technology*, 122: 22-29.

Duan, X. H., Jiang, R., Wen, Y. J. and Bin, J. H. (2013). Some 2S albumin from peanut seeds exhibits inhibitory activity against *Aspergillus flavus*. *Plant*

Physiology and Biochemistry, 66: 84-90.

Duran-Patron, R., Hernandez-Galan, R. and Collado, I.G. (2000). Secobotrytriendiol and related sesquiterpenoids: new phytotoxic metabolites from *Botrytis cinerea*. *Journal of Natural Products*, 63(2):182–184.

Dwivedi, S. K. and Enespa, A. (2012). Effectiveness of extract of some medical plants against soil borne fusaria causing diseases on *Lycopersicon esculantum* and *Solanum melongena*. *International Journal of Pharmacology and Biological Sciences*, *3*(4): 1171-1180

Eccleston, J. (1994). Microemulsions, in: Swarbrick, J., Boylan, J.C., (Eds.), Encyclopedia of Pharmaceutical Technology, Vol. 9, Marcel Dekker, New York, 375-421.

El Ghaouth, A., Wilson, C. L. and Wisniewski, M. (2003). Control of Postharvest Decay of Apple Fruit with *Candida saitoana* and Induction of Defense Responses. *Phytopathology*, 93(3): 344–348.

Elad, E., Williamson, B., Tudzynski, P. and Delen, N. (2007). *Botrytis*: Biology, Pathology and Control, pp.393, Springer Netherlands.

Elad, Y (1997) Response of plants to infection by *Botrytis cinerea* and novel means involved in reducing their susceptibility to infection. *Biological Reviews* 72: 381-422.

Elad, Y. (1989). Effect of abiotic conditions on development of gray mold of rose and scanning electron microscopy. *Phytopathologia Mediterranea*, 28: 122-130.

Elad, Y. and Evensen, K. (1995). Physiological aspects of resistance to *Botrytis cinerea*. *Phytopathology*, 85(6): 637-643.

Elad, Y., Pertot, I., Prado, A. M. C. and Stewart, A. (2016). Plant hosts of *Botrytis* spp. In *Botrytis–The Fungus, The Pathogen and Its Management in Agricultural Systems* (pp. 413-486). Springer International Publishing.

Elezabeth, V.D and Arumugam, S. (2014). GC-MS analysis of bioactive constituents of *Indigofera suffruticosa* leaves. *Journal of Chemical and Pharmaceutical Research*. 6: 294-300.

Elliot, M., Shamoun, S.F., Sumampong, G., James, D., Masri, S and Varga, A. (2009). Evaluation of several commercial biocontrol products on European and North American populations of *Phytophthora ramorum*. *Biocontrol Science and Technology*, 99(10): 1007-1021.

El-Mahmood, A.M., J.H. Doughari, and N. Ladan. (2008). Antimicrobial screening of stem bark extracts of *Vitellaria paradoxa* against some enteric pathogenic microorganisms. *African Journal of Pharmacy and Pharmacology*, 2(5):89-94.

Elmer, P.A.G. and Reglinski, T. (2006). Biosuppression of *Botrytis cinerea* in grapes. *Plant Pathology*, 55(2): 155-177.

EL-Mohamedy, R. S. R. and Abdalla, A. M. (2014). Evaluation of antifungal activity of *Moringa oleifera* extracts as natural fungicide against some plant pathogenic fungi In-vitro. *Journal of Agricultural Technology*, 10(4): 963–982.

El–Mohamedy, R. S., Abdalla, A. M. and Adam, S. M. (2014). Preliminary studies on response of *Moringa oleifera* plants to infection with some soil borne plant pathogenic fungi. *International Journal of Current Microbiology and Applied Sciences*, 3(12): 389-397.

Elmsly, T. A. and Dixon, J. (2008). Growth rates of ripe rot fungi at different temperatures. *New Zealand avocado grower's association annual research report*, 8: 77-84.

Eloff, J.N. (1998) Which extractant should be used for the screening and isolation of antimicrobial components from plants? *Journal of Ethnopharmacology*, 60(1): 1-8.

Emad El Din, G. G., Esmaiel, N., M., Salem, M. Z. and Gomaa, S. E. (2016). In Vitro Screening for Antimicrobial Activity of Some Medicinal Plant Seed Extracts. *International Journal of Biotechnology for Wellness Industries*. 5(4): 142-152.

Enwa, F. O., Omojate, C. G. and Adonu, C. (2013). A review on the phytochemical profile and the antibacterial susceptibility pattern of some clinical isolates to the ethanolic leaves extract of *Moringa oleifera* lam (*Moringaceae*). *International Journal of Advanced Research*, 1(5): 226-238.

Enyiukwu, D. N., Awurum, A. N. and Nwaneri, J. A. (2014). Efficacy of plant-derived pesticides in the control of myco-induced postharvest rots of tubers and agricultural products : A review, *Net Journals of Agricultural Science,* 2(1): 30–46.

Epton, H.A.S. and Richmond, D.V. (1980). Formation, structure and germination of conidia. In: Coley-Smith J.R., Verhoeff, K., Jarvis, W.R. (eds), The biology of *Botrytis*. Academic Press, London. pp. 41–83.

Erbil, H. Y. (1997). Interfacial Interactions of Liquids. *Handbook of Surface and Colloid Chemistry* (3rd Ed). CRC Press, Boca Raton. 751pp.

Ergene, A., Guler, P., Tan, S., Mirici, S., Hamzaoglu, E. and Duran, A. (2006). Antimicrobial and antifungal activity of *Heracleum sphondylium* subsp. artivinense. *African Journal of Biotechnology*, 5(11): 1087-1089.

Espinel-Ingroff, A., Fothergill, A., Peter, J., Rinaldi, M. G. and Walsh, T. J. (2002). Testing conditions for determination of minimum fungicidal concentrations of new and established antifungal agents for *Aspergillus spp*.: NCCLS collaborative study. *Journal of Clinical Microbiology*, 40(9): 3204-3208.

Esterio, M., Muñoz, G., Ramos, C., Cofré, G., Estévez, R., Salinas, A. and Auger, J. (2011). Characterization of *Botrytis cinerea* isolates present in Thompson seedless table grapes in the Central Valley of Chile. *Plant Disease*, 95(6): 683-690.

Etebu, E., Nwauzoma, A. B., Bawo, D. D. S., Island, W., State, B., Biology, E. and Norte, A. (2013). Postharvest Spoilage of Tomato (*Lycopersicon esculentum* Mill.) and Control Strategies in Nigeria, *Journal of Biology, Agriculture Healthcare*, 3(10): 51-61.

Ewulo, B., Ojeniyi, S. and Akanni, O. (2008). Effect of poutry manures onselected soil physical and chemical properties on growth, yield and nutrient status of tomato. *Journal of Agricultural Research*, 3(1): 613–616.

Fahey, J. W. (2005). *Moringa oleifera*: a review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. Part 1. *Trees for life Journal*, 1(5): 1-15.

Faizi, S., Siddiqui, B. S., Saleem, R., Siddiqui, S., Aftab, K. and Gilani, A. U. H. (1994). Isolation and structure elucidation of new nitrile and mustard oil glycosides from *Moringa oleifera* and their effect on blood pressure. *Journal of Natural Products*, 57(9): 1256-1261.

FAO (2010). Food and Agriculture Organization of the United Nations Rome, 2010.

FAO. Food and Agriculture Organization. (2012). *The State of Food and Agriculture* www.fao.org/docrep/016/i3027e/i3027e.

FAOSTAT, FAO Statistical Databases (2013). Food and agriculture organization of the United Nations, statistics division; http:// faostat3.fao.org/home/E. Accessed 16 June 2016

Fekete, É., Fekete, E., Irinyi, L., Karaffa, L., Árnyasi, M., Asadollahi, M. and Sándor, E. (2012). Genetic diversity of a *Botrytis cinerea* cryptic species complex in Hungary. *Microbiological Research*, 167(5): 283-291.

Felsenstein, J. (1985). Confidence limits on phylogenies: an approach using the bootstrap. *Evolution*, 39: 783-791.

Fernandez, J.G., Fernandez-Baldo, M.A., Sansone, G., Calvente, V. and Benuzzi, D. (2014). Effect of temperature on the morphological characteristics of *Botrytis cinerea* and its correlated with the genetic variability. *Journal of Coastal Life Medicine*, 2: 543-548.

Fernández-González, M., Rodríguez-Rajo, F. J., Jato, V., Aira, M. J., Ribeiro, H., Oliveira, M. and Abreu, I. (2012). Forecasting ARIMA models for atmospheric vineyard pathogens in Galicia and Northern Portugal: *Botrytis cinerea* spores. *Annals of Agricultural and Environmental Medicine*, 19(2): 255-262.

Fernández-Ruiz, V., Olives, A. I., Cámara, M., de Cortes Sánchez-Mata, M. and Torija, M. E. (2011). Mineral and trace elements content in 30 accessions of tomato fruits (*Solanum lycopersicum* L.,) and wild relatives (*Solanum pimpinellifolium* L., *Solanum cheesmaniae* L. Riley, and *Solanum habrochaites* S. Knapp and DM Spooner). *Biological Trace Element Research*, 141(1-3): 329-339.

Ferrada, E. E., Zoffoli, J. P., Diaz, G. A. and Latorre, B. A. (2015). First report of *Botrytis cinerea* causing blossom blight on Japanese plums in Chile. *Plant Disease*, 99: 888.

Flanagan, J., Kortegaard, K., Pinder, D. N., Rades, T. and Singh, H. (2006). Solubilisation of soybean oil in microemulsions using various surfactants. *Food Hydrocolloids*, 20(2): 253-260.

Foolad, M.R., Merk, H.L, Ashrafi, H. (2008). Genetics, genomics and breeding of late blight and early blight resistance in tomato. *Critical Reviews in Plant Sciences*, 27(2):75–107.

Fournier E. and Giraud, T. (2008). Sympatric genetic differentiation of a generalist pathogenic fungus, *Botrytis cinerea*, on two different host plants, grapevine and bramble. *Journal of Evolutionary Biology*, 21(1): 122–132.

Fournier E., Giraud, T. and Brygoo, Y. (2005). Partition of the *Botrytis cinerea* complex in France using multiple gene genealogies. *Mycologia*, 97(6): 1251–1267.

Freire, J. E., Vasconcelos, I. M., Moreno, F. B., Batista, A. B., Lobo, M. D., Pereira, M. L. and Oliveira, J. T. (2015). *Mo*-CBP_3, an Antifungal chitin-binding protein from *Moringa oleifera* seeds, is a member of the 2S albumin family. *PloS one*, 10(3): 119871.

Frıas, M., Gonzalez, C., Brito, N., (2011). BcSpl1, a cerato-platanin family protein, contributes to *Botrytis cinerea* virulence and elicits the hypersensitive response in the host. *New Phytologist*, 192(2): 483–495.

Fuglie, L. J. (1999). The miracle tree: *Moringa oleifera*, natural nutrition for the tropics. Church World Service, New York, USA. 68pp.

Ganesan, T. and Krishnaraju, J. (1994). Antifungal properties of wild plants. *Advances in Plant Scieces*, 7(1): 185-187.

Gao, X., Xie, M., Liu, S., Guo, X., Chen, X., Zhong, Z. and Zhang, W. (2014). Chromatographic fingerprint analysis of metabolites in natural and artificial agarwood using gas chromatography–mass spectrometry combined with chemometric methods. *Journal of Chromatography B*, 967: 264-273.

Gaston, T.N.R., Appolinaire, L.J., Jean, M.C.P., Ajong, F.D. (2014). Effect of different pH and temperature levels on in vitro growth and sporulation of *Phytophthora colocasiae*, taro leaf blight pathogen. *International Journal of Agronomy and Agricultural Research*, 4(4): 202-206.

Gatto, M. A., Ippolito, A., Linsalata, V., Cascarano, N. A., Nigro, F., Vanadia, S. and Di Venere, D. (2011). Activity of extracts from wild edible herbs against postharvest fungal diseases of fruit and vegetables. *Postharvest Biology and Technology*, 61(1): 72–82.

Gemeda, N., Woldeamanuel, Y., Asrat, D. and Debella, A. (2014). Effect of essential oils on *Aspergillus* spore germination, growth and mycotoxin production: a potential source of botanical food preservative. *Asian Pacific Journal of Tropical Biomedicine*, 4(1): 373-381.

Geoffrey, SK; Hillary, NK; Antony, KM; Mariam, M and Mutai, C. (2014). Challenges and Strategies to Improve tomato Competativeness along the Tomato Value Chain in Kenya. *International Journal of Business and Management*, 9(9): 205–212.

Getinet, H., Seyoum, T. and Woldetsadik, K. (2008). The effect of cultivar, maturity stage and storage environment on quality of tomatoes. *Journal of Food Engineering*, 87(4): 467-478.

Gharezi, M., Joshi, N. and Sadeghian, E. (2012). Effect of post harvest treatment on stored cherry tomatoes. *Journal of Nutrition and Food Science*, 2: 157-167.

Gi, H. J., Chen, S. N., Hwang, J. S., Tien, C. and Kuo, M. T. (1992). Studies of formation and interface of oil-water microemulsion. *Chinese Journal of Physics*, 30(5): 665-678.

Gifoni, J. M., Oliveira, J. T., Oliveira, H. D., Batista, A. B., Pereira, M. L., Gomes, A. S. and Vasconcelos, I. M. (2012). A novel chitin-binding protein from *Moringa oleifera* seed with potential for plant disease control. *Peptide Science*, 98(4): 406-415.

Gindro, K., Lecoultre, N., Molino, L., de Joffrey, J. P., Schnee, S., Voinesco, F. and Dubuis, P. H. (2014). Development of rapid direct PCR assays to identify downy and powdery mildew and grey mould in *Vitis vinifera* tissue. *Journal International des Sciences de la Vigne et du vin*, 48(4): 261-268.

Giovannucci E. (1999). RESPONSE: re: tomatoes, tomato-based products, lycopene, and prostate canoer: review of the epidemiologic literature. *Journal of the National Cancer Institute*, 91(15): I331.

Giraud, T., Fortini, D., Levis, C., Lamarque, C., Leroux, P., Lobuglio, K. and Brygoo, Y. (1999): Two sibling species of the *Botrytis cinerea* complex, transposa and vacuma, are found in sympatry on numerous host plants. *Phytopathology*, 89(10): 967-973.

Giraud, T., Fortini, D., Levis, C., Leroux, P. and Brygoo, Y. (1997). RFLP markers show genetic recombination in *Botryotinia fuckeliana* (*Botrytis cinerea*) and transposable elements reveal two sympatric species. *Molecular Biology Evolution*, 14(11): 1177–1185.

Goh, P. S., Ng, M. H., Choo, Y. M., Amru, N. B. and Chuah, C. H. (2015). Production of nanoemulsions from Palm-Based tocotrienol rich fraction by microfluidization. *Molecules*, 20(11): 19936-19946.

Gonorazky, G., Guzzo, M. C., Abd-El-Haliem, A. M., Joosten, M. H. and Laxalt, A. M. (2016). Silencing of the tomato phosphatidylinositol-phospholipase C2 (SlPLC2) reduces plant susceptibility to *Botrytis cinerea*. *Molecular Plant Pathology*, 17(9): 1354-1363.

González, G., Moya, M., Sandoval, C. and Herrera, R. (2009). Genetic diversity in Chilean strawberry (*Fragaria chiloensis*): differential response to *Botrytis cinerea* infection. *Spanish Journal of Agricultural Research*, 7(40): 886–95.

González-Fernández, R., Aloria, K., Valero-Galván, J., Redondo, I., Arizmendi, J. M. and Jorrín-Novo, J. V. (2014). Proteomic analysis of mycelium and secretome of different *Botrytis cinerea* wild-type strains. *Journal of Proteomics*, 97: 195-221

Govrin, E. M. and Levine, A. (2000). The hypersensitive response facilitates plant infection by the necrotrophic pathogen *Botrytis cinerea*. *Current Biology*, 10(13): 751-757.

Green, J.M. and Beestman, G.B. (2007). Recently patented and commercialized formulation and adjuvant technology. *Crop Protection*, 26(3): 320-327

Green, R.J. (2004). Antioxidant Activity of Peanut Plant Tissues. Masters Thesis. North Carolina State University. USA.

Grimault, V., Prior, P. and Anais, G. (1995). A monogenic dominant resistance of tomato to bacterial wilt in Hawaii 7996 is associated with plant colonization by *Pseudomonas solanacearum. Journal of Phytopathology*, 143(6): 349-352.

Grover, R.K and Moore, J.D. (1962). Toximetric studies of fungicides against brown rot organisms, *Sclerotia fructicola* and *S. laxa*. *Phytopathology*, 52: 876-880.

Guil-Guerrero, J. L. and Rebolloso-Fuentes, M. M. (2009). Nutrient composition and antioxidant activity of eight tomato (*Lycopersicon esculentum*) varieties. *Journal of Food Composition and Analysis*, 22(2): 123-129.

Gulluce, M., Aslan, A., Sokmen, M., Sahin, F., Adiguzel, A., Agar, G. and Sokmen, A. (2006). Screening the antioxidant and antimicrobial properties of the lichens *Parmelia saxatilis*, *Platismatia glauca*, *Ramalina pollinaria*, *Ramalina polymorpha and Umbilicaria nylanderiana*. *Phytomedicine*, 13(7): 515-521.

Guo, H., Callaway, J. B. and Ting, J. P. Y. (2015). Inflammasomes: mechanism of action, role in disease, and therapeutics. *Nature Medicine*, 21(7): 677-687.

Gupta, R. R., Jain, S. K. and Varshney, M. (2005). AOT water-in-oil microemulsions as a penetration enhancer in transdermal drug delivery of 5-fluorouracil. *Colloids and Surfaces B: Biointerfaces*, 41(1): 25-32.

Gupta, V. and Sharma, A.K. (2013). Assessment of optimum temperature of *Trichoderma harzianum* by monitoring radial growth and population dynamics in different compost manures under different temperature. *Octa Journal of Biosciences*, 1(2): 151-157.

Gurjar, M. S., Ali, S., Akhtar, M. and Singh, K. S. (2012). Efficacy of plant extracts in plant disease management. *Agricultural Sciences*, 3(3): 425.

Gutiérrez, J. M., González, C., Maestro, A., Sole, I., Pey, C. M. and Nolla, J. (2008). Nano-emulsions: New applications and optimization of their preparation. *Current Opinion in Colloid and Interface Science*, 13(4): 245-251.

Habtamu, D.A.M. (2016). Review on Contribution of Fruits and Vegetables on Food Security in Ethiopia. *Journal of Biology, Agriculture and Healthcare*, 6(11): 49-58.

Hall T.A. (1999). BioEdit: a user-friendly biological sequence alignment editor and analysis program for windows 95/98/NT. *Nucleic Acids Symposium Series*, 41:95–98.

Hall, F. R., and Menn, J. J. (1999). *Biopesticides: use and delivery*. Nueva Jersey: Humana Press. 626pp.

Hanson, P. M., Wang, J. F., Licardo, O., Mah, S. Y., Hartman, G. L., Lin, Y. C. and Chen, J. T. (1996). Variable reaction of tomato lines to bacterial wilt evaluated at several locations in Southeast Asia. *HortScience*, 31(1): 143-146.

Harbone, J. B. (2001). Phytochernical methods. Chapman and Hall Ltd: London, pp111-113.

Hasan, S., Singh, K., Danisuddin, M., Verma, P. K. and Khan, A. U. (2014). Inhibition of major virulence pathways of *Streptococcus mutans* by quercitrin and deoxynojirimycin: a synergistic approach of infection control. *PloS one*. 9(3): e91736.

Hatvani, L., Sabolić, P., Kocsubé, S., Kredics, L., Czifra, D., Vágvölgyi, C. and Kosalec, I. (2012). The first report on mushroom green mould disease in Croatia. *Arhiv Za Higijenu Rada I Toksikologiju*, 63(4): 481–487.

Have, A. T., Mulder, W., Visser, J. and van Kan, J. A. (1998). The endopolygalacturonase gene Bcpg1 is required for full virulence of *Botrytis cinerea*. *Molecular Plant-Microbe Interactions*, 11(10): 1009-1016.

Heatley, N.G. (1944). Method for the assay of penicillin. *Biochemical Journal*, 38(1): 61-65.

Hennebert, G. L. (1973). *Botrytis* and *Botrytis*-like genera. *Persoonia,* 7(2):183–204.

Herzog, K., Wind, R. and Töpfer, R. (2015). Impedance of the grape berry cuticle as a novel phenotypic trait to estimate resistance to *Botrytis cinerea*. *Sensors*, 15(6): 12498-12512.

Heydari, A and Pessaraki, M. (2010). a review on biological control of fungal plant pathogens using microbial antagonists. *Journal of Biological Sciences*, 10(4): 237–290.

Hobbs, E.L. and Waters, W.E. (1964). Influence of nitrogen+potassium on susceptibility of *Chrysanthemum morifolium* to *Botrytis cinerea*. *Phytopathology*, 54(6): 674-678.

Hollomon, D, W. (2015). Fungicide Resistance. 40 Years on and still a major problem. In Fungicide Resistance in Plant Pathogens (pp 3-11), *Tokyo: Springer.*

Holst-Jensen, A., Vaage, M. and Schumacher, T. (1998). An approximation to the phylogeny of Sclerotinia and related genera. *Nordic Journal of Botany*, 18: 705-719.

Holz, G., Coertze, S., and Williamson, B. (2004). The ecology of *Botrytis* on plant surfaces. in: *Botrytis*: Biology, Pathology and Control. Y. Elad, B. Williamson, P. Tudzynski, and N. Delen, eds. Kluwer Academic Publishers, Dordrecht, The Netherlands. Pages 9-27.

Hongyin, Z, Renping, L and Weimin, L. (2011). Effect of chitin and its derivative chitosan on postharvest decay of fruit. *International Journal of Molecular Sciences*, 12(2): 917–934.

Huang, H. and Campbell, B. (2016). *U.S. Patent No. 9,380,778*. Washington, DC: U.S. Patent and Trademark Office.

Huang, H. C., Wang, H. F., Yih, K. H., Chang, L. Z. and Chang, T. M. (2012). Dual bioactivities of essential oil extracted from the leaves of *Artemisia argyi* as an antimelanogenic versus antioxidant agent and chemical composition analysis by GC/MS. *International Journal of Molecular Sciences*, 13(11):14679-14697

Ibrahim, F. and Ebady, N. (2014). Evaluation of Antifungal Activity of Some Plant Extracts and their Applicability in Extending the Shelf Life of Stored Tomato Fruits. *Journal of Food Processing and Technology*, 5(6): 6–11.

Ibrahim, N., Abdurrahman, I. and Yusop, M. R. (2015). Effects of Functional Group of Non-Ionic Surfactants on the Stability of Emulsion. *Malaysian Journal of Analytical Sciences*, 19(1): 261-267.

Idah, P. A., Ajisegiri, E. S. A. and Yisa, M. G. (2007). Fruits and VegeTables Handling and Transportation in Nigeria. *AU Journal of Technology*, 10(3): 175–183.

Ijato, J. Y. Adebiyi, A. O. and Ijadunola, J. A. (2011). Antifungal effects of four tropical plant aqueous and thanol extracts on post harvest rot of tomato in Ado-Ekiti, Nigeria. *New York Science Journal*, 4(1): 64–68.

Isaac, S. (1992). Fungal-plant interactions. Chapman & Hall

Isenegger, D.A., Ades, P.K., Ford, R. and Taylor, P.W.J. (2008). Status of the *Botrytis cinerea* species complex and microsatellite analysis of transposon types in South Asia and Australia. *Fungal Divers*, 29:17-26.

Ishii, H. and Holloman, D. W. (2015). Fungicide Resistance in Plant Pathogens. *Tokyo: Springer*, 10: 978-4

Ismail, W. I. W., Shamshiri, R., Ahmad, D., and Janius, R. (2015). Adaptability Factors for Open-field Tomato Production in East and West of Malaysia. In *2015 ASABE Annual International Meeting* (p. 1). American Society of Agricultural and Biological Engineers.

Jacometti, M. A., Wratten, S. D. and Walter, M. (2010). Review: alternatives to synthetic fungicides for *Botrytis cinerea* management in vineyards. *Australian Journal of Grape and Wine Research*, 16(1): 154-172.

Jafari, S.M., Assadpoor, E., He, Y., and Bhandari, B. (2008). Re-coalescence of emulsion droplets during highenergy emuldification. *Food Hydrocolloids*, 22: 1191-1202.

Jaklitsch, W.M. (2011). European species of Hypocrea part II: species with hyaline ascospores. *Fungal Diversity*, 48: 1-250.

Janisiewicz, W. J. and Korsten, L. (2002). Biological control of postharvest diseases of fruits. *Annual Review of Phytopathology*. 40(1): 411-441.

Janisiewiez, W. J., Tworkoski, T. J. and Kurtzman, C. P. (2001). Biological control potential of *Metchnikowia pulcherrima* strains against blue mold of apple. *Phytopathology,* 91(11): 1098-1108.

Janmeda, P., Sharma, V., Singh, L., Paliwal, R., Sharma, S., Yadav, S. and Sharma, S. (2011). Chemopreventive effect of hydroethanolic extract of *Euphorbia neriifolia* leaves against DENA-induced renal carcinogenesis in mice. *Asian Pacific Journal of Cancer Prevention*, 12(3): 677-683.

Jarvis, W.R. (1977). *Botryotinia* and *Botrytis* species: Taxonomy, Physiology and Pathogenicity, A guide to the Literature. Monograph No. 15, Canada Department of Agriculture, Ottawa, Canada.

Javed, S., Javaid, A., Anwar, W., Majeed, R. A., Akhtar, R. and Naqvi, S. F. (2017). First Report of *Botrytis* Bunch Rot of Grapes Caused by *Botrytis cinerea* in Pakistan. *Plant Disease,* 101(6): 1036.

Jayapriya, G. and Shoba, F. G. (2015). GC-MS analysis of bio-active compounds in methanolic leaf extracts of *Justicia adhatoda* (Linn.). *Journal of Pharmacognosy and Phytochemistry*. 4(1): 113-117.

Jenssen, H., Hamill, P. and Hancock, R. E. (2006). Peptide antimicrobial agents. *Clinical Microbiology Reviews*, 19(3): 491-511.

Jiang, L. C., Basri, M., Omar, D., Rahman, M. B. A., Salleh, A. B. and Rahman, R. N. Z. R. A. (2011). Self-assembly behaviour of alkylpolyglucosides (APG) in mixed surfactant-stabilized emulsions system. *Journal of Molecular Liquids*, 158(3): 175-181.

John, D.C., Suthin, R., Usha, R. and Udhayakumar, R. (2010). Role of defehce enzymes activity in tomato as induced by *Tichoderma virens* against Fusarium wilt caused by *Fusarium oxysporum* f. sp. Lycopersici. *Jouurnal of Biopestcides*, 3(1): 158–162.

Johnston, P. R., Hoksbergen, K., Park, D. and Beever, R. E. (2014). Genetic diversity of *Botrytis* in New Zealand vineyards and the significance of its seasonal and regional variation. *Plant Pathology*, 63(4): 888-898.

Kader, A.A (2005). Postharvest handling. In. Preece, J.E and Reed (Ed.), *The biology of horticulture* (Second Ed.) pp. 379–407. John Willey & Sons Inc, Hoboken, NJ.

Kader, A.A. (1992). Postharvest biology and technology: an overview. In: A.A. Kader (eds.) Postharvest Technology of Horticultural Crops. University of California, Division of Agriculture and Natural Resources, Publication 3311, California, USA, pp: 15-20.

Kadhim, E. J. and AL-Shammaa, D. A. (2014). Phytochemical characterisation using GC-MS analysis of methanolic extract of *Moringa oleifera* (family *Moringaceae*) plant cultivated in Iraq. *Chemistry and Material Research*, 6(5): 9-26.

Kahkonen, M. P., Hopia, A. I., Vuorela, H. J., Rauha, J. P., Pihlaja, K., Kujala, T. S. and Heinonen, M. (1999). Antioxidant activity of plant extracts containing phenolic compounds. *Journal of Agricultural and Food Chemistry*, 47(10): 3954-3962.

Kamarudin, N. (2014). Oil nano-emulsion formulations of azadirachtin for control of Bemisia tabaci gennadius. Unpublished master's thesis, University Putra Malaysia, Selangor, Malaysia.

Karabulut, O. A. and Baykal, N. (2002). Evaluation of the use of microwave power for the control of postharvest diseases of peaches. *Postharvest Biology and Technology*, 26(2): 237–240.

Karchani-Balma S., Gautier, A., Raies, A. and Fournier, A. (2008). Geography, plants, and growing systems shape the genetic structure of Tunisian *Botrytis cinerea* populations. *Phytopathology*, 98(12): 1271–1279.

Karnovsky, M.J. (1965). A formaldehyde-glutaraldehyde fixative of high osmolality for use in electron microscopy. *Journal of Cell Biology*., 27: 137-138.

Kars, I., McCALMAN, M. E. L. Y. S. I. A., Wagemakers, L. and van Kan, J. A. (2005). Functional analysis of *Botrytis cinerea* pectin methylesterase genes by PCR-based targeted mutagenesis: *Bcpme1* and *Bcpme2* are dispensable for virulence of strain B05. 10. *Molecular Plant Pathology*, 6(6): 641-652.

Katoh, K. and Standley, D. M. (2013). MAFFT multiple sequence alignment software version 7: improvements in performance and usability. *Molecular Biology and Evolution*, 30(4): 772-780.

Kerssies, A., Bosker-van Zessen, A. I., Wagemakers, C. A. M. and Van Kan, J. A. L. (1997). Variation in pathogenicity and DNA polymorphism among *Botrytis cinerea* isolates sampled inside and outside a glasshouse. *Plant Disease*, 81(7): 781-786.

Khaleel, A. I., Sijam, K., Rashid, T. S. and Ahmad, K. B. (2016). Phytochemical determination and antibacterial activity of *Punica granatum* peel extracts against plant pathogenic bacteria. *American Journal of Plant Sciences*. 7(1): 159-166.

Khalil, A. S., Rahim, A. A., Taha, K. K. and Abdallah, K. B. (2013). Characterization of methanolic extracts of agarwood leaves. *Journal of Applied and Industrial Sciences*, 1(3): 78-88.

Kim, J. O., Shin, J. H., Gumilang, A., Chung, K., Choi, K. Y. and Kim, K. S. (2016). Effectiveness of Different Classes of Fungicides on *Botrytis cinerea* Causing Gray Mold on Fruit and Vegetables. *The Plant Pathology Journal*, 32:570-574.

Kimura M. A. (1980). Simple method for estimating evolutionary rate of base substitutions through comparative studies of nucleotide sequences. *Journal of Molecular Evolution*, 16:111-120.

Koch, R. (1882). Uber Die Milzbrandempfung. Eine Entgegnung auf den von Pasteur in Genf Gehaltenen Vortrag. Reprint 1912. *Gesammelte Werke von Robert Koch*, *1*: 207-231.

Komaiko, J. and McClements, D.J. (2014). Optimization of isothermal low-energy nanoemulsion formation: Hydrocarbon oil, non-ionic surfactant, and water systems. *Journal of Colloid and Interface Science*, 425: 59–66.

Komaiko, J. S. and McClements, D. J. (2016). Formation of Food-Grade Nanoemulsions Using Low-Energy Preparation Methods: A Review of Available Methods. *Comprehensive Reviews in Food Science and Food Safety*, 15(2): 331-352.

Kora, C., McDonald, M. R. and Boland, G. J. (2005). Occurrence of fungal pathogens of carrots on wooden boxes used for storage. *Plant Pathology*, 54(5):665–670.

Kretschmer, M. and Hahn, M. (2008). Fungicide resistance and genetic diversity of *Botrytis cinerea* isolates from a vineyard in Germany/Fungizidresistenz und genetische Diversität von *Botrytis-cinerea*-Isolaten eines deutschen Weinbergs. *Journal of Plant Diseases and Protection*, 115(6): 214-219.

Krishnamurthy, P. T., Vardarajalu, A., Wadhwani, A. and Patel, V. (2015). Identification and characterization of a potent anticancer fraction from the leaf extracts of *Moringa oleifera* L. *Indian Journal of Experimental Biology*, 53: 98-103.

Kumar, P. and Sood, A. K. (2012). Integration of antagonistic rhizobacteria and soil solarization for the management of bacterial wilt of tomato caused by *Ralstonia solanacearum*. *Indian Phytopathology*. 54: 12-15.

Kumar, P. S., Mishra, D., Ghosh, G. and Panda, C. S. (2010). Medicinal uses and pharmacological properties of *Moringa oleifera*. *International Journal of Phytomedicine*, 2(3): 210-216.

Kumar, S. and Pandey, A. K. (2013). Chemistry and biological activities of flavonoids: an overview. *The Scientific World Journal*, 2013:162750

Kumar, S. and Singh, A. (2015). Biopesticides: present status and the future prospects. *Journal of Biofertilizer and Biopesticides*, 6(2): 1-3.

Kumar, V., Yadav, C. S., Singh, S., Goel, S., Ahmed, R. S., Gupta, S. and Banerjee, B. D. (2010). CYP 1A1 polymorphism and organochlorine pesticides levels in the etiology of prostate cancer. *Chemosphere*, 81(4): 464-468.

Kumari, S., Tayal, P., Sharma, E., Kapoor, R. (2014). Analyses of genetic and pathogenic variability among *Botrytis cinerea* isolates. *Microbiological Research*, 169(11): 862-872.

Kutama, A; Aliyu, B.S and Moammed, I. (2007). Fungal pathogens asociated with tomato wicker storage baskets. *Science World Journal*, 2(2): 38–39.

Kuzmanovska, B., Rusevski, R., Jankuloski, L., Jankulovska, M., Ivic, D. and Bandzo, K. (2012). Phenotypic and genetic characterization of *Botrytis cinerea* isolates from tomato. *Genetika-Belgrade*, 44(3): 633-647.

Labandeira, C.C. and Prevec, R. (2014). Plant paleopathology and the roles of pathogens and insects. *International Journal of Paleopathology,* 4: 1-16.

Lacerda, A.F., Vasconcelos, É. A. R., Pelegrini, P. B. and Grossi-de-Sa, M. F. (2014). Antifungal defensins and their role in plant defense. *Frontiers in Microbiology*, *5*, 116.

Leroch, M., Kleber, A., Silva, E., Coenen, T., Koppenhöfer, D., Shmaryahu, A. and Hahn, M. (2013). Transcriptome profiling of *Botrytis cinerea* conidial germination reveals upregulation of infection-related genes during the prepenetration stage. *Eukaryotic cell*, 12(4): 614-626.

Leroux, P., Elad, Y., Williamson, B., Tudzynski, P. and Delen, N. (2004). *Chemical control of Botrytis and its resistance to chemical fungicides*. New Zealand: Kluwer Academic Publishers; p. 95–217.

Levis, C., Fortini, D. and Brygoo, Y. (1997). Flipper, a mobile Fot1-like transposable element in *Botrytis cinerea. Molecular and General Genetics*, 254(6): 674–80.

Leyronas, C., Bryone, F., Duffaud, M., Troulet, C. and Nicot, P. C. (2015). Assessing host specialization of *Botrytis cinerea* on lettuce and tomato by genotypic and phenotypic characterization. *Plant Pathology*, 64(1): 119-127.

Li, B., Wang, W., Zong, Y., Qin, G. and Tian, S. (2012). Exploring pathogenic mechanisms of *Botrytis cinerea* secretome under different ambient pH based on comparative proteomic analysis. *Journal of Proteome Research*, 11(8): 4249-4260.

Li, N., Zhang, J., Yang, L., Wu, M. D. and Li, G. Q. (2015). First report of *Botrytis pseudocinerea* causing gray mold on tomato (*Lycopersicon esculentum*) in Central China. *Plant Disease,* 99(2): 283.

Li, X.P., Kerrigan, J., Chai, W.X. and Schnabel, G. (2012). *Botrytis caroliniana*, a new species isolated from blackberry in South Carolina. *Mycologia*, 104: 650–658.

Liana, D., Ongouya, M., Aijie, W., Zhenzhu, Z., Kehinde, O., Chen, X., and Wang, A. (2013). Enhancement of defence responses by *Clonostachys rosea* against *Botrytis cinerea* in tomato. *Scientific Research*, 4(12): 1–7.

Liddell, H.G., Scott, R., Jones, H.S. and Barber, E.A. (1968). *A Greek-English Lexicon compiled by Henry George Liddell and Robert Scott*. The Clarendon Press, Oxford, London. 211pp.

Lima, C.G., Vilela, A.F.G., Silva, A.A.S., Piannovski, A.R., Silva, K.K., Carvalho, V.F.M., de Musis, C.R., Machado, S.R.P. and Ferrari, M. (2008). Desenvolvimento e avaliação da estabilidade física de emulsões O/A contendo óleo de babaçu (*Orbignya oleifera*). *Revista Brasileira De Farmacognosia* 89(3): 239–245.

Liu, X., Ouyang, C., Wang, Q., Li, Y., Yan, D., Yang, D. and Cao, A. (2016). Evaluation of antibacterial and antifungal properties of 9-oxo-10, 11-

dehydroageraphorone extracted from *Eupatorium adenophorum*. *Journal of Plant Diseases and Protection*, 123(2): 93-99.

Lorenzini, M., and Zapparoli, G. (2014). An isolate morphologically and phylogenetically distinct from *Botrytis cinerea* obtained from withered grapes possibly represents a new species of Botrytis. *Plant Pathology*, 63(6): 1326-1335.

Lourens, A. C. U., Reddy, D., Başer, K. H. C., Viljoen, A. M. and Van Vuuren, S. F. (2004). *In vitro* biological activity and essential oil composition of four indigenous South African Helichrysum species. *Journal of Ethnopharmacology*, 95(2): 253-258.

Lu, W. C., Huang, D. W., Wang, C. C., Yeh, C. H., Tsai, J. C., Huang, Y. T. and Li, P. H. (2017). Preparation, characterization, and antimicrobial activity of nanoemulsions incorporating citral essential oil. *Journal of Food and Drug Analysis*.

Lucas, G. C., Alves, E., Pereira, R. B., Perina, F. J. and Souza, R. M. D. (2012). Antibacterial activity of essential oils on *Xanthomonas vesicatoria* and control of bacterial spot in tomato. *Pesquisa Agropecuária Brasileira*, 47(3): 351-359.

Luqman, S., Srivastava, S., Kumar, R., Maurya, A. K. and Chanda, D. (2011). Experimental assessment of *Moringa oleifera* leaf and fruit for its antistress, antioxidant, and scavenging potential using *in vitro* and *in vivo* assays. *Evidence-Based Complementary and Alternative Medicine*, *2012*.

Maali, A. and Mosavian, M. H. (2013). Preparation and application of nanoemulsions in the last decade (2000–2010). *Journal of Dispersion Science and Technology*, 34(1): 92-105.

Macalood, J. S., Vicente, H. J., Gorospe, J. G., Boniao, R. D. and Roa, E. C. (2014). Revisiting *Carica papaya* L. latex potentials may resolve agricltural infestation problems. *International Journal of Scientific and Technology Research*, 3(1): 95-8.

MacFarlane, H. H. (1968). Review of Applied Mycology. Pp. 820 in plant host-pathogen index to volumes 1–40 (1922– 1968).

Mahmood, K. T., Mugal, T. and Haq, I. U. (2010). *Moringa oleifera*: A natural gift-A review. *Journal of Pharmaceutical Sciences and Research*, 1(2):775-781.

Mandal, S. M., Porto, W. F., Dey, P., Maiti, M. K., Ghosh, A. K. and Franco, O. L. (2013). The attack of the phytopathogens and the trumpet solo: identification of a novel plant antifungal peptide with distinct fold and disulfide bond pattern. *Biochimie*, 95(10): 1939-1948.

Mapson, L. W. (1970). Vitamins in fruits. In: A.C. Hulme, (Ed.), Biochemistry of Fruits and their products, London, Academic Press, pp: 369-383.

MARDI. (2001). Biological Control of Foliar Diseases of Tomato Grown in Soilless Culture.

Marei, G. I. K., Rasoul, M. A. A. and Abdelgaleil, S. A.M (2012). Comparative antifungal activities and biochemical effects of monoterpenes on plant pathogenic fungi. *Pesticide Biochemistry and Physiology*, 103(1), 56-61.

Mari, M., Bautista-Baños, S. and Sivakumar, D. (2016). Decay control in the postharvest system: Role of microbial and plant volatile organic compounds. *Postharvest Biology and Technology*, 122: 70-81.

Mari, M., Di Francesco, A. and Bertolini, P. (2014). Control of fruit postharvest diseases: old issues and innovative approaches. *Stewart Postharvest Review*, 10(1): 1-4.

Marino M, and Bersani, C. C. G. (2001). Impedancemeasurement to study antimicrobial activity of essential oils from Lamiaceae and Compositae. *International Journal of Food Microbiology*, 67: 187–195.

Marles, R. J. (2017). Mineral nutrient composition of vegetables, fruits and grains: The context of reports of apparent historical declines. *Journal of Food Composition and Analysis*, 56: 93-103

Marrufo, T., Encarnação, S., Silva, O. M. D., Duarte, A., Neto, F. F., Barbosa, F. M. and Agostinho, A. B. (2013). Chemical characterization and determination of antioxidant and antimicrobial activities of the leaves of *Moringa oleifera*. *International Network Environmental Management Conflicts*, 2(1): 1-15.

Mathews, G. (2008). *Pesticide application methods*, 3rd ed. John Wiley & Sons.431p.

Matshediso, P. G., Cukrowska, E. and Chimuka, L. (2015). Development of pressurised hot water extraction (PHWE) for essential compounds from *Moringa oleifera* leaf extracts. *Food chemistry*, 172: 423-427.

Mazumdar, B.C. and Majumder, K. (2003). Methods on Physico-chemical Analysis of Fruits, Daya Publ. House, Delhi, India, pp: 93-139.

Mbikay, M. (2012). Therapeutic potential of *Moringa oleifera* leaves in chronic hyperglycemia and dyslipidemia: a review. *Frontiers in Pharmacology*, 3: doi:10.3389/fphar.2012.00024.

McClements, D. J. (2005). Food Emulsions: Principles, Practice, and Techniques, CRC Press, Boca Raton. 392pp.

McClements, D. J. (2012). Nanoemulsions versus microemulsions: terminology, differences, and similarities. *Soft Matter*, 8(6): 1719-1729.

McClements, D. J. and Decker, E. A. (2000). Lipid oxidation in oil-in-water emulsions: Impact of molecular environment on chemical reactions in heterogeneous food systems. *Journal of Food Science*, 65(8): 1270-128

McDonald, B. A. and Linde, C. (2002). Pathogen population genetics, evolutionary potential, and durable resistance. *Annual Review of Phytopathology*, 40(1): 349-379.

McGuire, R.G, (1992). Reporting of objective colour measurements. *HortScience*, 27(12): 1254-1255.

Mehmood, T. (2015). Optimization of the canola oil based vitamin E nanoemulsions stabilized by food grade mixed surfactants using response surface methodology. *Food Chemistry*, 183: 1-7.

Mehrotra, R.S., and Agarwal, A. (2003). Plant Pathology (2^{nd} Ed). New Delhi, India. Teta McGraw-Hill Publishing Company.

Mendonça-Filho, R. R. (2006). Bioactive phytocompounds: new approaches in the phytosciences. *Modern Phytomedicine: Turning medicinal plants into drugs*, 1-25.

Meng, X., Yang, L., Kennedy, J. F. and Tian, S. (2010). Effects of chitosan and oligochitosan on growth of two fungal pathogens and physiological properties in pear fruit. *Carbohydrate Polymers*, 81(1): 70-75.

Miclea, R. V., Suciu, L. A., and Puia, C. E. (2012). *In Vitro* Studies Regarding the Morphology of *Botrytis cinerea* Pers. Isolated from Geranium Plants. *Pro Environment/ProMediu*, 5(9): 60-66.

Miličević T., Topolovec-Pintarić, S. Cvjetković, B. Ivić, D. and Duralija, B. (2006). Sympatric subpopulations of *Botrytis cinerea* on strawberries based on the content of transposable elements and their connection with resistance to botryticides. *Acta Horticulturae*, 708: 115–118.

Miller, N. J. and Rice-Evans, C. A. (1997). The relative contributions of ascorbic acid and phenolic antioxidants to the total antioxidant activity of orange and apple fruit juices and blackcurrant drink. *Food Chemistry*, 60(3): 331-337.

Mirali, M., Purves, R.W., Stonehouse, R., Song, R., Bett, K. and Vandenberg, A. (2016) Genetics and Biochemistry of Zero-Tannin Lentils. *PLoS ONE*, 11(10):164624.

Mirzaei S, Goltapeh, E.M., Shams-Bakhsh, M. (2007). Taxonomical studies on the genus *Botrytis* in Iran. *Journal of Agricultural Technology*, 3(1): 65-76.

Mirzaei, S., Mohammadi-Goltapeh, E., Shams-Bakhsh, M., Safaie, N. and Chaichi, M. (2009). Genetic and phenotypic diversity among *Botrytis cinerea* isolates in Iran. *Journal of Phytopathology*, 157(8): 474-482.

Mishra, R. K., Soni, G. C. and Mishra, R. P. (2014). A review article: On nanoemulsion. *World Journal of Pharmacy and Pharmaceutical Sciences*, 3(9): 258-274.

Moghimipour, E. and Handali, S. (2015). Saponin: properties, methods of evaluation and applications. *Annual Research and Review in Biology*, 5(3): 207-220.

Mohammed, M., Wilson, L. A. and Gomes, P. I. (1999). Postharvest sensory and physiochemical attributes of processing and nonprocessing tomato cultivars. *Journal of Food Quality*, 22(2): 167-182.

Moneruzzaman, K.M., Hossain, A.B., Sani, W. and Saifuddin, M. (2009). The effect of harvesting and storage conditions on the post harvest quality of tomato (*Solanum lycopersicon* Mill) cv. Roma VF. *Australian Journal of Food Crops* 3(2): 113-121.

Moore, D., Robson, G. D. and Trinci, A. P. (2012). Fungi as pathogens of animals, including humans, CH 16. of 21st Century Guidebook to Fungi. Cambridge University Press. pp 421-422.

Moraes, M. N., Zabot, G. L., Prado, J. M. and Meireles, M. A. A. (2013). Obtaining Antioxidants from Botanic Matrices Applying Novel Extraction Techniques. *Food and Public Health,* 3(4): 195-214.

Morais, J. K. S., Gomes, V. M., Oliveira, J. T. A., Santos, I. S., Da Cunha, M., Oliveira, H. D. and Vasconcelos, I. M. (2010). Soybean toxin (SBTX), a protein from soybeans that inhibits the life cycle of plant and human pathogenic fungi. *Journal of Agricultural and Food Chemistry*, 58(19): 10356-10363.

Mou, D., Chen, H., Du, D., Mao, C., Wan, J., Xu, H. and Yang, X. (2008). Hydrogel-thickened nanoemulsion system for topical delivery of lipophilic drugs. *International Journal of Pharmaceutics*, 353(1): 270-276.

Mouria, B., Ouazzani-touhami, A., Mouria, A., Benkirane, R. and Douira, A. (2015). Effect of compost and antagonistic fungi on suppression of Tomato Grey Mold. *An International Quaterly Journal of Biology and Life Sciences*, 3(2): 378–390.

Movahedi, S. and Heale, J. B. (1990). The roles of aspartic proteinase and endo-pectin lyase enzymes in the primary stages of infection and pathogenesis of various host tissues by different isolates of *Botrytis cinerea* Pers ex. Pers. *Physiological and Molecular Plant Pathology*, 36(4): 303-324.

Moyo, B., Masika, P.J. and Muchenge, V. (2012). Antimicrbial activities of *Moringa oleifera* Lam leaf extracts. *Africa Journal of Biotechnology*, 11(11): 2797–2802.

Munoz, C., Talquenca, S. G., Oriolani, E. and Combina, M. (2010). Genetic characterization of grapevine-infecting *Botrytis cinerea* isolates from Argentina. *Revista Iberoamericana de Micologia*, 27(2): 66-70.

Murrell, J. N., and Jenkins, A. D. (1994). *Properties of liquids and solutions*. (2nd Ed). Wiley & Sons. 303p.

Mushore, J. and Matuvhunye, M. (2013). Antibacterial properties of *Mangifera indica* on *Staphylococcus aureus*. *African Journal of Clinical and Experimental Microbiology*, 14(2): 62-74.

Mustafa, M. A., Ali, A., Manickam, S. and Siddiqui, Y. (2014). Ultrasound-Assisted Chitosan–Surfactant Nanostructure Assemblies: Towards Maintaining Postharvest Quality of Tomatoes. *Food and Bioprocess Technology*, 7(7): 2102-2111.

Muzzarelli, R.A.A. (1999). Native, industrial, and fossil chitins. pp. 1–6. In: Jollès P, Muzzarelli R.A.A, (eds). Chitin and Chitinases. Basel: Birkhäuser Basel.

Myers, D. (2005). Surfactant science and technology. (3rd. Ed). John Wiley & Sons Inc. New Jersey. ISBN: 978-0-471-68024, 400pp.

Nadal, M., Marquès, M., Mari, M. and Domingo, J. L. (2015). Climate change and environmental concentrations of POPs: A review. *Environmental Research*, 143: 177-185.

Nakajima, M. and Akutsu, K. (2014). Virulence factors of *Botrytis cinerea*. *Journal of General Plant Pathology*, 80(1): 15-23.

Naureen, F., Humaira, B., Viqar, S., Ara, J. and Ehteshamul-Haque, S. (2009). Prevalance of post-harvest rot of vegetables and fruits in Karachi, Pakistan. *Pakistan Journal of Botany*, 41(6): 3185–3190.

Negi, A. S., Darokar, M. P., Chattopadhyay, S. K., Garg, A., Bhattacharya, A. K., Srivastava, V. and Khanuja, S. P. (2005). Synthesis of a novel plant growth promoter from gallic acid. *Bioorganic and medicinal chemistry letters*, 15(4):1243-1247.

Ncube, N., Afolayan, S.A.J. and Okoh, A.I. (2008). Assessment techniques of antimicrobial properties of natural compounds of plant origin: Current methods and future trends. *African Journal of Biotechnology*, 7(12): 1797-1806.

Neilsen, K., Yohalem, D.S. and Jensen, D.F. (2002). PCR detection and RFLP differentiation of *Botrytis* species associated with neck rot of onion. *Plant Disease*, 86(6): 682-686.

Ngobisa, A. I. C., Abidin, M. A., Wong, M. Y. and Murnita, M. M. (2012). Cultural and Morphological Characterisations of *Fusicoccum sp*., the Causal Agent of Rubber (*Hevea brasiliensis*) Leaf Blight in Malaysia. *Journal of Rubber Research*, 15(1): 64-79.

Nicosia, M.G.L.D., Pangallo, S., Raphael, G., Romeo, F. V., Strano, M.C., Rapisarda, P. and Schena, L. (2016). Control of postharvest fungal rots on citrus fruit and sweet cherries using a pomegranate peel extract. *Postharvest Biology and Technology*, 114: 54-61.

Nicot, P. C., Mermier, M., Vaissiere, B. E., and Lagier, J. (1996). Differential spore production by *Botrytis cinerea* on agar medium and plant tissue under near-ultraviolet light-absorbing polyethylene film. *Plant Disease*, 80: 555-558.

Njan, A. A., Amali, M. O., Olatunji, L. O. and Olorundare, O. E. (2014). An overview of the ethno-pharmacological potential of *Moringa oleifera* Lam," The Miracle Tree. *Archives of Basic Applied Medicine*, 2: 135-145.

Noda, J., Brito, N. and González, C. (2010). The *Botrytis cinerea* xylanase Xyn11A contributes to virulence with its necrotizing activity, not with its catalytic activity. *BMC Plant Biology*, 10(1): 38-43.

Nunes, C. A. (2012). Biological control of postharvest diseases of fruit. *European Journal of Plant Pathology*, 133(1): 181-196.

Ocsoy, I., Paret, M. L., Ocsoy, M. A., Kunwar, S., Chen, T., You, M. and Tan, W. (2013). Nanotechnology in plant disease management: DNA-directed silver nanoparticles on graphene oxide as an antibacterial against *Xanthomonas perforans*. *Acs Nano*, 7(10): 8972-8980.

Olayemi, F., Adegbola, J., Bamishaiye, E. and Daura, A. (2011). Assessment of post-harvest challenges of small scale farm holders of tomotoes, bell and hot pepper in some local government areas of Kano State, Nigeria. *Bayero Journal of Pure and Applied Sciences*, 3(2): 39–42.

Oliveira, E.C.V., Boock, K.P., Maruno, M., Rocha-Filho, P.A. (2011). Accelerated stability and moisturizing capacity of emulsions presenting lamellar gel phase obtained from brazilian natural raw material. *Journal of Dispersion Science and Technology*, 32(8):1135–1139.

Omojate Godstime, C., Enwa Felix, O., Jewo Augustina, O. and Eze Christopher, O. (2014). Mechanisms of antimicrobial actions of phytochemicals against enteric pathogens–a review. *Journal of Pharmaceutical, Chemical and Biological Sciences*, 2(2): 77-85.

Onsare, J. G., and Arora, D. S. (2015). Antibiofilm potential of flavonoids extracted from Moringa oleifera seed coat against *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Candida albicans. Journal of Applied Microbiology*, 118(2): 313-325.

Osemwegie, O.O, Oghenekaro, A.O and Owolo, L. (2010). Effects of Pulverized *Ganoderma spp*. on *Sclerotium rolfsii* Sacc and Post-harvest Tomato (*Lycopersicon esculentum* Mill .) Fruits Preservation . *Journal of Applied Science and Research*, 6(11): 1794–1800.

Pacirc, M., Pacirc, A. E., Barbu-Tudoran, L., Roşca-Casian, O., Vlase, L., Danciu, M. R. and Pacirc, O. (2013). *In vitro* effects of *Allium obliquum* extract on the growth and ultrastructure of *Botrytis paeoniae*. *Journal of Medicinal Plants Research*, 7(17): 1138-1145.

Palavouzi, S.C., Tzamos, S., Paplomatas, E and Thomidis, T. (2015). First report of *Cytospora punicae* isolated from pomegranate plants with symptom of collar rot in Northern Greece, *Journal of Plant Pathology*, 97 (1): 216.

Panda, P., Rath, M., Pal, A., Sharma, T. and Das, D. (2015). GC-MS analysis of bioactive compounds in the methanol extract of *Clerodendrum viscosum* leaves. *Pharmacognosy Research*. 7(1): 110-113.

Panda, S., Kar, A., Sharma, P. and Sharma, A. (2013). Cardioprotective potential of N, α-l-rhamnopyranosyl vincosamide, an indole alkaloid, isolated from the leaves of *Moringa oleifera* in isoproterenol induced cardiotoxic rats: *In vivo* and *in vitro* studies. *Bioorganic and Medicinal Chemistry Letters*, 23(4): 959-962.

Pande, S., Sharma, M., Kishore, G. K., Shivram, L. and Mangala, U. N. (2010). Characterization of *Botrytis cinerea* isolates from chickpea: DNA polymorphisms, cultural, morphological and virulence characteristics. *African Journal of Biotechnology*, 9(46): 7961-7967.

Pande, S., Singh, G., Narayana, J., Bakr, M., Chaurasia, P., Joshi, S. and Gowda, C. (2001). Integrated management of *Botrytis* gray mold of chickpea. *India: International Crops Research Institute for the Semi-Arid Tropics*.

Pande, S., Singh, G., Rao, J.N., Bakr, M.A., Chaurasia, P.C.P., Joshi, S., Johansen, C., Singh, S.D., Kumar, J., Rahman, M.M. and Gowda, C.L.L. (2002). Integrated management of *Botrytis* gray mold of chickpea. Information Bulletin no. 61. ICRISAT Patancheru, Andhra Pradesh, India

Parekh, J., Jadeja, D. and Chanda, S. (2005). Efficacy of aqueous and methanol extracts of some medicinal plants for potential antibacterial activity. *Turkish Journal of Biology*, 29(4): 203-210.

Pârvu, M. and Pârvu, A. E. (2011). Antifungal plant extracts. *Science Against Microbial Pathogens: Communicating Current Research and Technological Advances. Formatex Research Center, Badajoz (Spain)*, 1055-1062.

Parvu, M., Pârvu, A. E., Crăciun, C., Barbu-Tudoran, L. and Tămaş, M. (2008). Antifungal activities of *Chelidonium majus* extract on *Botrytis cinerea in vitro* and ultrastructural changes in its conidia. *Journal of Phytopathology*, 156(9): 550-552.

Parvu, M., Parvu, A. E., Craciun, C., Barbu-Tudoran, L., Vlase, L., Tamas, M. and Molnar, A. M. (2010). Changes in *Botrytis cinerea* conidia caused by *Berberis vulgaris* extract. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, 38(3): 15-20.

Patwardhan, B., Warude, D., Pushpangadan, P. and Bhatt, N. (2005). Ayurveda and traditional Chinese medicine: a comparative overview. *Evidence-Based Complementary and Alternative Medicine*, 2(4): 465-473.

Pereira, F. S. G., da Silva, A. M. R. B., Galvão, C. C., de Lima, V. F., de Assunção Montenegro, L. G. L., de Lima-Filho, N. M. and da Silva, V. L. (2015). *Moringa oleifera* as Sustainable Source for Energetic Biomass. *International Journal of Chemistry*, 7(2): 177-185.

Perez, M. F., Contreras, L., Garnica, N. M., Fernández-Zenoff, M. V., Farías, M. E., Sepulveda, M. and Dib, J. R. (2016). Native Killer Yeasts as Biocontrol Agents of Postharvest Fungal Diseases in Lemons. *PloS one*, 11(10): 0165590.

Pernezny, K. (1997). *Tomato Production Guide for Florida: Disease Control*. Institute of Food and Agricultural Sciences, University of Florida Cooperative Extension Service, Gainesville, U.S.A, EDIS. 11pp.

Peters, N. K. and Verma, D. P. S. (1990). Phenolic compounds as regulators of gene expression in plant-microbe interactions. *Mol.ecular Plant-Microbe Interactions*, 3(1): 4-8.

Pila, N., Gol, N. B. and Rao, T. R. (2010). Effect of post harvest treatments on physicochemical characteristics and shelf life of tomato (*Lycopersicon esculentum* Mill.) fruits during storage. *American-Eurasian Journal of Agricultural and Environmental Sciences*, 9(5): 470-479.

Pinto, C. E., Farias, D. F., Carvalho, A. F., Oliveira, J. T., Pereira, M. L., Grangeiro, T. B. and Vasconcelos, I. M. (2015). Food safety assessment of an antifungal protein from *Moringa oleifera* seeds in an agricultural biotechnology perspective. *Food and Chemical Toxicology*, 83: 1-9.

Pirondi, A., Brunelli, A., Muzzi, E. and Collina, M. (2017). Post-infection activity of fungicides against *Phytophthora infestans* on tomato (*Solanum lycopersicum L.). Journal of General Plant Pathology*, 83: 244–252.

Polychniatou, V. and Tzia, C. (2014). Study of formulation and stability of co-surfactant free water-in-olive oil nano-and submicron emulsions with food grade non-ionic surfactants. *Journal of the American Oil Chemists' Society*, 91(1): 79-88.

Porter, D.M., Smith, D.H. and Rodriguez-Kabana, R. (1984). Compendium of Peanut Diseases 2nd ed. American Phytopathological Society Press, St. Paul, Minnesota, USA.94pp

Prapassom, P, Piyarat, N, Paweena, R. Chandrapatya, A. (2012). Effect of Crude Leaf Extracts on *Colletotrichum gloeosporioides* (Penz.) Sacc. *Pysche, ID 309046*, 1–6.

Purwal, L., Pathak, A. K. and Jain, U. K. (2010). In vivo anticancer activity of the leaves and fruits of *Moringa oleifera* on mouse melanoma. *Pharmacologyonline*, 1: 655-665.

Qaim, M. (2010). Benefits of genetically modified crops for the poor: household income, nutrition, and health. *New Biotechnology*, 27(5): 552-557.

Qiuping, Z. and Wenshui, X. (2007). Effect of 1-methylcyclopropene and and/or chitosan coating treatments on storage life and quality maintenance of Indian jujube fruit. *Food and Science Technology*, 40(3): 404-411.

Rahman, M., Abdul Rahman, R., Tengku Muda Mohamed, M., Kadir, J. and Begum, M. M. (2012). Potential co-application of *Burkholderia cepacia*, calcium and chitosan on enhancement of storage life and quality of papaya fruits. *Pertanika Journal of Tropical Agricultural Science*, 35(3): 439-458.

Rai, M., Jogee, P. S. and Ingle, A. P. (2015). Emerging nanotechnology for detection of mycotoxins in food and feed. *International Journal of Food Sciences and Nutrition*, 66(4): 363-370.

Rajaguru B.A.P. and Shaw, M.W. (2010). Genetic differentiation between hosts and locations in populations of latent *Botrytis cinerea* in southern England. *Plant Pathology*, 59(6): 1081–1090.

Ranganna, S. (1977). Manual of analysis of fruit and vegetable products. McGrawHill: New Delhi. 644pp.

Ranjan, S., Dasgupta, N., Chakraborty, A. R., Samuel, S. M., Ramalingam, C., Shanker, R., and Kumar, A. (2014). Nanoscience and nanotechnologies in food industries: opportunities and research trends. *Journal of Nanoparticle Research*, 16(6): 2464-2487.

Rao, J. and McClements, D. J. (2012). Lemon oil solubilization in mixed surfactant solutions: Rationalizing microemulsion and nanoemulsion formation. *Food Hydrocolloids*, 26(1): 268-276.

Rashid, T. S., Sijam, K., Kadir, J., Saud, H. M., Awla, H. K., Zulperi, D. and Hata, E. M. (2016). Screening for active compounds in *Rhus coriaria* L. crude extract that inhibit the growth of *Pseudomonas syringae* and *Ralstonia solanacearum*. *Indian Journal of Agricultural Research*. 50(1): 15-21.

Rashidi, L., and Khosravi-Darani, K. (2011). The applications of nanotechnology in food industry. *Critical Reviews in Food Science and Nutrition*, 51(8): 723-730.

Rawani, A., Ghosh, A. and Chandra, G. (2013). Mosquito larvicidal and antimicrobial activity of synthesized nano-crystalline silver particles using leaves and green berry extract of *Solanum nigrum* L. (Solanaceae: Solanales). *Acta Tropica* 128: 613-622.

Razis, A. F. A., Ibrahim, M. D. and Kutayya, S. B. (2014). Health benefits of *Moringa oleifera*. *Asian Pacific Journal of Cancer Prevention*, 15(20): 8571-8576.

Reino, J. L., Hernández-Galán, R., Durán-Patrón, R. and Collado, I. G. (2004). Virulence–toxin production relationship in isolates of the plant pathogenic fungus *Botrytis cinerea*. *Journal of Phytopathology*, 152(10): 563-566.

Reynolds, E.S. (1963). The use of lead citrate at high pH as an electron-opaque stain in electron microscopy. *Journal of Cell Biology,* 17: 208-212.

Rhouma, A., Ben Daoud, H., Ghanmi, S., Ben Salah, H., Romdhane, M. and Demak, M. (2009). Antimicrobial activities of leaf extracts of *Pistacia* and *Schinus* species against some plant pathogenic fungi and bacteria. *Journal of Plant Pathology*, 91(2): 339-345

Ribeiro, R. C. D. A., Barreto, S. M. A. G., Ostrosky, E. A., Rocha-Filho, P. A. D., Veríssimo, L. M. and Ferrari, M. (2015). Production and characterization of cosmetic nanoemulsions containing *Opuntia ficus-indica* (L.) mill extract as moisturizing agent. *Molecules*, 20(2): 2492-2509.

Richards, A., Veses, V. and Gow, N. A. (2010). Vacuole dynamics in fungi. *Fungal Biology Reviews*, 24(3): 93-105.

Rick, C. . (1978). The tomato. *Scientia America*, 7: 77–88.

Rigotti, S., Gindro, K., Richter, H. and Viret, O. (2002). Characterization of molecular markers for specific and sensitive detection of *Botrytis cinerea* Pers.: Fr. in strawberry (*Fragaria ananassa* Duch.) using PCR. FEMS *Microbiology Letters*, 209: 169-174.

Rikita, B. and Utpal, D. (2014). An overview of fungal and bacterial biopesticides to control plant pathogens/diseases. *African Journal of Microbiology Research*, 8(17): 1749-1762.

Roberts, D. A. and Boothroyd, C. W. (1972). *Fundamentals of plant pathology*. 2nd ed. W.H. Freeman and Company, New York. 432 pp.

Rodríguez-Pérez, C., Gilbert-Lopez, B., Mendiola, J. A., Quirantes-Piné, R., Segura-Carretero, A. and Ibáñez, E. (2016). Optimization of microwave-assisted extraction and pressurized liquid extraction of phenolic compounds from Moringa oleifera leavesby multiresponse surface methodology. *Electrophoresis*, 37(13): 1938-1946.

Rodríguez-Rojo, S., Varona, S., Núnez, M. and Cocero, M. J. (2012). Characterization of rosemary essential oil for biodegradable emulsions. *Industrial Crops and Products*, 37(1): 137-140.

Rohani, A., Nazni, W.A., Ngo, L.V., Ibrahim, J. and Lee, H.L. (1997) Adulticidal properties of the essential extracts of some Malaysian plants on vector mosquitoes. *Tropical Biomedicine*,14: 5-9.

Rolke, Y., Liu, S., Quidde, T., Williamson, B., Schouten, A., Weltring, K. M. and Tudzynski, P. (2004). Functional analysis of H2O2-generating systems in *Botrytis cinerea*: the major Cu-Zn-superoxide dismutase (BCSOD1) contributes to virulence on French bean, whereas a glucose oxidase (BCGOD1) is dispensable. *Molecular Plant Pathology*, 5(1): 17-27.

Romanazzi, G., Lichter, A., Gabler, F.M. and Smilanick, J.L. (2012). Recent advances on the use of natural and safe alternatives to conventional methods to control postharvest gray mold of table grapes. *Postharvest Biology and Technology*, 63(1): 141-147.

Romeo, F.V., Ballistreri, G., Fabroni, S., Pangallo, S., Nicosia, M. G. L. D., Schena, L. and Rapisarda, P. (2015). Chemical characterization of different sumac and pomegranate extracts effective against *Botrytis cinerea* rots. *Molecules*, 20(7): 11941-11958.

Rosano, H. L., Weiss, A. and Gerbacia, W. E. (1967). In Proceedings of the 12th Internation Congress on Surface Active Substances. Moscow, USSR, 1453.

Saha, A., Mandal, P., Dasgupta, S. and Saha, D. (2008). Influence of culture media and environmental factors on mycelial growth and sporulation of *Lasiodiplodia theobromae* (Pat.) Griffon and Maubl. *Journal of Environmental Biology*, 29(3): 407-410.

Saha, S., Hedau, N. K., Mahajan, V., Singh, G., Gupta, H. S. and Gahalain, A. (2010). Textural, nutritional and functional attributes in tomato genotypes for breeding better quality varieties. *Journal of the Science of Food and Agriculture*, 90(2): 239-244.

Saito, S., Suzuki, S. and Takayanagi, T. (2009). Nested PCR-RFLP is a high-speed method to detect fungicide-resistant *Botrytis cinerea* at an early growth stage of grapes. *Pest Management Science*, 65(2): 197-204.

Salinas, J. (1992) Function of cutinolytic enzymes in the infection of gerbera flowers by *Botrytis cinerea*. Ph.D. dissertation, University of Utrecht, Netherlands

Salma, M. and Jogen, C.K. (2011). A review on the use of biopesticides in insect pest management. *International Journal of Science and Advanced Technology*, 1:169-178.

Samuel S., Veloukas, T., Papavasileiou, A. and Karaoglanidis, G.S. (2012). Differences in frequency of transposable elements presence in *Botrytis cinerea* populations from several hosts in Greece. *Plant Disease*, 96(9): 1286–1290.

Saravi, S. S. S. and Shokrzadeh, M. (2011). *Role of pesticides in human life in the modern age: a review*. INTECH Open Access Publisher. Rijeka, Croatia. pp. 1-12.

Saseetharan, M., Huda, N. and Zakaria, L. (2014). Occurrence of *Fusarium* spp. on Vegetable Crops and Assessment of Their Pathogenicity. *Pertanika Journal of Tropical Agricultural Science*, 37(4): 445-455.

Sasidharan, S., Latha, L. Y., Ping, K. Y. xand Lachumy, S. J. (2012). Screening methods in the study of fungicidal property of medicinal plants. In *Fungicides for Plant and Animal Diseases*. InTech. P107-118.

Satish, A., Kumar, R. P., Rakshith, D., Satish, S. and Ahmed, F. (2013). Antimutagenic and antioxidant activity of *Ficus benghalensis* stem bark and *Moringa oleifera* root extract. *International Journal of Chemical and Analytical Science*, 4(2): 45-48.

Satish, S., Mohana, D. C., Ranhavendra, M. P. and Raveesha, K. A. (2007). Antifungal activity of some plant extracts against important seed borne pathogens of *Aspergillus sp*. *An International Journal of Agricultural Technology*, 3(1): 109-119.

Satyanarayana, U. (2005). Chromatography. In: Biochemistry, Books and Allied Publishing Company, Ltd. 809pp.

Schmourlo, G., Mendonça-Filho, R. R., Alviano, C. S. and Costa, S. S. (2005). Screening of antifungal agents using ethanol precipitation and bioautography of medicinal and food plants. *Journal of Ethnopharmacology*, 96(3): 563-568.

Schouten A, van Baarlen P. and van Kan, J.A.L. (2008). Phytotoxic Nep1- like proteins from the necrotrophic fungus *Botrytis cinerea* associate with membranes and the nucleus of plant cells. *New Phytologist,* 177(2):493–505.

Schubert, H., Ax, K., and Behrend, O. (2003). Product engineering of dispersed systems. *Trends in Food Science and Technology*, 14(1): 9–16.

Segmüller, N., Kokkelink, L., Giesbert, S., Odinius, D., van Kan, J. and Tudzynski, P. (2008). NADPH oxidases are involved in differentiation and pathogenicity in *Botrytis cinerea*. *Molecular Plant-Microbe Interactions,* 21(6): 808-819.

Sehajpal, P.K. and Singh, P.J. (2014). Effect of temperature on growth, sporulation and sclerotial formation of the fungus *Botrytis gladiolorum* timm. in different culture media and standardization of inoculum load of the fungus for generation of disease. *International Journal of Research*, 1: 772-779.

Sermakkani, M. and Thangapandian, V. (2012). GC-MS analysis of *Cassia italica* leaf methanol extract. *Asian Journal of Pharmaceutical and Clinical Research*. 5(2): 90-94.

Shafiq, S., Shakeel, F., Talegaonkar, S., Ahmad, F. J., Khar, R. K. and Ali, M. (2007). Development and bioavailability assessment of ramipril nanoemulsion formulations. *European Journal of Pharmaceutics and Biopharmaceutics*, 66 (2): 227-243.

Sharma, V. and Paliwal, R. (2011). Phytochemical analysis and evaluation of antioxidant activities of hydro-ethanolic extract of *Moringa oleifera* Lam. pods. *Journal of Pharmacy Research*, 1(4): 554-557.

Sharma, V. and Paliwal, R. (2013). Isolation and characterization of saponins from *Moringa oleifera* (*Moringaceae*) pods. *International Journal of Pharmacy and Pharmacological Sciences*, 5(1): 179-183.

Sharma, V., Paliwal, R., Janmeda, P. and Sharma, S. (2012). Chemopreventive efficacy of *Moringa oleifera* pods against 7, 12-dimethylbenz [a] anthracene induced hepatic carcinogenesis in mice. *Asian Pacific Journal of Cancer Prevention*, 13(6): 2563-2569.

Shaw, M. W., Emmanuel, C. J., Emilda, D., Terhem, R. B., Shafia, A., Tsamaidi, D. and Van Kan, J. A. (2016). Analysis of cryptic, systemic *Botrytis* infections in symptomless hosts. *Frontiers in Plant Science*, 7: 1-14.

Shlezinger, N., Doron, A. and Sharon, A. (2011a) Apoptosis-like programmed cell death in the grey mould fungus *Botrytis cinerea*: genes and their role in pathogenicity. *Biochemical Society Transactions,* 39(5): 1493–1498.

Shlezinger, N., Minz, A., Gur, Y., Hatam, I., Dagdas, Y. F., Talbot, N. J. and Sharon, A. (2011b). Anti-apoptotic machinery protects the necrotrophic fungus *Botrytis cinerea* from host-induced apoptotic-like cell death during plant infection. *PLoS Pathogens*, 7(8): e1002185.

Sibounnavoung, P., Kalaw, S. P., Divina, C. C. and Soytong, K. (2009). Mycelial growth and sporulation of *Emericella nidulans*, a new fungal antagonist on two culture media. *Journal of Agricultural Technology*, *5*(2): 317-324.

Simko, I. and Piepho, H. P. (2012). The area under the disease progress stairs: calculation, advantage, and application. *Phytopathology*, 102(4): 381-389.

Singh, A., Van Hamme, J. D. and Ward, O. P. (2007). Surfactants in microbiology and biotechnology:Part 2. Application aspects. *Biotechnology Advances*, 25(1): 99-121.

Singh, P., Mishra, A. K. and Tripathi, N. N. (2012). Assessment of mycoflora associated with postharvest losses of Papaya Friuts. *Journal of Agricultural Technology*, 8(3): 961–968.

Siqueira, J. O., Nair, M. G., Hammerschmidt, R., Safir, G. R. and Putnam, A. R. (1991). Significance of phenolic compounds in plant-soil-microbial systems. *Critical Reviews in Plant Sciences*, 10(1): 63-121.

Slawecki, R. A., Ryan, E. P. and Young, D. H. (2002). Novel fungitoxicity assays for inhibition of germination-associated adhesion of *Botrytis cinerea* and *Puccinia recondita* spores. *Applied and Environmental Microbiology*, 68(2): 597-60.

Smilanick, J. L., Mansour, M. F., Mlikota Gabler, F., Margosan, D. A. and Hashim-Buckey, J. (2010). Control of postharvest gray mold of Table grapes in the San Joaquin Valley of California by fungicides applied during the growing season. *Plant Disease*, 94(2): 250-257.

Smith, A. (1994). *The tomato on America*. University of Ilorin press. 224pp.

Snyder, L. R., Kirkland, J. J. and Glajch, J. L. (2012). *Practical HPLC method development* (2nd Ed). John Wiley & Sons. 542pp.

Sofowora A., (2005). Medicinal plants and traditional medicine in Africa. Spectrum Books Ltd: Ibadan. Nigeria, 289 pp.

Sogvar, O. B., Saba, M. K. and Emamifar, A. (2016). *Aloe vera* and ascorbic acid coatings maintain postharvest quality and reduce microbial load of strawberry fruit. *Postharvest Biology and Technology*, 114: 29-35.

Solans, C., Izquierdo, P., Nolla, J., Azemar, N. and Garcia-Celma, M.J. (2005). Nano-emulsions. *Current Opinion in Colloid*. 10(3): 102-110.

Spadaro, D., Ciavorella, A., Dianpeng, Z., Garibaldi, A. and Gullino, M. L. (2010). Effect of culture media and pH on the biomass production and biocontrol efficacy of a *Metschnikowia pulcherrima* strain to be used as a biofungicide for postharvest disease control. *Canadian Journal of Microbiology*, 56(2): 128-137.

Staats M, van Baarlen P, van Kan J.A. (2005). Molecular phylogeny of the plant pathogenic genus *Botrytis* and the evolution of host specificity. *Molecular Biology and Evolution*, 22(2): 333-346.

Staats, M., van Baarlen, P., Schouten, A., van Kan, J. A. and Bakker, F. T. (2007). Positive selection in phytotoxic protein-encoding genes of *Botrytis* species. *Fungal Genetics and Biology*, 44(1): 52-63.

Stall, R. (1991). Gray mold. In T. Jones, JB; Jones, JP; Sall, RE and Zitter (Ed.), *Compendum of tomato diseases* (pp. 16–17). American Phytopathological Society Press,St Paul Mn.

Stangarlin, J. R., Kuhn, O. J., Assi, L. and Schwan-Estrada, K. R. F. (2011). Control of plant diseases using extracts from medicinal plants and fungi. *Science against microbial pathogens: communicating current research and technological advances. Badajoz: Formatex*, 2: 1033-1042.

Stefanato, F. L., Abou-Mansour, E., Buchala, A., Kretschmer, M., Mosbach, A., Hahn, M. and Schoonbeek, H. J. (2009). The ABC transporter BcatrB from *Botrytis cinerea* exports camalexin and is a virulence factor on *Arabidopsis thaliana*. *The Plant Journal*, 58(3): 499-510.

Stohs, S. J. and Hartman, M. J. (2015). Review of the safety and efficacy of *Moringa oleifera. Phytotherapy Research*, 29(6): 796-804.

Su, H., Marrone, P. and Osborne, J. L. (2014). *U.S. Patent No. 8,658,567*. Washington, DC: U.S. Patent and Trademark Office.

Sugar, D. and Basile, S. R. (2008). Timing and sequence of postharvest fungicide and biocontrol agent applications for control of pear decay. *Postharvest Biology and Technology*, 49(1): 107-112.

Sugumar, S., Clarke, S.K., Nirmala, M.J., Tyagi, B.K., Mukherjee, A., Chnadrasekaran, N. (2014). Nanoemulsion of eucalyptus oil and its larvicidal activity against *Culex quinquefasciatus*. *Bulletin of Entomological Research* 104(3): 393-402.

Sundin, G. W., Castiblanco, L. F., Yuan, X., Zeng, Q. and Yang, C. H. (2016). Bacterial disease management: Challenges, experience, innovation, and future prospects. *Molecular Plant Pathology*, 17(9): 1506–1518.

Surassmo, S., Srinuanchai, W., Yostawonkul, J. and Ruktanonchai, U. (2013). Formulation development of plai nanoemulsion based on the influence of surfactant combinations. *Chiang Mai Journal of Science*, 40(6): 994-999.

Swamy, M. K., Sinniah, U. R. and Akhtar, M. S. (2015). In vitro pharmacological activities and GC-MS analysis of different solvent extracts of *Lantana camara* leaves collected from tropical region of Malaysia. *Evidence-Based Complementary and Alternative Medicine*, *2015*.

Tadesse, T. N. and Abtew, A. M. I. W. G. (2015). Degradation and Formation of Fruit Color in Tomato (*Solanum lycopersicum* L.) in Response to Storage Temperature. *American Journal of Food Technology*, 10(4): 147-157.

Tadros, T. F., Vandamme, A., Levecke, B., Booten, K. and Stevens, C. V. (2004a). Stabilization of emulsions using polymeric surfactants based on inulin. *Advances in Colloid and Interface Science*, 108: 207-226.

Tadros, T. F, Izquierdo, P., Esquena, J. and Solans, C. (2004b). Formation and stability of nano-emulsions. *Advances in Colloid and Interface Science*, 108: 303-318.

Taiga, A., Suleiman, M.N., W., and Olufolaji, D.B. (2008). Comparative in vitro inhibitory effects of cold extracts of some fungicidal plants on *Fusarium oxysporium* mycelium. *African Journal of Biotechnology*, 7(18): 3306-3308.

Tamilvanan, S. (2009). Formulation of multifunctional oil-in-water nanosized emulsions for active and passive targeting of drugs to otherwise inaccessible internal organs of the human body. *International Journal of Pharmaceutics*, 381(1): 62-76.

Tamura, K., Stecher, G., Peterson, D., Filipski, A. and Kumar, S. (2013). MEGA6: molecular evolutionary genetics analysis version 6.0. *Molecular Biology and Evolution*, 30(12): 2725-2729.

Tani, H., Koshino, H., Sakuno, E., Cutler, H. G. and Nakajima, H. (2006). Botcinins E and F and Botcinolide from *Botrytis cinerea* and Structural Revision of Botcinolides. *Journal of Natural Products*, 69(4): 722-725.

Tanovic, B., Delibasic, G., Milivojevic, J. and Nikolic, M. (2009). Characterization of *Botrytis cinerea* isolates from small fruits and grapevine in Serbia. *Archives of Biological Sciences*, 61(3): 419–29.

Taskeen-Un-Nisa, W. A. H., Bhat, M. Y., Pala, S. A. and Mir, R. A. (2011). In vitro inhibitory effect of fungicides and botanicals on mycelial growth and spore germination of *Fusarium oxysporum*. *Journal of Biopesticides*, 4(1): 53–56.

Taweechaisupapong, S., Singhara, S., Lertsatitthanakorn, P. and Khunkitti, W. (2010). Antimicrobial effects of *Boesenbergia pandurata* and *Piper sarmentosum* leaf extracts on planktonic cells and biofilm of oral pathogens. *Pakistan Journal of Pharmaceutical Sciences*, 23(2): 224-231.

Teixeira, E. M. B., Carvalho, M. R. B., Neves, V. A., Silva, M. A. and Arantes-Pereira, L. (2014). Chemical characteristics and fractionation of proteins from *Moringa oleifera* Lam. leaves. *Food Chemistry*, 147: 51-54.

Tenberge, K. (2004). Morphology and cellular organisation in *Botrytis* interaction with plants. In N. Elad, Y; Williamson,B; Tudzynski, P;and Delen (Ed.), *In:Botrytis: Biology, Patholgy and Control* (pp. 67–84). Dordrecht, The Netherlands.: Kluwer Academic Publishers,.

Terefe, H., Fininsa, C., Sahile, S. and Tesfaye, K. (2015). Effect of Temperature on Growth and Sporulation of *Botrytis fabae*, and Resistance Reactions of Faba Bean against the Pathogen. *Journal of Plant Pathology and Microbiology*. 6(7): 1-9.

Thompson, M.D. and Thompson, H.J. (2010). Botanical diversity in vegetable and fruit intake: potential health benefits. In: Bioactice Foods in Promoting Health Fruits and Vegetables. Academic Press, San Francisco, CA, USA, pp. 3–17.

Tijjani, A., Adebitan, S. A., Gurama, A. U., Haruna, S. G. and Safiya, T. (2014). Effect of some selected plant extracts on *Aspergillus flavus* , a causal agent of fruit rot disease of tomato (*Solanum lycopersicum*) in Bauchi State. *International Journal of Biosciences*, 4(12): 244–252.

Tiwari, V., Roy, R. and Tiwari, M. (2015). Antimicrobial active herbal compounds against Acinetobacter baumannii and other pathogens. *Frontiers in Microbiology*, 6: 00618.

Topolovec-pintaric, S., Milicevic, T., Cvjetkovic, B. (2004): Genetic diversity and dynamic of pyrimethanil-resistant phenotype in population of *Botrytis cinerea* Pers.:Fr. in one winegrowing area in Croatia. *Journal of Plant Diseases and Protection*. 111(5): 451-460.

Tripathi P., N. K. Dubey and A. K. Shukla. (2008). Use of some essential oils as post-harvest botanical fungicides in the management of grey mould of grapes caused by *Botrytis cinerea*. *World Journal of Microbiology and Biotechnology*, 24: 39–46.

Trotta, M., Gallarate, M., Pattarino, F. and Carlotti, M. E. (1999). Investigation of the phase behaviour of systems containing lecithin and 2-acyl lysolecithin derivatives. *International Journal of Pharmaceutics*, 190(1): 83-89.

Ukeh, N. and Chiejina, J. (2012). Preliminary investigation of the cause of the postharvest fungal rot of tomato. *IOSR Journal of Pharmocology and Biological Sciences*, 4(3): 36–39.

Usall, J., Casals, C., Sisquella, M., Palou, L. and De Cal, A. (2015). Alternative technologies to control postharvest diseases of stone fruits. *Stewart Postharvest Review*, 11(4): 1-6.

Vaczy, Z. K., Sandor, E., Karaffa, L., Fekete, E., Fekete, E., Arnyasi, M., Czegledi, L., Kovics, G., Druzhinina, S.I. and Kubicek, P.C. (2008): Sexual recombination in the *Botrytis cinerea* populations in Hungarian vineyards. *Phytopathology*, 98(12): 1312-1319.

Vadivel, E. and Gopalakrishnan, S. (2011). GC-MS analysis of some bioactive constituents of *Mussaenda frondosa* Linn. *International Journal of Pharm and Bio Sciences*, 2(1): 313-320.

Valette-Collet, O., Cimerman, A., Reignault, P., Levis, C. and Boccara, M. (2003). Disruption of *Botrytis cinerea* pectin methylesterase gene *Bcpme1* reduces virulence on several host plants. *Molecular Plant-Microbe Interactions*, 16(4): 360-367.

Valiuškaitė, A., Survilienė, E. and Baniulis, D. (2010). Genetic diversity and pathogenicity traits of *Botrytis spp*. isolated from horticultural hosts. *Žemdirbystė-Agriculture*, 97(4): 85-90.

Van Hamme, J. D., Singh, A. and Ward, O. P. (2006). Physiological aspects: Part 1 in a series of papers devoted to surfactants in microbiology and biotechnology. *Biotechnology Advances*, 24(6): 604-620.

Van Kan J.A. (2006). Licensed to kill: the lifestyle of a necrotrophic plant pathogen. *Trends in Plant Sciences*, 11: 247–253.

van Kan, J. A. (2003). Infection strategies of *Botrytis cinerea*. In *VIII International Symposium on Postharvest Physiology of Ornamental Plants 669* (pp. 77-90).

van Kan, J., Duarte, J., Dekkers, E., Dyer, P. and Kohn, L. M. (2010). The *Botrytis cinerea* mating type loci. In *Book of Abstracts 15th International Botrytis symposium, Cadiz, Spain, 30 May–4 June 2010* (pp. 39-39).

Veerakumar, K., Govindarajan, M., Rajeswary, M. and Muthukumaran, U. (2014). Low-cost and eco-friendly green synthesis of silver nanoparticles using *Feronia elephantum* (Rutaceae) against *Culex quinquefasciatus*, *Anopheles stephensi*, and *Aedes aegypti* (Diptera: Culicidae). *Parasitology Research* 113(5):1775-1785.

Vercesi, A., Toffolatti, S. L., Venturini, G., Campia, P. and Scagnelli, S. (2014). Characterization of *Botrytis cinerea* populations associated with treated and untreated cv. Moscato vineyards. *Phytopathologia Mediterranea*, 53(1): 108.

Verma, A. R., Vijayakumar, M., Mathela, C. S. and Rao, C. V. (2009). In vitro and in vivo antioxidant properties of different fractions of *Moringa oleifera* leaves. *Food and Chemical Toxicology*, 47(9), 2196-2201.

Verma, V. C., Kharwar, R. N. and Gange, A. C. (2010). Biosynthesis of antimicrobial silver nanoparticles by the endophytic fungus *Aspergillus clavatus*. *Nanomedicine*, 5(1): 33-40.

Villas-Bôas, S. G., Mas, S., Åkesson, M., Smedsgaard, J. and Nielsen, J. (2005). Mass spectrometry in metabolome analysis. *Mass Spectrometry Reviews*, 24(5): 613-646.

Vinoth, B., Manivasagaperumal, R. and Balamurugan, S. (2012). Phytochemical analysis and antibacterial activity of *Moringa oleifera* Lam. *International Journal of Research in Biological Sciences*, 2(3): 98-102.

Vior, M. C. G., Monteagudo, E., Dicelio, L. E. and Awruch, J. (2011). A comparative study of a novel lipophilic phthalocyanine incorporated into nanoemulsion formulations: photophysics, size, solubility and thermodynamic stability. *Dyes and Pigments*, 91(2): 208-214.

Vitoratos, A., Bilalis, D., Karkanis, A. and Efthimiadou, A. (2013). Antifungal Activity of plant essential oils against *Botrytis cinerea*, *Penicillium italicum* and *Penicillium digitatum. Notulae Botanicae Horti Agrobotanici Cluj-Napoca*, 41(1): 86–92.

Vongsak, B., Sithisam, P., Gritsanapan, W. (2014). Simultaneous HPLC quantitative analysis of active compoundsin leaves of *Moringa oleifera* Lam. *Journal Chromatographic Sciences*, 52(7): 641-645.

Wahab, H. A. (2015). Characterization of Egyptian *Botrytis cinerea* Isolates from Different Host Plants. *Advances in Microbiology*, 5(3): 177

Walker, A. S., Gautier, A., Confais, J., Martinho, D., Viaud, M., Le Pêcheur, P. and Fournier, E. (2011). *Botrytis pseudocinerea*, a new cryptic species causing gray mold in French vineyards in sympatry with *Botrytis cinerea*. *Phytopathology*, 101(12): 1433-1445.

Wang, B., Wang, R. R., Cui, Z. H., Bi, W. L., Li, J. W., Li, B. Q. and Wang, Q. C. (2014). Potential applications of cryogenic technologies to plant genetic improvement and pathogen eradication. *Biotechnology Advances*, 32(3): 583-595.

Wang, C. J. and Liu, Z. Q. (2007). Foliar uptake of pesticides—present status and future challenge. *Pesticide Biochemistry and Physiology*, 87(1): 1-8.

Wang, H.B., Wang, B.L., Wang, X.D., Wei, C.C., Nie, J.Y. and Liu, F.Z. (2010). The current situation of the grape industry, problems and development strategy. *China Fruits Issue*, 6: 69–71.

Wang, J. F., Hanson, P. and Barnes, J. A. (1998). Worldwide evaluation of an international set of resistance sources to bacterial wilt in tomato. pp. 269-275. In: Bacterial Wilt Disease. Molecular and Ecological aspect, Prior, P: Allen, C and Elphinstone, J (eds.) Springer Berlin Heidelberg.

Wang, L., Li, X., Zhang, G., Dong, J. and Eastoe, J. (2007). Oil-in-water nano-emulsions for pesticide formulations. *Journal of Colloid and Interface Science*, 314(1): 230-235.

Wang, Y., Chang, L., Zhao, X., Meng, X. and Liu, Y. (2012). Gas chromatography-mass spectrometry analysis on compounds in volatile oils extracted from Yuan Zhi (*Radix Polygalae*) and Shi Chang Pu (*Acorus Tatarinowii*) by supercritical CO2. *Journal of Traditional Chinese Medicine*, 32(3): 459-464.

Wang, Y; Bouwmeester, k; van de Mortel, J.E; Shan, W.X. and Govers, F. (2013). A novel arabidopsis-oomycete pathosystem:differential interactions with *Phytophthora capsici* reveal a role for camalexin, indole glucosinolates and salicylic acid in defence. *Plant Cell and Environment*, 36(6): 1192–1203.

Wani, A. H. (2011). An overview of the fungal rot of tomato. *Mycopathologica*, 9(1): 33–38.

Waterman, C., Cheng, D. M., Rojas-Silva, P., Poulev, A., Dreifus, J., Lila, M. A. and Raskin, I. (2014). Stable, water extractable isothiocyanates from *Moringa oleifera* leaves attenuate inflammation *in vitro*. *Phytochemistry*, 103: 114-122.

Wessels, B. A., Lamprecht, S. C., Linde, C. C., Fourie, P. H. and Mostert, L. (2013). Characterization of the genetic variation and fungicide resistance in *Botrytis cinerea* populations on rooibos seedlings in the Western Cape of South Africa. *European Journal of Plant Pathology*, 136(2): 407-417.

White, T. J., Bruns, T., Lee, S. J. W. T. and Taylor, J. W. (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: *PCR protocols: a guide to methods and applications*, ed. by Innis, M. A., Gelfand, D.H., Snisky, J.J and White, T. J., pp 315-322. Academic press, New York, USA.

Wien, H. C. (1997). *The Physiology of Vegetable Crops*. CAB International, UK. 672pp.

Wilbur, A. (1983). Introduction and history of Industry. In: *Tomato Production, Processing and Quality valuation* (pp. 3–7). The AVI Publishing company, Westport, Connectcurt, USA.

Williamson, B., Tudzynski, B., Tudzynski, P., Jan, A. L. and van kan. (2007). *Botrytis cinerea*:the cause of grey mold disease. *Molecular Plant Pathology*, 8(5):561–580.

Winans, S. C. (1990). Transcriptional induction of an Agrobacterium regulatory gene at tandem promoters by plant-released phenolic compounds, phosphate starvation, and acidic growth media. *Journal of Bacteriology*, 172(5): 2433-2438.

Windram, O., Madhou, P., McHattie, S., Hill, C., Hickman, R., Cooke, E. and Kiddle, S. J. (2012). Arabidopsis defense against *Botrytis cinerea*: chronology and regulation deciphered by high-resolution temporal transcriptomic analysis. *The Plant Cell*, 24(9): 3530-3557.

Windram, O., Stoker, C. and Denby, K. (2016). Overview of Plant Defence Systems: Lessons from Arabidopsis-*Botrytis cinerea* Systems Biology. In *Botrytis–the Fungus, the Pathogen and its Management in Agricultural Systems* (pp. 335-360). Springer International Publishing.

Wu, D., Feng, L., Zhang, C. and He, Y. (2008). Early detection of *Botrytis cinerea* on eggplant leaves based on visible and near-infrared spectroscopy. *Transactions of the ASABE*, 51(3): 1133-1139.

Xu, L. and Du, Y. (2012). Effects of yeast antagonist in combination with UV-C treatment on postharvest diseases of pear fruit. *BioControl*, 57(3): 451–461.

Xu, L., Zhu, H., Ozkan, H. E., Bagley, W. E. and Krause, C. R. (2011). Droplet evaporation and spread on waxy and hairy leaves associated with type and concentration of adjuvants. *Pest Management Science*, 67(7): 842-851.

Xu, Y. X., Hanna, M. A. and Josiah, S. J. (2007). Hybrid hazelnut oil characteristics and its potential oleochemical application. *Industrial Crops and Products*, 26(1): 69-76.

Xue, L. H., Liu, Y., Liu, H. Y. and Li, C. J. (2017). First Report of *Botrytis cinerea* Causing Fruit Rot on Kiwifruit (*Actinidia chinensis*) in China. *Plant Disease*, 101(6): 1054-1054.

Yadav, S., Tomar, A. K., Yadav, R. N. and Yadav, S. (2013). Screening of antifungal proteins from plants of Cucurbitaceae family against *Fusarium oxysporum*: potential as biofungicides. *International Research Journal of Environmental Sciences*, 2(6): 91-96.

Yao, Q., Wu, C. F., Luo, P., Xiang, X. C., Liu, J. J., Mou, L. and Bao, J. K. (2010). A new chitin-binding lectin from rhizome of *Setcreasea purpurea* with antifungal, antiviral and apoptosis-inducing activities. *Process Biochemistry*, 45(9): 1477-1485.

Yassa, H. D. and Tohamy, A. F. (2014). Extract of *Moringa oleifera* leaves ameliorates streptozotocin-induced Diabetes mellitus in adult rats. *Acta Histochemica*, 116(5): 844-854.

Yermiyahu, U., Shamai, I., Peleg, R., Dudai, N. and Shtienberg, D. (2006). Reduction of *Botrytis cinerea* sporulation in sweet basil by altering the concentrations of nitrogen and calcium in the irrigation solution. *Plant Pathology*, 55(4): 544-552

Zahid, N., Ali, A., Manickam, S., Siddiqui, Y. and Maqbool, M. (2012). Potential of chitosan-loaded nanoemulsions to control different *Colletotrichum spp*. and maintain quality of tropical fruits during cold storage. *Journal of Applied Microbiology*, 113(4): 925-939.

Zebena, L., Woubit, D., Mulugeta, N., Ashenafi, C., Thangavel, S. and Girma, G. (2014). Identification of postharvest rotting microorganisms from tomato fruits (*Solanun esculentum* Mill.) ii Toke Kutaye district of West Shoa Zone, Ethoiopia. *Journal of Stored Products and Postharvest Research*, 5(3): 14–19.

Zhang, C., Chen, K. and Wang, G. (2013). Combination of the biocontrol yeast *Cryptococcus laurentii* with UV-C treatment for control of postharvest diseases of tomato fruit. *BioControl*, 58(2): 269–281.

Zhang, Z., Duan, Z., Xu, P. and Li, G. (2010). Food security of China: the past, present and future. *Plant Omics*, 3(6): 183-189.

Zhao, S. and Zhang, D. (2013). Supercritical fluid extraction and characterisation of *Moringa oleifera* leaves oil. *Separation and Purification Technology*, 118: 497-502.

Zheng, W. and Wang, S. Y. (2001). Antioxidant activity and phenolic compounds in selected herbs. *Journal of Agricultural and Food chemistry*, 49(11): 5165-5170.

Zhou, Y. J., Zhang, J., Wang, X. D., Yang, L., Jiang, D. H., Li, G. Q. and Zhuang, W. Y. (2014). Morphological and phylogenetic identification of *Botrytis sinoviticola*, a novel cryptic species causing gray mold disease of table grapes (*Vitis vinifera*) in China. *Mycologia*, 106(1): 43-56.

Zottich, U., Da Cunha, M., Carvalho, A.O., Dias, G.B. and Silva, N.C. (2011). Purification, biochemical characterization and antifungal activity of a new lipid transfer protein (LTP) from *Coffea canephora* seeds with alfa-amylase inhibitor properties. *Biochimica et Biophysica Acta*, 1810(4): 375–383

Zvinorova, P. I., Lekhanya, L., Erlwanger, K. and Chivandi, E. (2015). Dietary effects of *Moringa oleifera* leaf powder on growth, gastrointestinal morphometry and blood and liver metabolites in Sprague Dawley rats. *Journal of Animal Physiology and Animal Nutrition*, 99(1): 21-28.