

Dedication

To My:

Parents,

Brothers,

Sisters,

Uncles,

Aunts,

Teachers,

Friends,

And all date palm growers.

Khalid

Acknowledgements

First of all I would like to express my thanks to Almighty Allah (The Greatest), who helped me to complete this research.

I would like to express my deepest thanks to my supervisor Dr. Awad Khalafalla for his supervision and interest throughout the research.

I am especially indebted to my co-supervisor Dr. Tagelsir Ibrahim for his patience and continuous guidance, fruitful directions and follow up throughout this work.

Special thanks are due to Ustaz Fakhreldeen Awad Hussein and Omer Ahmed for their cooperation in the statistical analysis and Omer Eldoush for typing the thesis

Thanks are extended to Mr. Salah Mobashar for his help and hosting me in his house at Elghaba during the field part of the research.

Appreciation also extended to the staff of the agricultural office of Elghaba locality, and the farmers in Elghaba Scheme especially Mahadi Mohi-Eldin, Abd-Elmonaim Elshaigy, Abdelrahiem Abdelhafiez and Dafa-Elseed Hashas.

Finally, special thanks are due to my family for their financial and moral support.

TABLES OF CONTENTS

Dedication	i
Acknowledgements.....	ii
Tables of contents	iii
`List of tables	vi
List of figures	viii
List of plates	x
Abstract	xi
Arabic abstract.....	xii
CHAPTER ONE :INTRODUCTION	
CHPTER TWO: LITERATURE REVIEW	
2.1 The problems of date palm in Northern Sudan:-	5
2.1.1 Pests of the date palm	5
2.1.2 Diseases of date palm	8
2.1.2.2 Nematodes reported on date palms	8
2. 2 The date palm green pit scale insect (<i>Asterolicanium phoenicis</i>)	12
2.2.1 Back ground	12
2.2.2 Classification	12
2.2.3 Description	14
2.2.4 Life cycle	16
2.2.5 Geographical Distribution	18
2.2.6 Host plant and economic importance	19
2.2.7 Varietal susceptibility of date palm varieties to the infesting of green pit scale insect	22
2.2.8 Control measures against green pit scale insect	22
2.2.8.1 Biological control	22
2.2.8.2 Cultural control	23
2.2.8.3 Chemical control	23
2.2.8.3.1 The standard insecticide Actara 25WG	25
2.3 Botanicals	26
2.3.1 Usher plant	28
2.3.1.1 Classification	28
2.31.2 Plant description	28
2.3.1.3 Ecology	29
2.3.1.4 Distribution	29
2.3.1.5 Chemical constituents of <i>Calotropis procera</i>	29
2.3.1.6 Insecticide Activity of <i>C. procera</i>	30
2.3.2 Argel	31
2.3.2.1 Description	31
2.3.2.2 Distribution	32

2.3.2.3 Locality	32
2.3.2.4 Chemical Constituents of Argel	32
2.3.2.5 Insecticide Activity of <i>Solenostemma argel</i>	32
CHAPTER THREE MATERIALS AND METHODS	
3.1. The study area	34
3.1.1 The study sites in 2006 season	34
3.1.1.1 Arab Narti site	34
3.1.1.2 Wad-diab site	35
3.1.2. The study sites in 2007	35
3.1.2.1 Gharb Dongola village	35
3.1.2.2 Elikinduwa peoples scheme	35
3.2 Experimental plant materials	35
3.2.1 Preparation of experimental plant powders	36
3.2.2 Preparation of the plant aqueous extracts	36
3.2.2.1 Preparation of the Argel aqueous extract	36
3.2.2.2 Preparation of the Usher aqueous extract	36
3.3 Applications of insecticides	37
3.3.1 Application of plant powders	37
3.3.2 Application of plant aqueous extracts	37
3.3.3 Application of standard insecticide (Actara)	37
3.4 First Season Trial (2006)	37
3.4.1 Treatments	38
3.4.2 Replications	38
3.5 Second season Trial (2007)	38
3.5.1 Treatments	39
3.5.2 Replications	39
3.6 Data collection	39
3.6.1 Count of green date palm pit scale insect	39
3.6.2 Yield comparison	40
3.7 Statistical analysis	40
CHAPTER FOUR: RESULTS	
4. 4. 1 Effect of Actara and various treatments of argel on control of the green date palm pit scale insect (<i>Asterolicanium phoenicis</i>) season 2006	46
4. 4. 1.1 Mortality of adult females at Arab Narti	46
4. 4. 1.2 Mortality of adult females at Wad-diab	48
4. 4. 1.3 Mortality of immature stages at Arab Narti	50
4. 4. 1.4 Mortality of immature stages at Wad-diab	54
4. 4. 2 Effect of Actara, Argel and usher treatments on mortality of the green date palm pit scale insect (January 2007)	54
4. 4. 2.1 Effect of Actara, argel and usher treatments on mortality of adult females	54

at Gharb Dongola (January 2007)	
4.2.2 Effect of Actara, argel and usher treatments on mortality of adult females at Elkinduwa (January 2007)	56
4.2.3 Effect of Actara, argel and usher treatment on mortality of immature stages at Gharb Dongola (January 2007)	58
4.2.4 Effect of Actara, argel and usher treatment on mortality of immature stages at Elkinduwa (January 2007)	60
4.3 Effect of Actara, argel and usher treatments on mortality of the green date palm it scale insect (May 2007)	62
4.3.1 Effect of Actara, argel and usher treatments on mortality of adult females at Gharb Dongola	62
4.3.2 Mortality of adult females at Elkinduwa treated with Actara, argel and usher treatments (May 2007)	64
4.3.3 Effect of treatments on mortality of immature stages at Gharb Dongola (May 2007)	66
4.3.4 Mortality of immature stages treated with Actara, argel and usher treatments at Elkinduwa (May 2007)	68
4.4 Effect of argel and the recommended insecticide (Actara) on yield of date palms	70
4.4.1 Effect of argel and the recommended insecticide (Actara) on yield at Arab Narti in 2006	70
4.4.2 Yield of date palms as affected by argel and Actara applications at Wad-diab in 2006	72
4.4.3 Comparison of date palm yield after treatments by argel, usher and recommended insecticide Actara at Gharb Dongola in 2007	74
4.4.4 Effect of argel, usher and the recommended insecticide Actara on yield of date palms at Elkinduwa in 2007	77
CHAPTER FIVE: DISCUSSION	80
REFERENCES	86
APPENDICES	99

List of Tables

Tables	Page No.
Table No.2. 1. Pests recorded on date palms	7
Table No. 2.2. Percentage of infected palms by pests in the Northern State -Sudan	8
Table No.2. 3. Compilation of reported diseases infecting date palms	8
Table No. 2.4. Types of nematodes attacking date palms	12
Table No.2.5. Infestation incidence of the date palm green pit scale insect .in different localities in the Northern State	19
Table No. 4.1. Mean percent mortality of adult females of the green pit scale insect treated by argel and Actara at Arab Narti in 2006.	47
Table No.4.2. Mean percent mortality of adult females of the green pit scale insect treated by argel and Actara at Wad-diab in 2006	49
Table No. 4.3. Mean percent mortality of immature stages of the green pit scale insect treated by argel and Actara at Arab Narti in 2006.	51
Table No. 4.4. Mean percent mortality of immature stages of green pit scale insect treated by argel and Actara at Wad-diab in 2006.	53
Table No. 4.5. Mean percent mortality of adult females of the green pit scale insect treated by argel, usher and Actara at Gharb Dongola in January 2007.	55
Table No. 4.6. Mean percent mortality of adult females of the green pit scale insect treated by argel, usher and Actara at Elikinduwa in January 2007.	57
Table No. 4:7. Mean percent mortality of immature stages of green pit scale insect treated by Argel, Usher and Actara at Gharb Dongola in January 2007.	59
Table No. 4.8. Mean percent mortality of immature stages of green pit scale insect treated by argel, usher and Actara at Elikinduwa in January 2007.	61
T Table No. 4.9. Mean percent mortality of adult female of the green pit scscale insect treated by argel, usher and Actara at Gharb Dongola in JaJanuary 2007.	63
Table No. 4.10. Mean percent mortality of adult females of the green pit scale insect treated by argel, usher and Actara at Elikindwa in May 2007.	65
Table No. 4.11. Mean percent mortality of immature stages of green pit scale insect treated by argel, usher and Actara at Gharb Dongola in May 2007.	67
Table No. 4.12. Mean m percent mortality of immature stages of the green	69

pit scale insect treated by argel, usher and Actara at Elikindwa in May 2007.	
Table No. 4.13. Yield of date palm after treatments of argel and Actara at Arab Narti in 2006.	71
Table No.4.14. Yield of date palms after treatments of argel and Actara at Wad-diab in 2006.	73
Table No. 4.15. Yield of date palms after treatments of argel, usher and Actara at Gharb Dongola in 2007.	75
Table No. 4.16. Yield of date palms after treatments of argel, usher and Actara at Elkinduwa in 2007.	78

List of Figures

Figures	Page No.
----------------	---------------------

Fig. No.2.1. Description of the adult female (<i>Asterolicanium phoenicis</i>)	16
Fig. No. 3.1. Map of the Northern State	44
Fig. No.3.2 Map of the study area	45
Fig. No. 4.1. Mean percent mortality of adult females of the green pit scale insect treated by argel and Actara at Arab Narti in 2006.	47
Fig. No. 4.2. Mean percent mortality of adult females of the green pit scale insect treated by argel and Actara at Wad-diab in 2006	49
Fig. No. 4.3. Mean percent mortality of immature stages of the green pit scale insect treated by argel and Actara at Arab Narti in 2006.	51
Fig. No. 4.4. Mean percent mortality of immature stages of green pit scale insect treated by argel and Actara at Wad-diab in 2006.	53
Fig. No. 4.5. Mean percent mortality of adult females of the green pit scale insect treated by argel, usher and Actara at Gharb Dongola in January 2007.	55
Fig. No. 4.6. Mean percent mortality of adult females of the green pit scale insect treated by argel, usher and Actara at Elikinduwa in January 2007.	57
Fig. No. 4.7. Mean percent mortality of immature stages of green pit scale insect treated by Argel, Usher and Actara at Gharb Dongola in January 2007.	59
Fig. No. 4.8. Mean percent mortality of immature stages of green pit scale insect treated by argel, usher and Actara at Elikinduwa in January 2007.	61
T Fig. No. 4.9. Mean percent mortality of adult female of the green pit scale insect treated by argel, usher and Actara at Gharb Dongola in January 2007.	63
Fig. No. 4.10. Mean percent mortality of adult females of the green pit scale insect treated by argel, usher and Actara at Elikindwa in May 2007.	65
Fig. No. 4.11. Mean percent mortality of immature stages of green pit scale insect treated by argel, usher and Actara at Gharb Dongola in May 2007.	67
Fig. No. 4.12. Mean percent mortality of immature stages of the green pit scale insect treated by argel, usher and Actara at Elikindwa in May 2007.	69
Fig. No.4.13. Yield of date palm after treatments of argel and Actara at Arab Narti in 2006.	71
Fig. No. 4.14. . Yield of date palms after treatments of argel and	73

Actara at Wad-diab in 2006.	
Fig. No.4.15. Yield of date palms after treatments of argel, usher and Actara at Gharb Dongola in 2007.	76
Fig. No.4.16. Yield of date palms after treatments of argel, usher and Actara at Elkinduwa in 2007.	79

List of Plates

Plate 2.1. Comparison between healthy and infested leaflets of date palm by <i>A. phoenicis</i>	21
Plate No. 2.2. Date palm fruits infested by <i>A. phoenicis</i> at Elkinduwa.	21
Plate No. 3.1. Raising earth around the date palm trees.	41
Plate No. 3.2. Internal view of the study farm at Gharb Dongola.	41
Plate No. 3.3. Internal view of the study farm (Elkinduwa)	42
Plate No. 3.4 The argel plant <i>Solenostemma argel</i>	42
Plate No. 3.5 The usher plant <i>Calotropis procera</i>	43
Plate No. 3.6 Weighing of date bunch with a 20 kg dial balance.	43

Abstract

This study was undertaken at Elghaba Agricultural Scheme, Eldabba locality, Northern State to evaluate the effectiveness of the extracts of two plants argel and usher against the green date palm pit scale insect (*Asterolicanium phoenicis*) and their effect on the productivity. The experiments were carried out in 4 villages in the area (Arab Narti, Wadiab, Gharab Dongola and Elkinduwa people's scheme).

Argel and usher powder were used by three methods of soil leaf powder application (dose 100 gm/palm), spray of leaves water extract (dose 100 gm/palm) and soil + spray of leaves water extract (dose 100gm soil + 100 spray/ palm). Actara 25 W.G Thimethoxam (Neonicotinoid group) (dose 20gm/palm) was used as recommended and for comparison.

To evaluate the effects of the plant extract after each treatment, 8 leaflets were chosen randomly from the 4 directions from each tree at biweekly intervals. From these 4 leaflets were chosen and each one was inspected under a binocular microscope to calculate the adult and immature mortality in an area of 1 cm².

The results showed that, the application of argel and usher in all treatments caused higher percent mortality of both adult females and immature stages compared to untreated control up to the 8th week after application.

Also all treatments increased the yield compared to the untreated control.

According to the results of the present study, the soil argel application at 100gm/tree at 6 week intervals should be recommended as an effective treatment to control the green date palm pit scale insect.

ملخص الدراسة

اجريت هذه الدراسة تحت ظروف الحقل في مشروع الغابة الزراعي بمحافظة الديبة الولاية الشمالية خلال موسمى 2005-2006 و 2006-2007 لتقدير فعالية كل من نبات الرجل ونبات العشر في السيطرة على الحشرة القشرية الخضراء التي تصيب نخيل التمر بصورة وبائية ودراسة الأثر الممتد على الانتاجية.

اجريت التجارب في 4 قرى في المنطقة هي: عرب نارتى - ود دباب - غرب دنقا - ومشروع الكندوة الاهلى.

تم استخدام الرجل والعشر بثلاثة طرق هي: بالإضافة المباشرة لمسحوق الأوراق إلى التربة (الجرعة 100 جم /نخلة)، الرش بالمحلول المائي للأوراق (الجرعة 100 جم /نخلة)، والمعاملة المشتركة بالإضافة المباشرة إلى التربة + الرش بمستخلص الأوراق (الجرعة: 100 جم للتربة + مستخلص 100 جم لرش كل نخلة). بجانب ذلك تم استخدام المبيد الموصى به من هيئة البحوث الزراعية لمقاومة الحشرة وهو اكتارا 25 WG بمعدل 20 جم لكل نخلة (Thimethoxam (Neonicotinoid group) بغرض مقارنة فعالية النباتين.

لتقييم فعالية مستخلصات النباتين بعد كل معاملة تم اختيار 8 وريقات عشوائية من أربعة اتجاهات من كل نخلة كل أسبوعين بعد بدء التجربة ومن هذه تم اختيار 4 وريقات ليتم فحص كل منها تحت الميكروسكوب لحساب موت الاطوار الكاملة وغير الكاملة في مساحة واحد سنتيمتر مربع من كل وريقة.

أوضحت النتائج ان استخدام الرجل والعشر في كل المعاملات ادى إلى زيادة عالية في نسبة موت الاناث والاطوار غير البالغة للحشرة مقارنة مع الاشجار غير المعاملة (الشاهد) حتى الاسبوع الثامن بعد المعاملة. اضافة لذلك فان كل المعاملات أدت إلى زيادة في الانتاجية مقارنة بالشاهد غير المعامل

بناء على نتائج هذه الدراسة فان استخدام الرجل بجرعة 100 جم / نخلة معاملة التربة على فترة كل 6 أسابيع يمكن أن يوصى به كمعاملة فعالة لمكافحة الحشرة القشرية الخضراء على النخيل

