Ladino clover, *Trifolium repens* var. *latum*, has been widely accepted as a forage crop in both irrigated (6, 7) and nonirrigated (1) pastures in the United States since its introduction from Italy in 1903 (10). Fertilizers have frequently been found necessary for satisfactory growth and maintenance of stands of clover in pastures. This need for fertilizers on soils cropped to Ladino clover has often been indicated by soil analysis and pot tests. It was during a series of field experiments in California, located by these methods, that it seemed desirable to obtain information on the nutritional requirements of Ladino clover through the analysis of clover plants grown in pots of soil that had been differentially fertilized with phosphorus and potassium. The results of this investigation, which suggest tentative critical or limiting phosphate phosphorus and potassium levels within the Ladino clover plant, are reported in this paper.

**THE CRITICAL NUTRIENT LEVEL**

The critical nutrient level of a plant may be defined as “that narrow range of concentrations in which the growth rate or yield first begins to decrease in comparison to plants at a higher nutrient level” (13). As the nutrient concentration of the plant decreases, and passes through the critical level, the probability of a response from the application of a nutrient rapidly increases. Conversely, as the nutrient concentration in the plant increases above the critical level, the probability of a response from the application of the nutrient rapidly decreases.

The decrease in yield of plants with nutrient concentrations at or below the critical level is related to the duration of the deficiency, the stage of development of the plant and to the supply of other favorable growth factors. The effect of nutrient deficiencies upon yields becomes more pronounced when the deficiencies exist for a long time; when they occur early in the growing season and when other conditions are favorable for growth. Conversely, deficiencies have less effect when they occur shortly before the time of harvest or when they take place during periods unfavorable to growth from causes other than a deficiency of nutrients. Responses will be more pronounced when all other growth factors remain adequate after the addition of the deficient nutrient, and less noticeable when another growth factor becomes limiting immediately after supplying the deficient nutrient. When more than one nutrient or factor becomes limiting, the probability of a response from the application of the nutrient rapidly decreases.

At the outset it must be recognized that the critical level is not a sharply defined point, but rather, a range of values the limits of which will be influenced by the part of the plant analyzed, the form of the nutrient determined, e.g., soluble phosphate phosphorus, total phosphorus, etc., the care in sampling plants, and the accuracy of the analytical methods. When a suitable part of the plant and a form of the nutrient are selected for analysis, the critical range becomes relatively narrow and then serve as a guide in evaluating the nutrient status of the plant.

The proximity of the samples to the growing point of the plant would likewise influence the critical nutrient level correlating with growth responses. Samples taken near the growing point of the plant would give high critical values, since these tissues have relatively high nutrient concentrations. Samples taken from senescent tissues of the plant would give relatively low critical levels, since the nutrient concentration relationships are the reverse of those described for samples near the growing point.

The evidence so far available indicates that under the conditions of the experiment, a 0.25 percent decrease in the salt balance have little effect on the critical level of a nutrient in the plant. In one instance, however, the presence or absence of sodium has been found to modify differently the critical potassium level in each part of the same plant. For example, tomatoes grown in the greenhouse, sodium has little effect on the critical potassium concentration of the blades (13), but in the conducting tissue (stems and rachises) of the same plant, the critical potassium level is 0.50% in the absence of sodium and 0.25% in its presence (12). This decrease from 0.50 to 0.25, expressed in percentage decrease, is very large, but when it is considered that potassium concentrations above the critical nutrient level for conducting tissue of tomato plants may vary from 0.50 to over 10.0% potassium on the dry basis, then whether the critical level is 0.25 or 0.50% is important from a diagnostic point of view.

**EXPERIMENTAL TECHNIQUE**

**CULTURAL TECHNIQUE**

San Joaquin loam taken from the 0 to 12-inch depth in the vicinity of Oakdale, Calif. was thoroughly mixed dry and then placed in 5-gallon pots. Each pot contained 2 pounds of soil and was provided with drainage by a 3-inch opening covered loosely by an inverted china saucer. The drainage water from each pot was collected in a 3-quart milk pan and returned to the surface of the turf just prior to irrigation. The proximity of the samples to the growing point of the plant would likewise influence the critical nutrient level correlating with growth responses. Samples taken near the growing point of the plant would give high critical values, since these tissues have relatively high nutrient concentrations. Samples taken from senescent tissues of the plant would give relatively low critical levels, since the nutrient concentration relationships are the reverse of those described for samples near the growing point.

The evidence so far available indicates that under the conditions of the experiment, a 0.25 percent decrease in the salt balance have little effect on the critical level of a nutrient in the plant. In one instance, however, the presence or absence of sodium has been found to modify differently the critical potassium level in each part of the same plant. For example, tomatoes grown in the greenhouse, sodium has little effect on the critical potassium concentration of the blades (13), but in the conducting tissue (stems and rachises) of the same plant, the critical potassium level is 0.50% in the absence of sodium and 0.25% in its presence (12). This decrease from 0.50 to 0.25, expressed in percentage decrease, is very large, but when it is considered that potassium concentrations above the critical nutrient level for conducting tissue of tomato plants may vary from 0.50 to over 10.0% potassium on the dry basis, then whether the critical level is 0.25 or 0.50% is important from a diagnostic point of view.

**EXPERIMENTAL TECHNIQUE**

**CULTURAL TECHNIQUE**

San Joaquin loam taken from the 0 to 12-inch depth in the vicinity of Oakdale, Calif. was thoroughly mixed dry and then placed in 5-gallon pots. Each pot contained 2 pounds of soil and was provided with drainage by a 3-inch opening covered loosely by an inverted china saucer. The drainage water from each pot was collected in a 3-quart milk pan and returned to the surface of the turf just prior to irrigation.