

Formulation and characterization of extracts of AJWA dates



BY

Aroosa Afzal

ID: 15004140027

SUPERVISOR: Dr. Ayesha Mohyuddin

DEPARTMENT OF CHEMISTRY
SCHOOL OF SCIENCE
UNIVERSITY OF MANAGEMENT AND TECHNOLOGY,
LAHORE, PAKISTAN

2017

FORMULATION AND CHARACTERIZATION OF
AJWAH DATE

Submitted to University of Management and Technology Lahore
in partial fulfillment of the requirements
for the award of degree of

MS

IN

CHEMISTRY

BY

AROOSA AFZAL

ID: 15004140027

SESSION: 2015-2017

DEPARTMENT OF CHEMISTRY
SCHOOL OF SCIENCE
UNIVERSITY OF MANAGEMENT AND TECHNOLOGY,
LAHORE, PAKISTAN

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Lord Muhammad (peace be upon him)

*“The Calamity of Knowledge is forgetfulness;
and to lose knowledge is this, to speak of it to the
unworthy.*

*Who are the learned? Those who practice
what they know” .*

DECLARATION

I AROOSA AFZAL D/O M. AFZALID: 15004140027, Session 2015-2017

hereby declare that the matter printed in the thesis titled “**FORMULATION AND CHARACTERIZATION OF EXTRACTS OF AJWAH DATES**” is my own work and has not been printed, published and submitted as research work, thesis or publication in any form in any University, Research institution etc. in Pakistan or Abroad.

Dated: _____

()

RESEARCH COMPLETION CERTIFICATE

Certified that the research work contained in this thesis titled, “**FORMULATION AND CHARACTERIZATION OF EXTRACTS OF AJWAH DATES**” has been carried out and completed by **AROOSA AFZAL, ID: 15004140027**. The quantum and the quality of the work contained in this thesis is adequate for the award of Degree of MS/M. Phil.

Supervisor

Dr. Ayesha Mohyuddin
Associate Professor

Department of Chemistry
UMT, Lahore.

External Examiner

Dr. Sammia Shahid

Chairperson,

Department of Chemistry,
UMT, Lahore.

Dr. Muhammad Azhar Iqbal

Dean

School of Science,
UMT, Lahore.

DEDICATION

I dedicate my dissertation work to my family. A special feeling of gratitude to my loving parents, M. Afzal and Zaib-u-Nisa whose words of encouragement and push for tenacity ring in my ears. My brothers Zeeshan and Waqas have never left my side and are very special.

I also dedicate this dissertation to my many friends and my husband who have supported me throughout the process. I will always appreciate all they have done, especially Dr. Ayesha for helping me develop my technology skills.

All of you have been my best cheerleaders

CONTENTS

List of Tables	viii
List of Figures & Graphs	ix
Acknowledgement	x
Abstract	xi

CHAPTER 1.1: INTRODUCTION 1-19

1.2. Family Arecacea	1
1.2.1. Classification of family arecacea	1
1.2.2. Morphological Aspects	2
1.1.3. Important Genera of the FamilyArecacea	2
1.1.4. Significance of the family Arecacea	4
1.3. Genus <i>phoenix dactylifra</i>	5
1.3.1. Morphological Aspects of <i>phoenix dactylifra</i>	5
1.3.2. Important Species of Genus <i>phoenix dactylifra</i>	5
1.3.3. Vernacular names of <i>phoenix dactylifra</i>	6
1.3.4. Taxonomy of <i>phoenix dactylifra</i>	6
1.3.5. Significance of <i>phoenix dactylifra</i>	7
1.4. Ajwa dates	7
1.4.1. Habit and habitat	7
1.4.2. Botanical features	7
1.4.3. Importance of Ajwa in Ahadith	8
1.4.4. Chemical constituents in Ajwa dates	9
1.4.5. Role of Ajwa dates in human body	11
1.4.6. Uses of Ajwa	11
1.5. Secondary Metabolites	12
1.5.1. Classification of secondary metabolite	12
1.5.2. Alkaloids	12
1.5.3. Terpenoids	14

1.5.4. Phenolic compounds	14
1.6. Antioxidant activity	16
1.6.1. Total Phenolic Content (TPC)	17
1.7. Antibacterial Study	17
1.7.1. <i>Staphylococcus aureus</i>	18
1.7.2. <i>Escherichia coli</i>	18
1.7.3. <i>Pseudomonas aeruginosa</i>	18
1.7.4. <i>Spectroccoccusmutans</i>	18
1.8. Aims and Objectives	19
CHAPTER 2: LITERATURE REVIEW	20-28
CHAPTER 3: EXPERIMENTAL WORK	29-36
3.1. Equipment/ Glassware	29
3.2. Chemicals	30
3.3. Equipment/ Instruments	31
3.4. Collection of Ajwa	32
3.5. Extraction of chemical constituents	32
3.5.1. Drying of Ajwa dates	32
3.5.2. Aqueous Extraction	32
3.5.3. n-hexane Extraction	32
3.5.4. Methanolic Extraction	32
3.5.5. Concentration of Extracts of Ajwa	33
3.6. Phytochemical Evaluation of Extract	33
3.6.1. Test for Phenolic compounds	33
3.6.2. Test for saponins	33
3.6.3. Test for Alkaloids	33
3.6.3.1. Wagner Test	33
3.6.3.2. Hager's Test	34

3.6.3.3. Mayer's Test	34	
3.6.4. Test for Tannins		34
3.6.5. Test for Flavonoids		34
3.6.6. Test for Steroids		34
3.7. Antioxidant Study		34
3.7.1. Total Phenolic Content assay		35
3.8. Antibacterial Study		35
3.8.1. Preparation of Sample		35
3.8.2. Preparation of Nutrient agar	36	
3.8.3. Preparation of Nutrient broth		36
3.8.4. Preparation of Inoculums		36
3.8.5. Preparation of Petri-dishes		36
CHAPTER 4.0: RESULTS AND DISCUSSION		37-47
4.1. Extraction of Ajwa	37	
4.2. Determination of Phytochemicals		37
4.3. Antioxidant Study		38
4.3.1. Total Phenolic Content assay		39
4.4. Antibacterial Study		41
4.4.1. Antibacterial study for methanolic extract of Ajwa	42	
4.4.2. Antibacterial study for n-hexane extract of Ajwa		43
4.4.3. Antibacterial study for aqueous extract of Ajwa		45
CONCLUSION		46
REFERENCES		48-54

LIST OF TABLES

Table 3.1: List of Apparatus/ Glassware	30
Table 3.2: List of Chemicals	31
Table 3.3: List of Equipment/Instruments	32
Table 4.1: Phytochemical Tests of the Extracts of Ajwa dates	38
Table 4.2: Calibration Curve of Gallic acid Concentrations against Absorbance	39
Table 4.3: Antioxidant activity of all extracts of Ajwa dates	40
Table 4.4: Antibacterial activity for methanolic extract of Ajwa	42
Table 4.5: Antibacterial activity for n-hexane extract of Ajwa	44
Table 4.6: Antibacterial activity for aqueous extract of Ajwa	45

LIST OF FIGURES & GRAPHS

Figure 1.1: Important genera of arecaceae	3
Figure 1.2: Ajwa dates	8
Figure 1.3: Tree and leaves of Ajwa dates	8
Figure 1.4: Active compounds of Ajwa dates	10
Figure 1.5: Alkaloids in Ajwa dates	13
Figure 1.6: Basic structure of terpene	14
Figure 1.7: Classes of phenolic compounds	15
Figure 1.8: Examples of Non flavonoids	16
Figure 4.1: Calibration Curve of Gallic acid	40
Figure 4.2: Comparison of all extracts of Ajwa	41
Figure 4.3: Antibacterial activity for methanolic extract of Ajwa dates	43
Figure 4.4: Antibacterial activity for n-hexane extract of Ajwa dates	44
Figure 4.5: Antibacterial activity for aqueous extract of Ajwadates	46

ACKNOWLEDGEMENTS

Up and above anything else, all gratitude and praises are due to **ALMIGHTY ALLAH** alone, the most gracious, merciful and companionate, the creator of the universe, Who blessed me with potential, thoughts, talented teachers, cooperated friends and opportunity to make some contribution to the already existing ocean of knowledge. If ocean turn into ink and all the wood becomes pens, even then, the praises of **ALLAH ALMIGHTY** cannot be expressed.

Then the trembling lips and wet eyes praise the greatest man of Universe, the last messenger of **ALLAH, Hazrat MOHAMMAD (P.B.U.H.)**, whom **ALLAH** has sent as mercy for worlds, the illuminating torch, the blessing for the literate, illiterate, rich, poor, powerful, weaker, able and disabled.

I deem it a rare privilege and source of great pleasure in expressing my profound and cordial gratitude to my research supervisor **Dr. Ayesha Mohyuddin (Department of Chemistry, UMT Lahore)** not only for providing me opportunity to do my research work but also for her dynamic elaborate instructions, enlightening suggestions, illustrious advices, persistent help and constant encouragement during whole course of my academic session.

I will owe my special regards to **Dr. Muhammad Azhar Iqbal (Dean, School of Science, and UMT Lahore)** who takes special interest in research activities. I feel a great honor in expressing my profound gratitude to **Dr. Sammia Shahid (Chairperson, Department of Chemistry, UMT Lahore)** for her learned guidance and kind behavior during the course of my studies.

To all my **friends**, especially Amna Tabassum who was my lab partner also, thank you for your understanding and encouragement in my many, many moments of crises, your friendship makes my life a wonderful experience. It is fact that I would not be successful in my aim without sincerest prayers of my **Parents** and encouraging behavior of my **husband and brothers**. All of them prayed for my brilliant success and provided me every facility and cooperation during my academic career with tremendous love and honor.

Despite these acknowledgements the weaknesses and limitations of this thesis are remain all mine.

(Aroosa Afzal)

ABSTRACT

Ajwa dates (*Phoenix dactylifera*) are special type of fruit which are cultivated in Madinah. Ajwa dates are unique due to its medicinal properties and high nutritional value. It contains high percentage of secondary metabolites. Ajwa dates are being used for medicinal purposes for decades due to the presence of bioactive compounds in them.

Objective of this study was to evaluate the anti-oxidant and anti-bacterial activity of the Ajwa date extracts. In order to carry out the extraction methanol, water and n-hexane were used as solvents. Phytochemical tests of these extracts were carried out and results showed the high concentration of the flavonoids, saponnins, steroids and many phenolic compounds. Antioxidants were evaluated by using TPC assay which shows that the aqueous extract gives 2.1233 which is the highest value among all solvents and the lowest activity shown by the n-hexane extract which was (0.283).Methanolic extract showed activity (0.6156) which was slightly greater than the n-hexane.

Antibacterial activity was performed by agar well diffusion method. In this method all extracts of Ajwa dates were tested against the four bacteria using Amoxicillin as standard.Highest zone of inhibition was shown by the methanolic extract with 50mg/mL concentration of 21mm against *E.coli*. N-hexane extract of concentration 100mg/mL shows maximum zone of inhibitionof 13mm against the*Staphylococusaureus*.

The aqueous extract of concentration 150mg/mL shows13mmas highest zone of inhibition for both *Staphylococusaureus*, *Spectrococcusmutans*. Results suggested that Ajwa dates can significantly act as an anti-bacterial and anti-oxidant agent.

1.1 INTRODUCTION

Many fruit plant are used for medicinal purposes for decades among of which are reported to explore their medicinal value. These plants can act as an anti-oxidants and anti-therapeutic agents and play an important role to cure and treat many human health diseases. Fruit plant being a natural product involves in making of many herbal medicines and maintained their value in the field of herbal medicines as well as in industry all over the world (Scartezziniet *al.*, 2000).

1.2 FAMILY ARECACEAE

This family is the major group of flowering plants. It consists of about 20 genera and 4000 species. Usually they are natives of tropical and subtropical climate. Most of the shrubs, plants or trees with large leaves relates to the family. They all are of monocots in order and ever green leaves with them (Dransfeild *et al.*, 2005).