A METHOD OF SELECTING JAPANESE LARCH TREES THAT ARE SUPERIOR IN VOLUME PRODUCTION

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The purpose of this talk is to present a method for selecting Japanese larch trees that are superior in volume production. It is based on the premise that the selected trees will produce the greatest volume of wood for the area that they occupy. It is a method of selection that uses a ratio of tree volume to crown volume.

Some of the more commonly used methods of selecting a plus tree are based on volume of the tree in reference to the volume of the three largest trees in the immediate area, or for being the largest tree of a given number, or for being the tree with the best volume growth that also meets other silvical requirements such as branch angle and stem form, The methods are all quite satisfactory in so far as they go. They will locate a superior phenotype that can be tested for genetic superiorit y. However, these methods lack statistical relationship with the mean of the stand which is necessary to predict the degree of improvement that can be expected. Also there is generally a lack of relationship between the volume of the tree and the space that it occupies. When one selects a plus tree by comparing it with the three largest trees immediately around it, he is accepting the possibility that on some occasion he could eliminate two plus trees because they were adjacent to one another in a stand.

In this preliminary study of a statistical method of selection, a ratio representing the volume of the tree over the crown area was used to select the trees in plantations that have produced the most wood for the area that they occupy. Diameter breast height squared times height was used as a measure of volume. The crown diameter squared was used as the measure of the area of land occupied. In these two mathematical expressions, the constants were eliminated for simplification. All the living trees within sample plots were measured so as to get the mean and the variance of the ratios within plots. The ratios were analyzed statistically to determine their normality and to ascertain how they changed under varying stand conditions.

The experiment was originally set up to compare paired plots in stands of different densities; however, the difficulty of controlling site and spacing conditions forced the use of unpaired testing. The plots were established to include a variety of thinning conditions and ages. The d.b.h.'s were measured with steel calipers and heights of the trees were measured with a Blume-zeiss and the trees were numbered for further reference. The crown diameters were obtained by measuring four radii of each crown. In order to eliminate as much human bias as possible, the radii were always measured on the four cardinal points of the compass with a device to optically project the crown extremities vertically to the ground.

Statistical analyses were performed on the ratios that were obtained, and by the use of rankits and probits the frequency distributions of the ratios were found to be normal. This permitted the use of the standard deviations for specifying the superior ratios. The mean ratios of the stands were found to vary with the environmental conditions; therefore, the absolute values can only be compared within the individual stands - not be tween stands. At the present, we lack any correlation between the ratio and the environmental conditions. However, suitable experiments could determine what correlations do exist between the ratios and the environmental conditions.

By using 2.33 and 3.08 standard deviations above the mean, the best ratio in a hundred and in a thousand trees respectively can be determined. After the data were worked up and the superior trees were selected, at two levels, the sample plots were revisited and the selected trees were observed. It may be pointed out here that the selection of the superior trees in the experiment was done entirely from the data without any influence by the silvical characteristics of the individual trees. When the selected trees were observed, they proved to be ones that, with one exception, could be described as the better trees in the sample plots. Although they were not in all cases the largest trees in the plot, the selected trees were usually much above the average in volume, with good form, and did not have coarse branching. The selected trees occurred in all types of thinning conditions. Some stood more or less alone while others were relatively crowded.

In actually applying this method in large stands one would select the stand that represented conditions of management, probably intense, that he might anticipate using in the future. The next step would be to take a representative sample to determine the mean ratio and the standard deviation of the stand, After these have been computed,, the person making the selec tion would then revisit the plantation to select the trees that he feels are most likely to be superior. There are many trees that would be disqualified as superior trees for obvious reasons such as low volume, saber butt, wobble, forking, and so on. The final step would be the measuring of the chosen trees and the computing of their ratios to find out which of them, if any, are plus trees, Any level of selection could be established in terms of standard deviation - according to the needs of the particular tree improvement program.

One thing that became evident in doing this work was the difficulty of using this method of selection in a dense, unthinned stand where the trees are in serious competition for survival. Normally,, however, such a stand would not be used in selecting plus trees.

This preliminary study indicates that this statistical method of selection is feasible. Its greatest advantage is the establishment of a statistical relationship of the selected trees with the means of the stands in which they were selected. Further studies could be expected to enlarge its usefulness. The ultimate evaluation of this would, of course, rest on the outcome of inheritance studies.