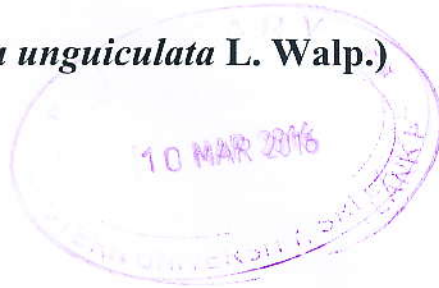


**EFFECTS OF DIFFERENT LEVELS OF SALT STRESS ON
THE GROWTH AND YIELD OF COWPEA CULTIVAR
“WARUNI”**

(*Vigna unguiculata* L. Walp.)



BY

G.A.MAHESH SUSHANTHA



FAG465



Project Report
Library - EUSL

465

**DEPARTMENT OF AGRICULTURAL BIOLOGY
FACULTY OF AGRICULTURE
EASTERN UNIVERSITY
SRI LANKA
2016**

PROCESSED
Library, EUSL

ABSTRACT

Salinity is an important agricultural problem which decreases or restricts crop production both globally as well as in Sri Lanka. Cowpea (*Vigna unguiculata* L. Walp.) is well adapted in different environmental conditions and could be used as an alternative crop for salt affected soils. The present experiment was aimed to evaluate the effects of different levels of salt stress on the growth and yield of cowpea cultivar 'Waruni' at different growth stages. This experiment was conducted at the Agronomy farm of the Eastern University, Sri Lanka from October 2015 to January 2016. The experiment was laid out in the Completely Randomized Design which consisted of six treatments and four replications. The treatments consisted with same potting media such as top soil: red soil: compost with a ratio of 1: 1: 1. Cowpea seedlings were subjected to salt stress by the application of different levels of NaCl solution (100 mM, 200 mM, 300 mM, 400 mM and 500 mM NaCl solution) at three days interval. Twelve plants from each treatment were evaluated for the selected characters such as plant height, leaf area, stem dry weight, leaf dry weight, shoot dry weight, root dry weight, number of pods per plant, number of seeds per pod, hundred seed weight, pod girth, pod length, root dry weight, chlorophylls "a" and "b," total chlorophyll, leaf water content and yield. All the tested attributes of cowpea cultivar 'Waruni' were significantly affected by different levels of salt stress. Among the treatments the highest results were found in treatment 3 which is 200 mM of salinity on plant height, leaf area and stem dry weight, number of seeds per pod, hundred seed weight, pod girth, pod length and yield except the other parameters.

The lowest values were observed in 500 mM of salinity. The highest yield of 1794.5 kg ha⁻¹ was recorded in T₃ treatment whereas the lowest one (833.1 kg ha⁻¹) was found in T₆ treatment. From these results it was found that the effects of different levels of salt stress on the growth and yield of cowpea cultivar "Waruni" during different growth stages had been remarkable. Concentrations of different levels of salinity above 200 mM drastically reduced the pods production and pod yield.

TABLES OF CONTENTS

	Page No
ABSTRACT	i
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS.....	iv
LIST OF TABLES.....	viii
LIST OF FIGURES	x
LIST OF PLATES	xi
CHAPTER 1	1
INTRODUCTION	1
CHAPTER 2	8
LITERATURE REVIEW.....	8
2.1 A brief description of cowpea (<i>Vigna unguiculata</i> L. Walp.).....	8
2.1.1 Origin and diversity of cultivated forms	9
2.1.2 Taxonomy.....	10
2.1.3 Morphological description of cowpea plant.....	12
2.2 Cultivation of cowpea	13
2.2.1 Environmental requirements.....	13
2.2.2 Site selection.....	15
2.2.3 Sowing	15
2.2.4 Fertility and lime requirements.....	15
2.2.5 Weed Control.....	16
2.2.6 Harvesting.....	16
2.2.7 Drying and storage.....	16
2.2.8 Characteristics of widely used cultivars of cowpea in Sri Lanka	16
2.3 Common pests and diseases of cowpea plants	20

2.3.1 Common pests of cowpea plants	20
2.3.2 Common diseases of cowpea plants	21
2.4. Importance and uses of cowpea.....	22
2.4.1 Importance as a food crop.....	22
2.4.2 Health benefits of cowpea.....	25
2.4.3 Useful compounds isolated from cowpea.....	27
2.4.4.Symbiotic biological nitrogen fixation.....	27
2.4.5 Cowpea as an inter-cropping system	29
2.5 Physiological responses of cowpea plants to salinity.....	29
2.5.1 Germination of cowpea seeds	30
2.5.2 Plant height	31
2.5.3 Number of leaves	31
2.5.4 Leaf area	32
2.5.5 Fresh and dry weights of plants	32
2.5.6 Osmotic potential of the leaf sap	33
2.5.7 Photosynthetic pigments	34
2.5.8 Protein content	34
2.5.9 Effects of salinity on seed yield.....	35
CHAPTER 3	37
MATERIALS AND METHODS	37
3.1. Location.....	37
3.2 Requirement of seeds	37
3.3 Selection of cowpea cultivar	38
3.4 Seed treatment	38
3.5 Germination test.....	38
3.6 Preparation of different levels of salt (NaCl) solutions.....	38
3.7 Preparation and filling of polyethylene bags.....	39
3.8 Planting of seeds.....	39
3.9 Treatments	40
3.10 Experimental design	40
3.11 Preparation of rain shelter	41

3.12 Irrigation.....	41
3.13 Thinning out and gap filling.....	41
3.14 Weeding.....	42
3.15 Fertilization	42
3.16.1 Growth measurements	43
3.16.2 Plant height	43
3.16.3 Leaf Area Index (LAI).....	43
3.16.4 Leaf dry weight.....	44
3.16.5 Stem dry weight.....	44
3.16.6 Shoot dry weight.....	44
3.16.7 Pod dry weight.....	44
3.16.8 Root dry weight	44
3.16.9 Number of pods per plant	45
3.16.10 Number of seeds per pod	45
3.16.11 100 seed weight	45
3.16.12 Pod girth.....	46
3.16.13 Pod length	46
3.16.14 Determination of “Chlorophyll content”	46
3.16.15 Leaf water potential	48
3.16.16 Yield.....	48
3.17. Data analysis.....	48
CHAPTER 4	50
RESULTS AND DISCUSSION	50
4.1 Growth physiological attributes	50
4.1 .1 Plant height	50
4.1.2 Leaf area	53
4.1.3 Dry weight of leaves	55
4.1.4 Stem dry weight.....	57
4.1.5 Shoot dry weight	60
4.1.6 Root dry weight.....	62
4.1.7 Number of pods per plant.....	64