

CONTENTS

Abstract	2
1. Introduction	4
2. Potassium in soils	5
2.1. Forms of potassium in soil	7
2.1.1. Soil solution potassium	8
2.1.2. Exchangeable potassium	9
2.1.3. Fixed and lattice potassium	10
2.2. Loss of potassium by leaching	11
2.3. Effect of soil pH on potassium fixation	12
2.4. Forms of fixed potassium in soil	13
2.4.1. Sequential extraction of soil with calcium resin	14
2.4.2. Exhaustive cropping of soil in the glasshouse	15
2.4.3. Comparison of potassium exhaustion experiments in the laboratory and field	18
2.5. Availability of fixed and lattice potassium	19
2.6. Relationship between water soluble, exchangeable and non- exchangeable potassium	21
2.7. Soil analysis for potassium	22
2.7.1. Quantity/potential and quantity/intensity measurements of soils	23
2.7.2. The buffer capacity	23
2.7.3. Strong acids	23
2.7.4. Sodium tetraphenylboron (NaTPB)	24
2.7.5. Ion exchange resins	24
2.7.6. Determination of potassium in soil extracts	24
3. Potassium in plants	24
3.1. Potassium uptake during growth and effect on yield	25
3.2. Concentration of potassium in plants	27
3.3. Amounts of potassium in crops	29
3.3.1. Interaction of nitrogen and potassium on the potassium content of crops	30
3.4. Plant analysis for potassium	30
4. Response of crops to soil and added potassium	32
4.1. Response of crops to soil potassium	32
4.2. Response of crops to added potassium	34
4.3. Critical level of plant-available potassium in soil	34
4.3.1. Determining the critical level of plant-available potassium – the use of long-term experiments	35
4.4. Potassium and nitrogen interactions in plant nutrition	36
4.4.1. Experiments with two levels of exchangeable potassium	36
4.4.2. Experiments with a range of exchangeable potassium levels	40
5. 'The Conundrum'. Crop response to soil and fertiliser potassium	41
6. Acknowledgements	45
7. Appendix	45
8 References	45
Related Proceedings of the Society	51