

PERMANENT REFERENCE

**REACTIVITY OF SELECTIVELY MINED  
EPPAWALA ROCK PHOSPHATE  
ON SANDY REGOSOLS**

BY

**VANITHA THIREGANATHAN**

A RESEARCH REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE  
REQUIREMENT OF THE ADVANCED COURSE

IN  
SOIL SCIENCE  
FOR



THE DEGREE OF THE BACHELOR OF SCIENCE IN AGRICULTURE  
FACULTY OF AGRICULTURE  
EASTERN UNIVERSITY, SRI LANKA.



1996

APPROVED BY

*K. Premakumar*

Supervisor  
Mr. K. Premakumar  
Lecturer  
Faculty of Agriculture  
Eastern University  
Chenkalady

*Caiffa*

Co-supervisor  
Mrs. P. Mahenthiran  
Lecturer  
Faculty of Agriculture  
Eastern University  
Chenkalady

*T. Mahendran*

Head of the Department  
Dr (Mrs) T. Mahendran  
Head/Agronomy  
Faculty of Agriculture  
Eastern University  
Chenkalady.

Date: 31/10/96.

Date: 31/10/96.

Date: 1/11/96

< 4628

PROCESSED  
Main Library, EUSL

## ABSTRACT

This investigation was conducted at the Agronomy Farm of the Eastern University during the period from May to August 1996. Its main objective was to study the reactivity of Selectively Mined Eappawala Rock Phosphate (SERP) on Sandy Regosols, on relation to the growth and yield of maize.

The experiment compared five levels of rock phosphate (0, 30, 60, 90 and 120 kg SERP/ha) applied in combination with poultry manure plus sulphur, and application of 100 kg TSP/ha with a control treatment where no phosphorus was applied. The investigation was conducted in a Randomized Complete Block Design (RCBD) with four replicates and managed under recommended cultural practices.

Data were collected and measurements made on the concentrations of the major nutrients (N, P and K) in the soil; soil pH; and the biomass and grain yield of the maize crop.

Results have shown that the available soil P concentration in the soil where SERP was applied along with poultry manure plus sulphur dust was higher than in the treatment (T<sub>7</sub>) where no SERP was applied. Soluble P values in the treatments where SERP was applied at the rate of 30, 60, 90 and 120 kg/ha were greater by around 50%, 80% 100% and 150% respectively, when compared to the treatment where no SERP was applied. The differences in average soil N and K concentrations between treatments receiving different SERP levels were negligible over the period of experiment.

The data on the major plant characters measured viz grain yield, biomass and leaf area show that grain yield, biomass and leaf area values increased with increasing levels of SERP application from 0 to 120 kg/ha. Increasing levels of SERP from 30, 60, 90 and 120 kg/ha resulted in biomass increases of 29%, 34%, 40% and 75% relative to the treatment where no SERP was applied.

The increase in grain yield was 18%, 11%, 21% and 68% in the treatments receiving 30, 60, 90 and 120 kg SERP/ha respectively, relative to the treatment where no SERP was applied. The higher yields were positively correlated with leaf area and negatively correlated with date to silking and tasselling. These correlations were highly significant.

The difference between the relatively steep response in soil P with increasing SERP levels and the much lesser response in biomass and grain yield is probably due to competition between the maize crop and soil micro organisms for soil nutrients.

# CONTENTS

	<i>Page No</i>
ABSTRACT	i
ACKNOWLEDGEMENT	iii
CONTENTS	iv
LIST OF TABLES	vii
LIST OF FIGURES	viii
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
<b>CHAPTER 2 REVIEW OF LITERATURE</b>	<b>4</b>
2.1 Importance of phosphorus in plant growth	4
2.2 Phosphorus requirements of crops	4
2.3 Geology of Eppawala Rock Phosphate (ERP) Deposit	5
2.4 Mineralogy of ERP	6
2.5 Chemical Aspects of ERP	7
2.6 Solubility of ERP	8
2.6.1 Agronomic Factors Relating to Solubility	9
2.6.1.1 Particle size	9
2.6.1.2 Application method	10
2.6.1.3 Soil pH	10
2.6.1.4 Phosphorus fixation capacity	11
2.6.1.5 Soil phosphorus level	11
2.6.1.6 Soil temperature	12
2.6.1.7 Length of the crop growth period	12
2.6.1.8 Soil moisture	13
2.6.2 Effect of Microbs on Phosphate Solubilization	13
2.6.3 Effect of Poultry manure on Dissolution of ERP	14
2.6.4 Effect of application of S dust on the Dissolution of ERP	15
2.7 Interactions of Sulphur with other nutrients	16
2.7.1 Major nutrients	16
2.7.1.1 Nitrogen-Sulphur Interaction	16
2.7.1.2 Phosphorus-Sulphur Interaction	16
2.7.1.3 Magnesium-Sulphur Interaction	16
2.7.2 Micro nutrients	17
2.8 Maize and its Environment	17
2.9 Soil	17

<b>CHAPTER 3 SOIL, EXPERIMENTAL DESIGN AND LABORATORY METHODS</b>	<b>18</b>
3.1 Location	18
3.2 Soil	18
3.3 Field Experiment	19
3.3.1 Treatments	19
3.3.2 Plot size	20
3.3.3 Spacing	20
3.4 Agronomic Practices	20
3.4.1 Land preparation	20
3.4.2 Manure and fertilizer application	20
3.4.3 Planting	21
3.4.4 Irrigation	21
3.4.5 Pest and Disease control	21
3.4.6 Weed control	21
3.5 Methods and Observations	21
3.5.1 Soil Samples	21
3.5.2 Soil Analytical methods	22
3.5.2.1 Soil pH	22
3.5.2.2 Soil Nitrogen	22
3.5.2.3 Soil Phosphorus	23
3.5.2.4 Soil Potassium	24
3.6 Plant measurement and Observation	25
3.6.1 Plant height	25
3.6.2 Biomass	26
3.6.3 Leaf area	26
3.6.4 Commercial grain yield	26
3.6.5 Percentage of recovery from cob (PORC)	26
3.7 Statistical Analysis	27
<b>CHAPTER 4 RESULTS</b>	<b>30</b>
4.1 Soil Phosphorus	30
4.1.1 Poultry Manure plus Sulphur Treatment	30
4.1.2 Different levels of SERP (With Poultry Manure and Sulphur)	30
4.1.3 Super phosphate	32
4.2 Soil Nitrogen	33
4.2.1 Control Treatment	33
4.2.2 Superphosphate Treatment	33
4.2.3 The Poultry Manure and Sulphur Treatments	33
4.3 Soil Potassium	35
4.4 Soil pH	38

4.5	Biomass	38
4.5.1	Biomass at 30 DAP	38
4.5.2	Biomass at 60 DAP	40
4.5.3	Biomass at 90 DAP	40
4.6	Leaf Area	41
4.6.1	Leaf Area at 30 DAP	41
4.6.2	Leaf Area at 60 DAP	41
4.6.3	Leaf Area at 90 DAP	43
4.7	Plant Height at 100% Tasselling and Silking	43
4.7.1	Plant height at 100% Tasselling	45
4.7.2	Plant height at 100% Silking	45
4.8	Days to 100% Tasselling and Silking	46
4.8.1	Days to 100% Tasselling	47
4.8.2	Days to 100% Silking	47
4.9	Yield of Grain	48
4.10	Percentage of Grain Recovery from Cob	50
<b>CHAPTER 5</b>	<b>DISCUSSION</b>	52
5.1	Biomass at 90 DAP and Grain Yield	52
5.2	Soil N	54
5.3	Soil K	54
5.4	Soil P	55
5.5	Solubilization of Rock Phosphate with Time	56
5.6	Biomass yield, Grain yield and Available soil P	57
<b>CHAPTER 6</b>	<b>CONCLUSION</b>	60
<b>BIBLIOGRAPHY</b>		61
<b>APPENDIX</b>		