

PERMANENT REFERENCE

EFFECT OF PLANT DENSITY, LEVELS OF NITROGEN AND GYPSUM ON
GROWTH AND YIELD OF GROUNDNUT (ARACHIS HYPOGAEA L.) IN
REGOSOLS IN BATTICALOA DISTRICT

By

KUMUTHINI SIVANESARAJAH

Thesis

Submitted in partial fulfilment of the requirements
for the degree of

MASTER OF PHILOSOPHY

in the

POSTGRADUATE INSTITUTE OF AGRICULTURE

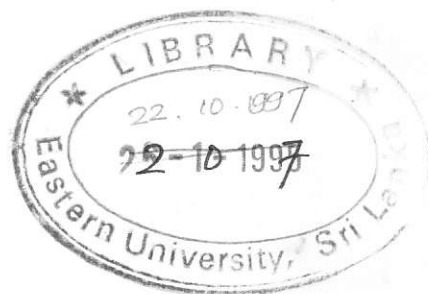
of the

UNIVERSITY OF PERADENIYA

SRI LANKA

May 1994.

26923



Thesis
Library - EUSL

011.751 583 337
SIV

PROCESSED
Main Library, EUSL

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	x
LIST OF FIGURES	xii
1. INTRODUCTION.	1
2. REVIEW OF LITERATURE.	8
2.1 Varietal influences on yield.	9
2.2 Effect of nutrients.	12
2.2.1 Effect of nitrogen.	13
2.2.1.1 Effect on vegetative growth.	17
2.2.1.2 Effect on root and nodulation.	18
2.2.1.3 Effect on yield and yield components.	19
2.2.2 Effect of phosphorus.	22
2.2.3 Effect of potassium.	24
2.2.4 Effect of magnesium.	25
2.2.5 Effect of calcium.	25
2.2.5.1 Effect of calcium on vegetative Growth.	28
2.2.5.2 Effect on root growth and nodulation.	29
2.2.5.3 Effect on yield and yield components.	30
2.2.5.4 Effect on quality of nuts.	34
2.2.6 Effect of sulphur.	35
2.2.7. Effect of micronutrients.	37

2.2.7.1	Effect of boron.	38
2.2.7.2	Effect of manganese.	39
2.2.7.3	Effect of molybdenum	39
2.2.7.4	Effect of cobalt.	39
2.2.7.5	Effect of iron.	40
2.2.7.6	Effect of zinc.	40
2.3	Irrigation.	41
2.4	Effect of plant density.	42
2.4.1	Effect of plant density on vegetative growth.	44
2.4.2	Effect of on root growth.	47
2.4.3	Effect of plant density on yield and yield components.	48
2.4.4	Effect on quality of ground nuts.	56
2.4.5	Effect on pests and diseases.	56
2.5	Systematic design.	58
3.	MATERIALS AND METHODS.	63
3.1	Location and soil.	63
3.2	Climate.	65
3.3	Species and variety.	65
3.4	Experiments.	65
3.4.1	Experiment-1.	66
3.4.1.1	Statistical design.	66
3.4.1.2	Plot size.	67
3.4.1.3	Guard row.	67

3.4.1.4	Agronomic practices.	69
3.4.1.4.1	Land preparation.	69
3.4.1.4.2	Planting.	69
3.4.1.5	Cultural practices.	69
3.4.1.5.1	Gap filling.	69
3.4.1.5.2	Fertilizer application.	69
3.4.1.5.3	Earthing-up.	70
3.4.1.6	Watering.	70
3.4.1.7	Weed control	70
3.4.1.8	Pest and diseases.	70
3.4.1.9	Soil analysis.	71
3.4.1.10	Growth assesments.	72
3.4.1.10.1	Leaf area.	72
3.4.1.10.2	Leaf area index.	72
3.4.1.10.3	Weight of plants	73
3.4.1.11	Yield and yield components.	73
3.4.11.1	Pod yield	73
3.4.1.11.2	Number of pods.	73
3.4.2	Experiment-2.	73
3.4.2.1	Statistical design.	74
3.4.2.2	Plot size.	75
3.4.2.3	Agronomic practices.	76
3.4.2.3.1	Land preparation.	76
3.4.2.3.2	Planting.	76

3.4.2.4	Cultural practices.	76
3.4.2.4.1	Gap filling.	76
3.4.2.4.2	Fertilizer application.	76
3.4.2.4.3	Earthing up and gypsum application.	77
3.4.2.4.4	Weed control.	77
3.4.2.5	Watering.	77
3.4.2.6	Pest and diseases.	77
3.4.2.7	Soil analysis.	78
3.4.2.8	Growth assessments (plant growth)	78
3.4.2.8.1	Height of main stem.	78
3.4.2.8.2	Number of primary branches.	78
3.4.2.8.3	Leaf area and leaf area index.	78
3.4.2.8.4	Weight of plants.	79
3.4.2.9	Yield and yield components.	79
3.4.2.9.1	Pod yield.	79
3.4.2.9.2	Number of pods.	79
3.4.2.9.3	Kernel weight.	79
3.4.2.9.4	Shelling percentage	79
3.5.	Processing of data.	80
3.5.1	Analysis of results.	80
4.	RESULTS AND DISCUSSION.	81
4.1	Effect of spacing on growth and yield parameters.	81

4.1.1	Dry weight of leaves.	81
4.1.2	Leaf area.	83
4.1.3	Leaf area index.	87
4.1.4	Dry weight of stems.	91
4.1.5	Dry weight of roots.	98
4.1.6	Dry weight of nodules.	102
4.1.7	Total dry weight of plants.	104
4.1.8	Dry weight of pods.	111
4.1.9	Number of pods.	118
4.2	Effect of plant density, levels of nitrogen and gypsum on growth and yield parameters.	123
4.2.1	Height of main stem.	123
4.2.2	Number of primary branches.	126
4.2.3	Leaf area index.	131
4.2.4	Dry weight of leaves.	135
4.2.5	Dry weight of stems.	141
4.2.6	Dry weight of roots.	146
4.2.7	Dry weight of nodules.	156
4.2.8	Dry weight of plant.	167
4.2.9	Dry weight of pods.	177
4.2.10	Number of pods.	177
4.2.11	Shelling percentage.	182
4.2.12	100-Kernel weight.	188