Plant Analysis—A Method of Determining the Phosphorus Requirements of Peas

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FIELD experiments with peas in western Washington (1) have shown that phosphorus is the most important plant nutrient required for maximum yields, provided the plants are well supplied with root nodules. Potassium may become a limiting element for the growth of peas in certain areas. A method of determining the potassium requirements of peas by use of plant analysis has been reported (2). The present study was undertaken to determine which plant part would best serve as an indicator of the phosphorus status of the plant, when the sample should be taken, and the relationship between the phosphorus content (soluble in 2% acetic acid) of the plant and the yield of peas.

EXPERIMENTAL PROCEDURE

Planting and Harvesting

Chehalis (Chehalis silty clay loam).—A description of the planting and harvesting operation for peas grown at Chehalis during 1946 and 1947 has been reported (2).

Puyallup (Sultan silt loam).—Thomas Laxton peas treated with Spergon were planted on April 4, 1949, with an experimental pea drill supplied by the U. S. Department of Agriculture. The fertilizers used were placed 1 inch to the side and 1 inch below the seed. Quintuplicate randomized plots, approximately 1/60 acre in size, were used. The plots were harvested and vined on July 10, 1949, by commercial methods.

Sequim (Sequim gravelly loam).—Spergon-treated peas of the Asgrow 40 variety were planted on March 5, 1948. The fertilizers used were placed about 1 1/2 inches to the side and 1 1/2 inches below the seed. The plots in this study consisted of two rows of peas, 2 1/2 feet apart, about 1/80 acre in size. The treatments were replicated five times. The peas were harvested for pickings on July 10 and July 17, 1948. The same procedures were used for the 1949 plantings at Sequim, except that four replications were sampled for the plant analysis studies.

Plant Sampling Technique

Approximately 50 plants were taken from each fertilizer plot. The 10 plants selected for analysis are recorded as tops in this paper. The other 40 plants were separated into leaf blades and leaf petioles where indicated. In all these studies, the stage of growth of the plants is determined by the number of nodes that have developed rather than by reference to the time of planting to time of sampling. This method of determining the stage of growth of the plant is preferred because of the influence of climatic factors on the growth of peas. Under certain conditions, a plant may develop three to four nodes in 2 weeks, whereas if the weather is less conducive it may develop only two nodes. The time and position of sampling the pea plants from the different locations are recorded.

Methods of Analysis

The plant samples were dried in an oven at 80° C to pass a 40-mesh sieve in a Wiley mill. The methods of Ulrich (4) were used for the extraction and determination of acetic acid-soluble phosphorus.

Statistical Methods

The field experiments at the various locations were set up as replicated randomized blocks. Differences required for significance in the yield data and plant analysis data were determined by analyses of variance. Correlation and regression coefficients were calculated when studies were made between yields and the phosphorus content of the different plant parts.

EXPERIMENTAL RESULTS

Time of Sampling

Chehalis, 1946. Greatest differences in phosphorus content between plants which received phosphorus and those which did not were obtained in the early