INCREASING BLOOM PRODUCTION IN RHODODENDRONS BY FERTILIZING PRACTICES

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A fertilization practice that will initiate good flower bud formation on young rhododendron plants is a need expressed by commercial growers and home gardeners alike in western Washington.

A review of American and English rhododendron publications reveals much information on general cultural practices but very little specific information on fertilizing rhododendrons that could serve as guides for this region. Since grower practices and experiences in fertilizing this crop vary widely, information from this source is not always reliable. Therefore, a research study to determine the fertility requirements for rhododendrons when grown under field conditions as measured by plant growth, flower bud formation, and chemical composition of the plant was initiated at the Western Washington Experiment Station in 1957.

1958 Plots

Rooted cuttings of *Rhododendron* variety, Cynthia, were taken directly from the propagation bed and set out in randomized, replicated field plots on Puyallup silt loam March, 1958. These plants were fertilized in April, 1958, 1959, 1960, 1961, 1962, with 30 different nutrient treatments. Treatments included comparisons of three different sources of nitrogen (ammonium sulfate, ammonium nitrate, urea-formaldehyde); rates of application of nitrogen, phosphorous, and potasium (40, 80, 120 pounds N, P_2O_5, K_2O — actual pounds per acre); phosphorus applied preplanting and incorporated in soil in plant root area as a three-year supply (dicalcium phosphate 240 pounds P_2O_5 per acre) vs. annual surface application of treble phosphate (80 pounds P_2O_5 per acre); addition of magnesium, minor elements, iron chelates to certain plots; and sawdust mulch vs. no sawdust mulch. Data were recorded each year for plant growth (measured as plant volume) and flower bud formation.

The 1959 results showed that phosphorous greatly increased flower bud formation. Plants that were treated with dicalcium phosphate, plus a surface application of ammonium sulfate (80 pounds N), produced a total of 159 flower buds for 21 plants as compared to 119 for surface application of treble phosphate plus ammonium sulfate (80 pounds N), 42 for plants receiving only nitrogen, and 13 for non-fertilized plants. Best performance of the nitrogen sources tested was obtained with ammonium sulfate. Some slight potash response was noted in flower bud set when potassium sulfate was added to ammonium sulfate-treated plants. Significant increase of plant growth and some increase in number of flower buds formed was obtained with the use of sawdust mulch.

The 1960 results showed that phosphorous continued to increase the number of flower buds formed, but less differences occurred between treatments as plants increased in age. The following figures indicate this difference decreases in average number of flower buds per plant for 1960, 1961, 1962: phosphorus plus nitrogen — 26.1, 81.9, 163.5; nitrogen only — 12.6, 53.7, 130.5; check — 11.7, 46.9, 107.0. The effect of sawdust mulch also became less pronounced as plants increased in size and more shading of roots by foliage occurred.

1959 Plots

Rooted cuttings of *Rhododendron* variety, Cynthia, were set out in field plots on Puyallup silt loam in March, 1959, and fertilized in April, 1959, 1960, 1961, 1962, 1963, with 34 different nutrient treatments. Since phosphorus applied preplanting appeared promising for initiating flower buds on young plants in the previous experiment, different sources of this element were incorporated and compared. Other treatments included the use of starter solutions (52% phosphoric acid applied at 1:50 and 1:100 dilution), and a comparison of time of fertilizer application.

The 1959 results showed that on this particular soil type (32% sand, 47% silt, 21% clay; pH=5.6) phosphorus again proved beneficial in increasing bloom production. With certain treatments 40 per cent the rooted cuttings produced flower buds in the fall of the same year in which they were set out No flower buds were formed on non-fertilized plants or those that received surface applications of nitrogen, phosphorus, potassium in June.

Data taken in 1960 showed the following average number of flower buds per plant: no fertilizer — 2.8; phosphorus incorporated preplanting (480 pounds P_2O_5) as dicalcium phosphate — 9.8, treble phosphate — 9.3, rock phosphate — 8.8, bone meal — 8.3; treble phosphate applied on soil surface (80 pounds P_2O_5) — 6.8; starter solution — 10.5. Plants that received nitrogen, phosphorus and potassium in April produced almost twice as many flower buds when compared to June applications at similar fertilizer rates. As was noted in the 1958 plots, differences in number of flower buds formed were less pronounced between treatments as the plants increased in age. Average number of flower buds in 1961 and 1962 for non-fertilized plants were 19.3, 51.6, respectively; 43.9, 90.6 for phosphorus-incorporated treatments.

1961 Plots

Rooted cuttings of Cynthia variety were set out March, 1961, on a lighter soil type than used in the two previous experiments. Treatments given included only those that gave good results on the heavier soils. The data obtained in 1962 may be summarized as follows:

Plants that received phosphorus produced more flower buds

per plant than non-fertilized plants — 3.5 and 0.0, respectively.

Plants that received phosphorus, incorporated preplanting, produced slightly more flower buds than surface application of phosphorus — 3.5 and 2.6, respectively.

Plants with no sawdust mulch produced more flower buds than mulched plants. Increased nitrogen rates from 40 to 120 pounds N per acre decreased this difference considerably. No doubt, a shortage of available nitrogen occurred with the use of fresh fir sawdust and, with added amounts of nitrogen, an increase uptake of nitrogen increased plant metabolic activity with subsequent increased phosphorus uptake.

The effect of phosphorus on plant growth is well known and its use is valuable since it seems to counteract some of the detrimental effects of overfeeding with nitrogen by hastening maturity and increasing the root system. As evident from research being conducted at the Western Washington Experiment Station, phosphorus also plays an important role in flowering. It seems advisable, therefore, that rhododendron growers in this area use fertilizers that contain adequate amounts of phosphorus. If fertilizers with low phosphorus content are to be used, then supplemental preplanting soil incorporation of phosphorus is suggested. Placement of phosphorus within close proximity of the root system, rather than an overall broadcast practice, is recommended.

MODERATOR JOE KLUPENGER: I know that with these experienced men here in soil mediums and with Art Myhre with his good set of buds on rhododendrons, that we want to get under way now with the question and answer period. At this time anyone who would like to ask a question may. Don't be bashful. Get up because here is where we're going to get an answer of some kind.

MRS. JEAN WHALLEY: Dr. Myhre, about how many flower buds did you average per plant on the second year in your rhododendron study?

DR. ARTHUR MYHRE: Our experiments in 1959 were with incorporation of dicalcium phosphate, but similar results could be had with treble super phosphate, or potassium calcium pyrophosphate, or potassium mono phosphate. The second year we got forty-two buds per plant. In the treatment without phosphate, we only got nineteen. In the surface application of eighty pounds every year — eighty pounds of actual phosphorus — we got seven buds per plant. With fish fertilizer we only got three. With June application — remember in all that first season we didn't get any buds — with June application we got four buds compared to surface application of seven buds. Then as you increase it, the final year, or the third year, with this annual application we got seventy-four buds per plant. With June application we got sixty-two, so it's coming up. So you're building up your phosphate so that by spring you're having phos-

phate there that's available. It's just the first year that the later application didn't give us the developing buds.

Our plants were set out in March and our fertilizer applications were applied in mid-April; it got so rainy one year that we tried the latter part of April. I might mention that our June applications did not give the low branching that we got with the early application. Then we had some late growth too, on the June application. We always had that second flush of growth. I might say in all our plants we did not have that second flush of growth — only on our container-grown plants where we had to water them a lot.

MR. JACK: This is for Don Nuffer. Do you use fungicides and insecticides in overhead sprinkling?

MR. DON NUFFER: We have been using Morton's Drench C for control of fungi that gets into junipers. It also has helped control mosses. We have used copper sulphate for the control of liverworts which make a regular mat over the top of the cans. As to insecticides, it has been more or less experimental, but I have used Malathion for cut worms in the nursery. While they didn't seem to be bothering our junipers, they were there and we didn't want them.

MR. BILL CURTIS: What concentration of fungicides and insecticides do you generally use in your sprinkler system along with your fertilizer?

MR. FLOYD RIGBY: We have 15,000 square foot plots that we irrigate at one time. We have an injector that allows us to inject varying rates, one to fifteen, or clear up to one to three hundred. When we use insecticides, we've had no insects and we have not been out with the sprayer now for two years. We use ½ gallon of Malathion, which is put into our injector. We fill the injector with water, and then we inject this at the rate of one to fifteen. It takes us about six minutes to spray the whole 15,000 square feet. We've had exceptionally good results with this method. The injector that we have holds 15 gallon of water, so we put ½ gallon of Malathion into the injector and then we fill the injector with water. This is at a rate of one to thirty. Then we inject this diluted solution into the sprinkler system at the rate of one to fifteen.

MR. ROBERT BODDY: This is a question for Art Myhre. In your rhododendron experiments, as I understand it, phosphate in all instances was incorporated into the soil except where it was compared with surface applications. In all instances, in all of your experiments, there was a pre-planting application then?

DR. ARTHUR MYHRE: Yes, where we had a five-year supply, or three-year supply.

MR. ROBERT BODDY: I have a second question. You said that you were starting to conduct experiments with plants in egg cans on growth retardents and so forth. Are you going to

do the same with your fertilizers? Are you going to, in all instances, incorporate phosphate into your planting mix?

DR. ARTHUR MYHRE: Yes, you bet we are.

MR. BRUCE BRIGGS: Did you not use on your rhododendrons 480 pounds of triple super phosphate; that was standard?

DR. ARTHUR MYHRE: The question was about that 480 pounds — that is a high rate; where you are planting and taking them out in a few years; personally I wouldn't do that, but you might for the three year's supply. We just incorporated it, right in that square foot area, and set the plant right in there.

MR. BRUCE BRIGGS: Then that would be approximately ¾ ton per acre; so that would mean that if you are tilling the whole ground, you'd want at least 2 or 3 tons to give you the same effect. Would that be right?

DR. ARTHUR MYHRE: I wouldn't suggest just going out and scattering it because, at least in our area, a lot of the phosphate is going to be tied up. We want this fertilizer right there where the plant is. That is a heavy shot; unless you're going to leave the plants there a long time there really isn't any advantage of going to that heavy rate if you're using a fertilizer that is high in phosphates. You could put it right down the row. I personally wouldn't just scatter it all over because its expensive and you can place it right around the plant. Maybe you'd rather do that in other ways that are more economical.

MR. BILL CURTIS: Many of us in this area grow rhododendrons set quite closely together. I plant them on 24-inch centers. I was wondering if we could apply phosphate over the entire area. What would you apply per acre if you are to cover the whole area because it would be too bothersome if you put a handful or spoonful where you put it on each plant? It would be much simpler to take a spreader and spread the fertilizer over the entire area, then rototill it in.

DR. ARTHUR MYHRE: I can see no reason why that would not be feasible. We just placed it around our plants because our plants were set wider apart. The rate of application depends on what kind of fertilizer you use and how long your plants are going to be there.

MR. BILL CURTIS: Our plants would normally be moved out in three years. We would just love to sell them in two years —then we can make a little money. But if we can get buds in three years and get a 21 to 24 inch size in two year's time, why, we move them out in two years. We figure three years as the maximum.

DR. ARTHUR MYHRE: I would suggest you use treble-phosphate. We have been using super-phosphate but treble is quite soluble and I would suggest that you use, maybe 240 pounds of this three-year supply per acre. I'd put it on early, as early as you can get it on.

Maybe I'd just better mention one other thing. I happen to be a rhododendron hobbyist. I like rhododendrons. I have a hundred varieties on my place, one of each thing. Some one said, "Well, do you go up there and spoon feed like you do down here?" I said "No" and they want to know what I used. I might just mention what I use up there. I use 11-48-0 which is very soluble, and then, every other year, I add a little sulfa-Mag which gives a little magnesium and potash, and I've never had any trouble on my varieties, but it's a fast way — ammonium phosphate and sulfa-Mag.

MR. BRUCE BRIGGS: This is directed to Dan Schmidt. Can you substitute pine needles or some other form of either pine or fir in place of your leaf mold?

MR. DAN SCHMIDT: Where we get our leaf mold there are some fir trees, although most is alder and maple. I think you'd have a different reaction, probably you'd be getting into something more like the bark dust if you used pine needles or fir needles or something like that.

MR. RAY BURDEN: Mr. Myhre, all my life I have heard about sawdust tying up the nitrogen in the soil, and especially with the mulches. Yet these fellows go out and plant rhododenrons in 90% sawdust with good results. I was just thinking, why no lack of nitrogen? As you know, in the spring, the sun warms the soil up and creates a bacterial action that makes nitrogen more readily available. I was wondering if the fact that the sawdust, instead of tying up the actual nitrogen, just kept the soils cooler and prevented the bacterial action, and therefore, made the nitrogen less available rather than just tying it up. I have been trying to figure this out for five years and it just sounds logical to me.

DR. ARTHUR MYHRE: My answer is, I don't think so. It may cause a little difference, but I think we all know about the process of the microorganisms which need energy and use up the carbohydrates, etc. I just think whenever you add sawdust there, you just don't have, at that time, available nitrogen. It is true, that it will have some effect, but at that nursery where we saw a lot of sawdust in the soil there has been a good supply of nitrogen previously. There's nothing wrong in incorporating sawdust. We do it a lot with blueberries. We rotovate and plant our rhododendrons and then add sawdusts and mulch it in just for the winters — providing we have the extra nitrogen. I would like to use, however a fast-acting form of nitrogen, like ammonium sulphate.