

Effect of Wheat Residue and Evaporative Demands on Intermittent Evaporation

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(Accepted for publication 13 April 1989)

ABSTRACT

Al-Darby, A.M., Mustafa, M.A., Al-Omran, A.M. and Mahjoub, M.O., 1989. Effect of wheat residue and evaporative demands on intermittent evaporation. *Soil Tillage Res.*, 15: 105-116.

Evaporation with time was measured from wetted columns of loam (fluventic Camborthids) soil treated with 7 application rates of straw, either surface applied or incorporated into the top 10 cm. The application rates were 0, 1, 2, 3, 4, 6 and 10 Mg ha⁻¹. The experiment was conducted in a growth chamber under low (4.5 mm day⁻¹) and high (16.0 mm day⁻¹) evaporative demand conditions. Soil moisture profiles were also measured. Incorporated residue treatments did not show any significant advantages over the control, under both evaporative demands. In general, evaporation decreased and thus the amount of water conserved increased with increasing surface-residue rates under both evaporative demands. Those evaporation reductions were clearly reflected in soil-moisture profiles. However, it has been concluded that 4 Mg ha⁻¹ was the most efficient surface residue rate in water conservation. The amount of water conserved with the rate of 4 Mg ha⁻¹ was 1.7 times that of the control under low evaporative demand. Whereas the amounts of water conserved were 1.4, 1.5 and 1.3 times that of the control by the end of the first, second and third cycles, respectively, under high evaporative demand. Highly significant ($P=0.01$) linear relationships were established between the evaporation reductions and the square root of surface-residue rates for both evaporative demands. These relationships may prove useful as a guide for water conservation. The results of this study may be used as a guide for further field investigation.

INTRODUCTION

In view of the limited water resources, there is a growing need to conserve soil water in arid lands. During tillage, planting, germination and early seedling stages, evaporation is the dominant form of soil water loss, particularly under extremely hot arid conditions such as those prevalent in Saudi Arabia. Various mulches such as plastic cover, crop residue and sand, have been suggested for suppressing soil water evaporation (Willis, 1962; Greb et al., 1967; Modaihsh et al., 1985). Conservation tillage which leaves part of a previous crop residue on the surface is usually an effective practice for water conserva-