WATER requirement has been defined by Briggs and Shantz (3) as "The ratio of the weight of water absorbed by a plant during its growth to the weight of dry matter produced". They postulated that the subject was "one of considerable economic importance in connection with the agriculture of semiarid regions, since the crop or variety which is most economical in the use of water, other things being equal, is evidently the one best adapted to regions having a limited water supply". Following a comprehensive study including several varieties of each of a number of species, they conclude that "Varieties of the same species show measurable differences in their water requirement. This suggests the possibility of developing strains which are more efficient in the use of water than those now grown in dry-land regions". Subsequently Kiesselbach (9, 10), Singh, et al. (17), and Stephens, et al. (18) have presented additional evidence supporting this view.

It was with the above information in mind that the present study was undertaken. It involves an investigation of the relative water requirement of 16 selected genotypes of orchardgrass (Dactylis glomerata L.). This is the most important grass in the currently recommended mixtures for irrigated pastures in the Intermountain region. It is also valuable for reseeding summer range lands throughout the West.

**REVIEW OF LITERATURE**

Comprehensive reviews of the literature were reported in 1913 by Briggs and Shantz (4), in 1915 by Kiesselbach (9), and in 1923 by Richardson (16). Extensive studies involving a number of species have been reported and there are in addition a considerable number of papers of a more restricted scope. A brief summary of factors affecting technique will be given here.

Plants for water requirement studies have been grown in containers ranging in size from one-half gallon to over a cubic meter. Weight has been the basis for restoring water to the soil. Evaporation from the soil surface has been reduced or prevented by the use of metal lids (with holes for the plants), sand or gravel mulches, waxed paper, or wax applied directly to the soil surface. Some investigators left bare soil exposed, but calculated a correction from water lost from similar containers which had no plants.

Many studies are of restricted value because they involved attempts to wet the soil to different percentages. It is now well understood that soil moisture movement percentages below field capacity (6, 14, 15) is often inadequate to maintain plant productivity (8). The 50 selected plants were in a high yield and root growth after harvest in the competitive arrangement. The genotypes used were cloned by breaking the plants down into single shoots, and rooting them in tap water. They were planted in gallon cans in a dry-weight basis. The soil used was from the Central Experimental Farm of the Utah Agricultural Experiment Station, and is described as a sand or gravel mulches, waxed paper, or wax applied directly to the soil surface. Some investigators left bare soil exposed, but calculated a correction from water lost from similar containers which had no plants.

Many studies are of restricted value because they involved attempts to wet the soil to different percentages. It is now well understood that soil moisture movement levels less than 15% of the total dry weight, and levels less than 5% (16). Perennial forms produce root systems which exceed top weight (1).

Root growth has often been ignored in root growth studies. Maximov (11) considers this a serious source of error. Root systems of annual crops commonly represent levels less than 15% of the total dry weight, and levels less than 5% (16). Perennial forms produce root systems which exceed top weight (1).

Water requirement is strongly influenced by such factors as temperature, light intensity, humidity, soil fertility, infection with rust (7, 13, 2), and variations in the competitive arrangement. The genotypes are now also well recognized (14).

Thom and Holtz (19) concluded that anything which disturbs the normal life processes, atmospheric, or pathogenic, increases the water requirement.

**MATERIALS AND METHODS**

A study was undertaken with 17 plants of orchardgrass, chosen from 1,400 growing in a spaced arrangement of the species such that a partially controlled competitive situation was maintained. The 50 selected plants were in a high yield and root growth after harvest in the competitive arrangement. The genotypes used were cloned by breaking the plants down into single shoots, and rooting them in tap water. They were planted in gallon cans in a dry-weight basis. The soil used was from the Central Experimental Farm of the Utah Agricultural Experiment Station, and is described as a sand or gravel mulches, waxed paper, or wax applied directly to the soil surface. Some investigators left bare soil exposed, but calculated a correction from water lost from similar containers which had no plants.

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