of plant and soil with which he is working might be better able to plan and evaluate his fertilizer program.

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MODERATOR NEWHOUSE: Thank you, Martin. Our next speaker has travelled a long way to talk to us this afternoon; he is Bob Ticknor from Aurora, Oregon.

INFLUENCE OF FERTILIZERS AND GROWTH REGULATORS ON FLOWER BUD PRODUCTION OF FIELD-GROWN RHODODENDRONS

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Phosphorus used in larger amounts than normal has been reported by McGuire (4), Myhre and Mortensen (5), Ryan (6) and Vanderbilt (9) to increase flower bud set in rhododendrons. This is particularly true for two— and three-year-old plants which, in some varieties, are difficult to bud.

Growth regulating chemicals also have been suggested as a means of increasing flowering of rhododendrons by Cathey and Taylor (1), Criley and Mastalerz (2), Crossley (3) and Ticknor (7) and Ticknor and Nance (8). Most of this work was done under greenhouse conditions, although the variety 'Roseum Elegans' growing in the field was used in some previous trials.

To test the relative merits of these two systems of increasing flowering of field-grown rhododendrons under Willamette Valley conditions, a trial was started in 1968. Five varieties—'Elizabeth Hobbie', 'Princess Juliana', 'Pink Pearl', 'Roseum Elegans" and 'White Pearl'—known to vary in ease of budding were planted June 19, 1968. One month prior to planting, three inches of fir sawdust was worked into the upper six inches of the Willamette sandy loam soil. Ammonium nitrate to

supply nitrogen at the rate of 80 pounds per acre was applied over the sawdust before working it into the soil. A soil sample taken before planting indicated a pH of 5.9 and a phosphorus content of 84.5 ppm. In November, 1969, the pH ranged from 5.4 to 5.7 and the phosphorus content from 175.0 to 262.5 ppm.

Treatments used were as follows:

1. Check.
2. Cycocel (2-chloroethyltrimethylammonium chloride) at 2000 ppm.
3. Broadcast phosphate (0-45-0) at 2000 lbs/A.
4. Broadcast phosphate (0-45-0) at 2000 lbs/A, plus chelated iron at 54.5 lbs/A.
5. Phosphate (0-45-0) at 1 tablespoon per plant.
6. Super FTE 504 (0-34-0) plus fritted trace elements at 4 teaspoons per plant.
7. Broadcast Super FTE 504 at 1000 lbs/A followed by 1244 lbs/A of 0-45-0 in April, 1969.
8. Ethrel (2-chloroethylphosphonic acid) at 4000 ppm.

Broadcast treatments were worked in prior to planting.

Following planting, all plants received 80 pounds of nitrogen. Where phosphorus was applied at planting, the plants were fertilized with ammonium sulfate. Where phosphorus was not applied at planting, a 16-20-0 fertilizer was applied. Urea to supply 20 pounds of nitrogen per acre was applied August 12, 1968.

Several applications of fertilizer have been made in 1969. The 80 lbs of nitrogen from 16-20-0 and from ammonium sulfate were repeated April 10. On June 11, K-Mag at a 320 lbs/A rate was used to supply magnesium, potassium and sulfur to all plots. Forty pounds of nitrogen/A from ammonium nitrate was applied July 2. Ammonium sulfate was used to supply an additional 30 pounds of nitrogen/A on November 19.

Cycocel at 2000 ppm and Ethrel at 4000 ppm were initially applied June 22, 1968, and follow-up applications were made July 8, 1968. The 1969 applications of these chemicals were made May 22 and June 5. The first application of the year was made when the new growth was about two-thirds expanded. The follow-up applications covered late emerging buds as they expanded.

Plots used were 26 feet wide and 15 feet long, containing one row of each of the five varieties spaced 4 feet apart. The plants were spaced 2 feet apart in the row, so that there were seven or eight plants of a variety per plot. For final record purposes, the five middle plants were used in this experiment, which was replicated three times.

Since only two years have elapsed of a three-year experiment, the results reported must be considered preliminary. Table 1 presents the measurements taken.

Results

It appears in this experiment that bud production of rhododendrons at an early age is controlled more by the internal plant system than by externally applied treatments. It is possible, however, to increase markedly the amount of flower bud formation on those varieties which normally bloom young by applied treatments.

Observations about each treatment are as follows:

1. The effect of variety on budding was most apparent in the check treatment where 65 percent of the 'Elizabeth Hobbie' and 'Roseum Elegans' budded, while there was no budding in the 'Princess Juliana' or 'Pink Pearl'.

2. Cycocel application resulted in increased flowering of 'Elizabeth Hobbie', 'Roseum Elegans' and 'White Pearl'. A reduction in plant height but little effect on width was noted.

3. Broadcast of 0-45-0 did not stimulate flowering except possibly in the case of 'Pink Pearl.' Plant size was similar to the check.

4. Broadcast of 0-45-0 plus chelated iron appeared to stimulate flower bud formation in 'Elizabeth Hobbie', 'Roseum Elegans' and White Pearl'. The only two out of 180 plants of 'Princess Juliana' which formed flower buds were growing in this treatment.

5. One tablespoon of 0-45-0 at planting has not stimulated flower bud formation in this trial. Plant size has not been appreciably affected.

6. Four teaspoons of 0-34-0 per plant resulted in marginal necrosis, particularly in 'Princess Juliana' and 'White Pearl' in 1968. Purple spotting of leaf margins of these varieties occurred in 1969-produced leaves. Plant size and flowering were depressed, apparently the result of minor element toxicity; but the leaves have not been analyzed to determine which element or elements in the fritted trace element mixture is responsible.

7. Purple spotting of leaves of 'Princess Juliana' occurred to a reduced degree when 0-34-0 was applied as a broadcast application as compared to application in the planting hole. Plant size and flower bud formation were reduced.

8. Ethrel tended to reduce flower bud formation without reducing plant size. Heavy budding the year following Ethrel application to 'Roseum Elegans' was reported in a previous paper (7). It remains to be seen whether these plants will set large numbers of flower buds in 1970. The other potential effect of Ethrel on stimulating axillary bud formation was not observed. Almost a "witch's broom" effect on 'Sappho' rhododendrons growing in containers followed four applications of Ethrel at 5000 ppm during spring and summer, 1969, in another experiment.

Conclusions

At present, Cycocel at 2000 ppm and 0-45-0 at 2000 lbs/A plus 54.5 lbs/A of chelated iron appear to be the most promis-

Table 1. Average plant size in inches and percentage with flower buds of five Rhododendron varieties following phosphorus fertilizer and growth regulator treatments.

Tr. No	Material	'Elizabeth Hobbie'			'Princess Juliana'			'Pink Pearl'			'Roseum Elegans'			'White Pearl'		
		Ht	Width	% With Flower Buds	Ht	Width	% With Flower Buds	Ht.	Width	% With Flower Buds	Ht	Width	% With Flower Buds	Ht	Width	% With Flower Buds
1	Check	7.5	12.9	65.0	17.8	18.1	0	14.5	15.7	0	19.0	18.5	65.2	17.0	20.7	52.2
2	Cycocel, 2000 ppm	7.3	12.4	80 0	16.6	18.1	0	13.8	16.6	8.7	14.6	17.3	91.3	16.9	20.8	60.9
3	Broadcast (0-45-0) at 2000 lbs/A	6.6	12.2	36.8	17.7	18.5	0	14.9	16.7	29.2	16.6	16.7	54.2	18.7	21.0	37.5
4	Broadcast (0-45-0) at 2000 lbs/A + chelated iron at 54.5 lbs/A	7.0	13.3	77.3	18.0	18.6	9.1	15.5	16.6	18.2	18.3	18.3	81.8	17.8	21.3	59 1
5	0-45-0 at 1 tblsp /plant	7.2	12.4	36.8	16.5	16.6	0	14.8	16.4	9.1	17.2	17.2	50.0	17.5	20.3	50.0
6	0-34-0 w/trace elements at 4 tsp/plant	6.4	11.6	31.6	16.9	17.3	0	14.5	14.9	18.2	14.7	14.0	18.2	15.8	19.2	31.8
7	0-34 0 at 1000 lbs /A + 0-45-0 at 1244 lbs/A	7.4	12.0	52 6	16.4	16.8	0	13.4	15.3	4.5	16.4	15.7	40.9	16.3	19.7	27.3
8	Ethrel, 4000 ppm	7 6	12.5	50.0	16.0	17.9	0	14.9	15.4	0	18.5	18.7	17.4	17.2	20.5	22.7

ing treatments for stimulating early and heavier budding in rhododendrons. Varieties which tend to bud early naturally were most responsive to these treatments. Not all varieties were responsive to phosphorus nor to growth regulator treatments under these conditions.

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MODERATOR NEWHOUSE: Thank you, Dr. Ticknor. We have had two excellent talks so far and the last one is to be given by Andrew Adams from Maryland.

USE OF CYCOCEL IN PREVENTING FALL LOW-TEMPERATURE DAMAGE TO AZALEAS

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For those of us who grow azaleas of the evergreen types, Kurume, Glenn Dale, Gable, Kaempferi and their hybrids, it is certainly discouraging every spring to find so many plants that are not saleable due to either bark split or bud damage. Most azalea damage, we have found over the years, occurs around the middle of October or the first part of November, after a long Indian summer with lush growing conditions — no frost, just warm rains. The growing season generally ends the first night with the temperature dropping to 23°F or so.

We have often said, and I know many of you folks have too, if we could only stop this growth the latter part of August or early September and be satisfied, instead of pushing our plants right up until the last good fall day. One method, which is time proven, of course, is to dig every plant around the middle of August and check its growth, but that went out with the depression when labor wages started skyrocketing.