

CONTENTS

	Page.
1. INTRODUCTION	1
2. REVIEW OF LITERATURE	4
2.1. Hydrophysical properties of sandy soils	4
2.2. Super absorbent materials (hydrogels) as conditioners for sandy soils	6
2.2.1. Laboratory and greenhouse studies on the effect of hydrogels on soil properties and plant growth	7
2.2.2. Field studies on the effect of hydrogels on soil properties and plant growth	15
3. MATERIALS AND METHODS	21
3.1. Effect of incorporating hydrogels in sandy soils on its hydrophysical properties (laboratory studies)	21
3.1.1. Materials	21
3.1.1.1. Soils	21
3.1.1.2. Soil Conditioner	21
3.1.1.3. Irrigation Water	21
3.1.2. Experimental	21
1. Stability of structure in the wet and dry state .	25
2. Water movement and preservation	26
3. Mechanical stability of air dry soil	27
3.2. Field trials on the effect of hydrogels used as condi- tioners for sandy soil on growth response and water use and fertilizers use efficiency by some econo- mical crops	27
3.2.1. Experiment 1: A vegetable crop (Cucumber)	27
3.2.2. Experiment 2: Some summer forage crops (Guar & Cowpea)	29
3.3. Methods of determination	30
3.3.1. Soil analyses	32

	page
3.3.1.1.Hydrophysical properties	32
3.3.1.2.Chemical properties	35
3.3.2.Water analysis	36
3.3.3.Plant analysis	37
3.3.4.Experimental design and statical analysis	37
4. RESULTS AND DISCUSSION	38
4.1.Effect of incororating hydrogels in sandy soil on its hydrophysical properties (Laboratory studies)	38
4.1.1.Structure stability and maintenance	38
4.1.1.1.Stability of soil structure in the dry state	39
4.1.1.2.Water stability of soil structure	43
4.1.1.3.Maintenance of structure	45
4.1.2.Porosity and pore size distribution	48
4.1.3.Moisture retention in the soil	53
4.1.4.Water loss from the soil through evaporatoin Laboratory experiment I	60
Laboratory experiment II	65
4.1.5.Infiltration rate	72
4.1.6.Hydraulic conductivity and mean diameter of soil pores	75
4.1.7.Mechanical strength of air dry soil	76
4.2.Field studies on the effect of hydrogels used as cond- itioners for sandy soil on the growth response and wat- er and fertilizers use efficiency by some crops	80
4.2.1.A vegetable crop (Cucumber)	80
4.2.1.1.Germination	80
4.2.1.2.Growth parameters	84
4.2.1.3.Nutrients uptake by plants	84
4.2.1.4.Yield	87
4.2.1.5.Water use efficiency by plants	87

	Page
4.2.1.6.Fertilizers use efficiency by plants	39
4.2.2.Some summer forage crops (Guar and Cowpea)	39
4.2.2.1.Guar	39
4.2.2.1.1.Growth parameters	39
4.2.2.1.2.Water use efficiency by Guar plants	96
4.2.2.1.3.Fertilizers use efficiency by Guar plants	93
4.2.2.2.Cowpea	100
4.2.2.2.1.Growth parameters	100
4.2.2.2.2.Water use efficiency by Cowpea plants	106
4.2.2.2.3.Fertilizers use efficiency by Cowpea plants ...	106
4.3.General discussion and conclusions	110
5. SUMMARY	113
6. REFERENCES	123
7. ARABIC SUMMARY	131