



**Left—Leaves from phosphorus-deficient young walnut tree. Phosphorus content 0.075%, 1959. Right—Leaves from adjoining tree receiving 25 pounds triple superphosphate in November, 1954. Phosphorus content 0.115%, 1959. Both trees graded the same before treatment. Pictures taken August 21, 1959.**

before treatments were given, and also on similar tree size in 1958, show that treated trees made significantly greater length growth per unit size than similar untreated, phosphorus-deficient trees.

Yield of trees in the mature orchard was obtained in 1959. Trees were paired on the basis of comparable tree condition before treatments were made, and comparable tree size. Yields were significantly larger on trees that had received phosphorus than on untreated trees. All Franquette yields were abnormally low in 1959. Additional plots for further

study have been established in other bearing orchards in the vicinity.

A limited survey, made in 1959, of walnut orchards on Hesse series soils and on the closely related Glenview and Aiken series, all of volcanic origin, indicated that some orchards on all of these soil series may be seriously deficient in phosphorus. However, there is no indication of a general deficiency of phosphorus in walnut orchards of California. Only a limited acreage of orchards on volcanic soils seems to be involved.

Further trials are needed to determine

the most economical methods of supplying phosphorus to orchards. Broadcast surface applications are not effective because of the high fixing power of the soil for phosphorus. This has been demonstrated in two orchards in the affected district where broadcast surface applications have been made for several years and the trees are still showing severe deficiency symptoms.

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## Early stocking affects

# Forest Stands

## in quality and value

Stand density or stocking during early stages of stand development has an important effect on quality and value of the timber because it influences size and distribution of knots. Openly stocked stands tend to develop large, persistent limbs which remain in the logs as knots. Large and numerous knots result in downgrading of logs, thereby lowering their value.

The forester can control stocking of seedlings on pole stands through regulation of planting densities and early thinning. In this way he may also, in large measure, control the quality and value of logs produced. However, he must have guides to aid in regulating early stocking to meet quality production

goals. To provide such guides, studies were made of young Douglas-fir stands in Humboldt County and of ponderosa pine stands in the Sierra Nevada. Results with Douglas-fir to be grown to rotation ages of 80 years or less were as follows:

1. Average stocking of less than 170 trees per acre during the first 20 years of stand development results in butt logs with knots larger than 1½" in diameter. These logs are disqualified for use as peeler logs in the manufacture of plywood. Furthermore, 70% of the butt logs will have knots larger than 2½" in diameter, and will be graded No. 3 sawlogs.

2. With average stocking of less than 135 trees per acre during the first 20

years, none of the butt logs will grade higher than No. 3 sawlogs.

3. To minimize the degrading effect of knots on log quality, stands should be grown at densities greater than 170 trees per acre during the first 20 years, or should be artificially pruned.

Results from similar studies on ponderosa pine cannot be so definitely shown because of basic differences in log grading rules, but so far they indicate:

1. Average limb age and knot size increase with fewer trees per acre.

2. Average limb age on pine stands grown during the first 20 years at 170 trees or more per acre is nine years, while that of Douglas-fir may be 15 or 20, indicating that natural pruning may occur earlier on open-grown pine than on open-grown Douglas-fir.

3. Limbs live longer and reach larger average diameters on south and west than on north and east faces of the trees.

The combined studies indicate so far that early stocking is probably a more important determinant of quality and value in Douglas-fir than in ponderosa pine stands.

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