

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

**CHEMICAL WEED CONTROL
STUDIES IN FABA BEAN
Vicia faba L.**

**BY
AMANI HAMAD ELTAYEB HAMAD**

**B.SC HONOURS (AGRIC)
UNIVERSITY OF SUDAN
1997**

**A
Thesis Submitted in Fulfillment of the
Requirements for the Degree of M.Sc
(AGRONOMY)**

**SUPERVISOR:
DR. SAMI ALI MOHAMED HAMID
SUDAN UNIVERSITY OF SCIENCE
AND TECHNOLOGY
COLLEGE OF AGRICULTURAL STUDIES**

2003

DEDICATION

*To the Soul of my father,
to my mother,
brothers,
sisters,
and all family members
this work is dedicated*

Amani

ACKNOWLEDGEMENTS

All my thanks and praise to ALLAH who gave me the health, strength, and patience during the course of the study.

I wish to express my sincere and deep thanks to Dr. Sami Ali Mohamed Hamid, who supervised this study, for his guidance, criticism, help and encouragement.

Thanks are due also to Dr. Nagat El Mubarak El Tayeb for the kind supply of the herbicides, and the staff of Biological Nitrogen Fixation of the National Research Centre for the supply of the inoculum.

Deep gratitudes are due to my colleagues at the College of Agricultural Studies for their unvaluable assistance and help. Also to Salah M. Osman for preparing this manuscript.

CONTENTS

	Page No.
Dedication	ii
Acknowledgements	iii
Contents	iv
List of Tables	vii
List of Figures	viii
List of Appendices	ix
Abstract	x
Arabic Abstract	xi
CHAPTER ONE: INTRODUCTION	1
CHAPTER TWO: LITERATURE REVIEW	
2.1 Botany	4
2.2 Ecology	5
2.3 Uses	5
2.4 Cultural practices	6
2.4.1 Sowing date	6
2.4.2 Seed rate and plant spacing	7
2.4.3 Depth of sowing	7
2.4.4 Irrigation	8
2.4.5 Rhizobial inoculation	8
2.4.6 Fertilization	9
2.5 Weeds	10
2.5.1 Losses due to weeds	10
2.5.2 Faba bean and weed competition	12
2.5.3 Weed control	12
2.5.3.1 Preventive methods	12
2.5.3.2 Cultural methods	13
2.5.3.3 Biological control	14
2.6 Chemical weed control	14
2.6.1 Herbicides in the soil	15
2.6.1.1 Soil texture and structure	15
2.6.1.2 Soil organic matter	15

	Page No.
2.6.1.3 Soil pH	16
2.6.1.4 Soil moisture content	16
2.6.1.5 Nutrient status of the soil	16
2.6.1.6 Environmental factors	17
2.6.2 The fate of soil applied herbicides	18
2.6.2.1 Leaching	18
2.6.2.2 Volatilization	19
2.6.2.3 Photodecomposition	20
2.6.2.4 Chemical decomposition	20
2.6.2.5 Microbial degradation	20
2.6.2.6 Removal by higher plant	21
2.6.3 Selectivity of soil acting herbicides	21
2.6.4 Foliage applied herbicides	22
2.7 Chemical weed control in faba bean	22
2.8 Mode of action	26
 CHAPTER THREE: MATERIALS AND METHODS	
3.1 Materials	28
3.1.1 Plant material	28
3.1.2 Inoculum	28
3.1.3 Treatments	28
3.1.3.1 Herbicides	28
3.1.3.1.1 Ronstar	29
3.1.3.1.2 Diuron	29
3.1.3.1.3 Modown	30
3.1.3.1.4 Atrazine	30
3.1.4 Experimental site	31
3.2 Methods	31
3.2.1 Land preparation	31
3.2.2 Experimental design	31

	Page No.
3.2.3 Sowing	31
3.2.4 Herbicides application	32
3.2.5 Hand weeding	32
3.3 Data collection and analysis	32
3.3.1 Qualitative analysis	32
3.3.1.1 Weed identification	32
3.3.1.2 Phytotoxicity symptoms	32
3.3.2 Quantitative analysis	32
3.3.2.1 Weed count	32
3.3.2.2 Growth and yield parameters	32
3.3.3 Statistical analysis	33
CHAPTER FOUR: RESULTS	
4.1 Germination	34
4.2 Weed counts and identification	34
4.3 Phytotoxicity	38
4.4 Nodule count	38
4.5 The grain yield	38
4.6 Number of pods per plant	44
4.7 Number of seeds per pod	44
4.8 Seed size	44
CHAPTER FIVE: DISCUSSION	48
CHAPTER SIX: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	
6.1 Summary	52
6.2 Conclusions	52
6.3 Recommendations	53
REFERENCES	54
APPENDICES	69

LIST OF TABLES

Table	Page No.
1: The mean germination percentage	35
2: Weed identification	39
3: 0-10 scale 2001/2002	40
4: 0-10 scale 2002/2003	41
5: The mean grain yield (kg/feddan)	43
6: The mean number of pods per plant	45
7: The mean number of seeds per pod	46
8: The mean seed weight (wt 100 seeds/g)	47

LIST OF FIGURES

Figure	Page No.
1: Weed count (2001/02)	36
2: Weed count (2002/03)	37
3: Mean number of nodules	42

LIST OF APPEDNICES

Appendix table	Page No.
1: Analysis of variance (ANOVA) Tables	
1.1 Germination percentage (2001/02)	69
1.2 Germination percentage (2002/03)	69
1.3 Weed count (grasses) (2001/02)	70
1.4 Weed count (grasses) (2002/03)	70
1.5 Weed count (broadleaves) (2001/02)	71
1.6 Weed count (broadleaves) (2002/03)	71
1.7 Number of nodules	72
1.8 Grain yield (2001/02)	72
1.9 Grain yield (2002/03)	73
1.10 Number of pods per plant (2001/02)	73
1.11 Number of pods per plant (2002/03)	74
1.12 Number of seeds per pod (2001/02)	74
1.13 Number of seeds per pod (2002/03)	75
1.14 Hundred seed weight (2001/20)	75
1.15 Hundred seed weight (2001/20)	76
2. Monthly average of the max. and min. temperature and the percent relative humidity during the experimental period	77
3. Chemical and physical properties of the field soil	78

ABSTRACT

A two season field experiments were conducted in the College of Agricultural Studies, demonstration farm at Shambat in the winter seasons of 2001/02 and 2002/03. The objectives of this experiment were to evaluate the efficacy and phytotoxicity of some herbicides on the degree of nodulation, grain yield, and primary morphological yield components of faba bean *Vicia faba*. The herbicide treatments used were Modown Atrazine mixture at 1.0 and 1.5 litre per feddan, Ronstar at 1.0 and 1.5 litre per feddan, and Ronstar Diuron mixture at 1.0 and 1.5 litre per feddan. A completely randomized block design with four replicates was used for this purpose. All herbicides were applied pre-emergence. The herbicide treatments were compared with unweeded control to evaluate the efficacy, and with hand-weeded control to evaluate the phytotoxicity. The herbicide treatments at the rate of 1.0 litre per faddan proved to be effective in cutting down weed competition, and hence increasing the grain yield of faba bean. The increase in the grain yield was mainly due to increase in number of pods per plant. The herbicide used did not affect the degree of nodulation however, increasing the rate up to 1.5 litre per feddan resulted in slight phytotoxic symptoms.

بسم الله الرحمن الرحيم

ملخص الأطروحة

أجريت تجربة حقلية فى مزرعة كلية الدراسات الزراعية بشمبات فى شتاء موسمى 02/2001 و ٢٠٠٢/٠٣ وذلك من أجل تقويم الفعالية والآثار السمية المترتبة عن إستعمال مبيدات الحشائش على تكوين العقد البكتيرية، الإنتاجية ومكونات الإنتاجية الظاهرية فى محصول الفول المصرى. مبيدات الحشائش التى أستعملت فى هذه التجربة كانت مودان أترازين بمعدل 1.0 و ١.٥ لتر للفدان، رونستار أيضاً بمعدل 1.0 و ١.٥ لتر للفدان، رونستار كذلك بمعدل 1.0 و ١.٥ لتر للفدان. للمقارنة أستعملت معاملة الشاهد بدون تعشيب لتقويم الفعالية، معاملة الشاهد بالتعشيب اليدوى لتقويم آثار السمية. أستخدم لهذا الغرض تصميم القطاعات كاملة العشوائية بأربع مكررات. تم تطبيق كل معاملات مبيدات الحشائش قبل الإنبات. دلت التجربة على فعالية المبيدات، عندما تطبق بمعدل لتر واحد للفدان، فى خفض منافسة الحشائش وزيادة الإنتاجية بفروق معنوية علاوة على إنتاجية الشاهد بدون تعشيب. لم يؤثر أى من مبيدات الحشائش المستعملة على تكوين العقد البكتيرية، وذلك عندما تمت المقارنة مع شاهد التعشيب اليدوى. رفع معدل التطبيق إلى واحد ونصف لتر للفدان أحدث بعض الآثار السمية الطفيفة.