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GROWN IN KENTUCKY

DEVELOPING A DEMONSTRATION PLOT

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We are periodically faced with new products or techniques that can be applied to Christmas tree production. Most of us are often reluctant, however, to try anything new on a very large scale and would prefer to see for ourselves that new products and techniques will be worthwhile before abandoning our current practices.

One way to test a new product or technique without making a major commitment is to run a small trial or experiment/demonstration. Since experiments are neither too complex nor expensive to design and conduct, you can use them for evaluating new products and techniques under your own conditions. Terms used in describing how experiments are designed and conducted can be confusing, but some basic principles will allow you to do some testing on your own.

If a new fertilizer was available and the claims sounded very tempting, would you switch? Hopefully not without testing the new fertilizer against the product(s) you are currently using. How do you know that the manufacturer's rate will give equal results under your light, water, temperature and other conditions?

A clearly-marked experimental layout

To test the new fertilizer set up an experiment using the new and your current fertilizer (A = currently used, B = new fertilizer) each at three different rates (1 = lower than recommended, 2 = recommended, 3 = higher rate). Because you will want all possible combinations of fertilizers and rates, you can set up a *factorial experiment* using the two products tried at all three rates. Multiplying the two products by the three rates, you would have six treatments (2 fertilizers (A and B) x 3 rates (1, 2, 3) = 6 treatments: A1, A2, A3, B1, B2, B3).

How many trees should you use per treatment? One tree treated with each fertilizer and rate combination is not enough. What if that one tree dies? How do you know whether it was killed by the treatment or by a rabbit grazing or by a disease or if a weak seedling was used? Because you may not be able to say with certainty what caused the tree's death, you can't trust only one tree to tell you how each treatment works.

Statisticians say to use a minimum of three trees, but a minimum of 6 to 10 would be even better. If you then test 6 trees with each treatment combination, you will have repeated or *replicated* each treatment 6 times.

How are you going to select those trees? Logic might suggest that to keep track of everything easily you should set the 6 reps of each treatment up in straight rows. An experiment set up that way would look like this:

B3	B3	B3	B3	B3	B3	
B2	B2	B2	B2	B2	B2	→
B1	B1	B1	B1	B1	B1	N
A3	A3	A3	A3	A3	A3	
A2	A2	A2	A2	A2	A2	
A1	A1	A1	A1	A1	A1	

The diagram shows nice straight rows, everything easy to find, but what's wrong? You have all the possible combinations and you replicated everything 6 times. However, all the environmental conditions to which your trees will be exposed may not be equal across your plantation. For example, what if your treatment rows run east-west and the row containing all of the A1 plants is the most southerly? Then those trees would get less shading and their roots more heat; consequently, you would bias your results.

Instead of putting each treatment in its own row, set up *randomized blocks* to prevent bias. Each block will contain one of each of the 6 treatments but the position of each treatment is randomly determined. Pull numbers from a hat to ensure that *no* treatment gets any favored location.

Rep. 1	A2	B2	A1	Rep. 2	A3	B1	A1	
	B1	B3	A3		B3	B2	A2	
Rep. 3	B3	A3	A2	Rep. 4	B1	B2	A1	→
	A1	B1	B2		A3	B3	A2	N
Rep. 5	A1	B1	B3	Rep. 6	B2	A1	A3	
	B3	A2	A3		A2	B1	B3	

(Note that in some cases a particular treatment may occupy the same position in more than one rep. As long as that situation occurred by the "luck-of-the-draw," there is no problem.)

You may want to repeat the experiment with two or three different field locations or more than one species of Christmas tree to lend additional credibility to your results. All trees used should be as uniform as possible to prevent the trees themselves from becoming a complicating factor. Be sure that all other factors—tree age, shearing, weed control, etc. are the same for all trees to avoid any unwanted interference by non-test factors.

You will also need to decide how to evaluate your results. You might visually grade the plants, measure height or count the number of branches after each growing season. Color, fullness, general "health" of trees may all be characteristics you would use to decide whether the new product/technique is worth the change from an old method/treatment.

This simple experimental design should allow you to test new products and techniques to help you to determine the best way to produce top quality trees. Keep these basic factors in mind:

(a) use well chosen treatments or treatment combinations,

(b) provide at least 6 replications (trees/treatment),

(c) randomize treatments in blocks,

(d) apply the treatments to several species or at several locations.

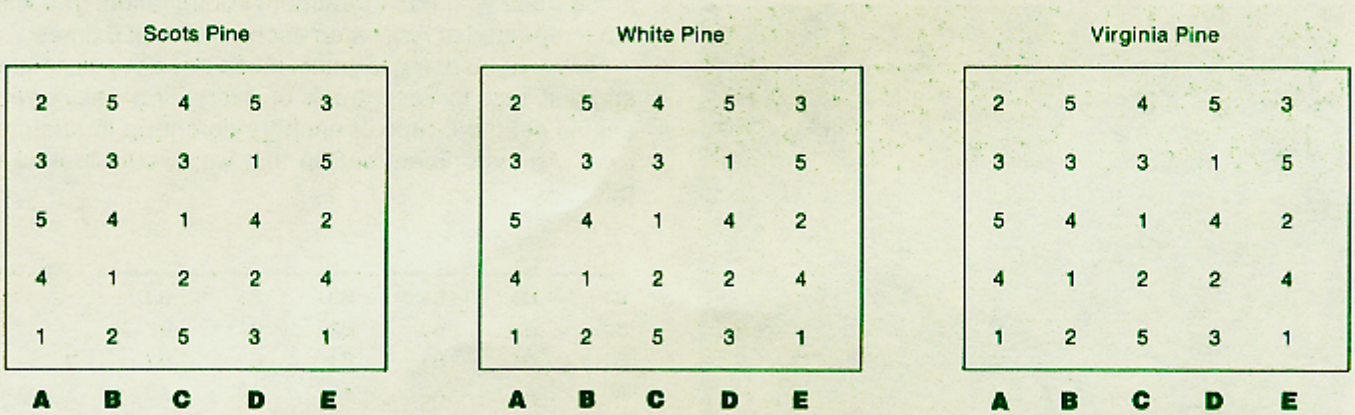
Use the average treatment response as your most believable value, but look at the variation among the replicates of the same treatment as well before deciding.

DEMONSTRATION — BEREA COLLEGE HYDROGELS

TREATMENTS
1 = Control
2 = Viterra®
3 = Liqua-Gel®
4 = Terra-Sorb GB®
5 = Hydreserve®

Each vertical row has every treatment represented.

2-yr-old Scots and white pine stock
1-yr-old Virginia pine stock
Planted 3-31-86 on 6-foot centers



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