been busy in expanding activities at the home nursery, where azaleas are grown among other plants and where many of these azaleas are grown from seeds.

It gives me great pleasure to introduce Mr. Zophar P. Warner, Warner Nursery, Willoughby, Ohio, who will talk to us on azaleas from seed.

MR. WARNER: Thank you, Dr. Skinner. I am very grateful that you covered a phase of my talk of which I know very little, and I have completely left that part of it out of my talk.

Mr. Warner presented his paper, entitled: "Azaleas from Seed" (Applause).

AZALEAS FROM SEED

ZOPHAR P. WARNER
Warner Nursery, Willoughby, Ohio

There are other propagators, several of whom are here, that use essentially the same method of growing azaleas from seed that we use. However, we have had continued success and will offer our procedure in the hope it will be of some value.

In addition to the azaleas that are desirable to grow from seed, the following procedure for the most part can be followed in growing *Pieris, Rhododendrons, Leucothoe, Kalmia*, and similar plants.

Our time of sowing the seed is based on the fact that we want to make use of the winter months and that we want a plant large enough to bed out by the last week of May. That is considered to be the frost date around here. Also we have limited greenhouse space and we do not want too large a plant.

January 15 is about the right time for azaleas. *Rhododendrons* and *Kalmia* should be sown in early December or before. All our flats are 20 x 14" and 2-3/4" deep. Only the depth is important. Less depth will cause drying. More depth is unnecessary and makes flats cumbersome to handle.

Only moist peat should be used in the preparation. It should be neither dry nor soggy. First, about an inch of coarse peat should be placed in the bottom of the flat. From here on, we recommend using only the lighter brown, coarse ground Michigan type peat, pH 4.5-5, such as comes from the vicinity of Sandusky, Michigan. The flat should be filled and firmed to within about half an inch of the top with unscreened peat. The last half inch should be filled and firmed with screened peat.

Now, if I seem to be going a little bit too much into detail, the people who know how to do this aren't going to change their method anyhow and I am sure the people who don't know can have success by using this method. I believe one of the main features in using Michigan peat is that you don't have to know what you are doing to have success.

Actually, the plants will do better in the unscreened peat but it is easier to separate the plants at dibbling time if screened peat is used. Clean seed is then sprinkled over the prepared flat. If the seed is good, it is easy to get them too thick. After seeding, sift on just enough ground sphagnum moss to barely cover the seed. Place the flat in a water pan until it is completely soaked

to the top. We then set the flat in the greenhouse in full light. Temperature from 70 to 80 degrees F. are desirable, 60 degrees F. will slow things down a little. Water lightly from the top just as soon as the sphagnum shows dry.

We grow our seedlings in an old tumbledown greenhouee that has a lot of air circulation in it, consequently, there is little trouble with fungus. When necessary we use Natriphene. A good house for rooting cuttings is definitely not good for seedlings unless it is properly ventilated.

The seedlings are ready for dibbling as soon as the first two seed leaves appear. Very little root system has formed, consequently, the plant is retarded very little, and it is most easily removed from the seed flat.

The transplanting flat should be about 3/4" deep, filled and firmed with moist, coarse ground, lighter brown, Michigan-type peat mentioned before. No fine screened peat should be used as it prevents aeration and encourages the growth of moss, which is undesirable. The plants are lifted with a steel writing pen, prepared by heating the point and spreading. We favor making a little hole, pencil size, in the peat, so that the stem of the plant will not have a kink or twist. The kink formed if the plant is pressed into the peat with the pen alone may break during heaving the first winter. We once had about a half bed of Carolina rhododendrons break out and I couldn't figure out what bug was active in freezing weather. I discovered there had been a little curl put in the stem. Since they were brittle, they were forced out by heaving.

We plant 350 plants in a 14 x 20" flat. We don't use a template to mark the holes. I don't know if it would work in the coarse peat. A person should soon be able to do a flat of 350 in an hour. It helps to sprinkle the flats lightly the day before dibbling. That will hasten speed of operation because the loose peat won't cling to the tools. After each flat is finished, it should be completely soaked by setting in a flat pan of water.

The flats are then placed in full light and watered from the top as soon as the peat shows drying. It is usually not necessary to water for a couple of weeks but as the days lengthen and the greenhouse becomes hotter, two waterings a day may become necessary.

We set the thermostat at about 60 degrees F. but do not worry about ventilating until it is over 80 degrees F.

We have used Fermate weekly as a preventive fungicide, but I don't think it has been necessary to use it during the last year or two.

We make two applications of Rapid-Gro about three weeks apart, the first coming after growth is well started. I don't think it is desirable to use even liquid fertilizer when the plants have just been disturbed. It might work but I have always been afraid to try it. It is probably not desirable to use acid type fertilizer when pure Michigan peat is used.

By the middle of May or probable frost free date, the plants should be three or four inches tall. The flats can be carried outside in full sun, and cut back with the hedge shears. The greenhouse has been completely unshaded during this time. If you are in a warmer section, you will have an earlier frost free date and can get them out sooner. You do have to ventilate quite extensively, and consequently, water extensively. It is not desirable to cut back the plants and plant immediately afterwards. Buds should be well started first.

Another application of liquid fertilizer about a week before planting is helpful in breaking buds.

In preparing field beds, I will assume we are starting with good soil, usually old bed areas with a high percentage of old peat. We use no boards or concrete structures to make frames.

First, we make a heavy application of cow manure if we can get it. The whole area is then disked or rototilled. The beds are laid out 80" center to center with 24" paths. This allows two row trailers and tractors to run over the beds with the wheels in the paths. Three or four inches of soil are shoveled from the paths and spread on the beds which are raked level. This should probably be done mechanically. When I have just another mile or two of beds I will figure out doing it that way. An application of commercial fertilizer is then made and about four inches of Michigan peat are spread evenly on the bed. DDT is applied on top of the peat. to keep out white grubs and Japanese beetle larvae.

An irrigation system that applies water at a low rate is the best. This prevents puddling and also allows longer applications of water during the heat of the day. We use nozzles of No. 1 or No. 2 size which can be turned on as planting progresses. You don't have to hold up planting operations while you water. There should be no delay in watering on hot days. Areas planted at 12:00 o'clock and not watered until 1.00 will suffer severe losses.

The beds should be thoroughly watered the day before planting, or even longer ahead than that, and the flats of azaleas should be thoroughly soaked before being separated for planting. This keeps root damage to a minimum and starts the plants off in a turgid condition. It helps in handling if the roots, with peat adhering, are squeezed into a compact ball. By this time, the flats are completely root-bound and there wouldn't be any loose peat left in the flats after you separate it.

Spacing should be gauged so that plants will be crowded but not damaged by crowding at the end of the first growing season. Less space is required and better growth is obtained if the plants are not too far apart, three or four inches apart is about right. We place 16 to 18 plants across a bed that is 54 or 56 inches wide. Shading is not used at any time.

Wiltpruf cuts down drying-out but it will also substantially delay starting of growth. If watering is watched closely, it is not necessary to use it. Watering twice a day may be necessary at first. Later, once a day and finally every other day will do. If peat shows drying in the early morning, the beds are too dry.

In about a week after new growth is evident, we make a light application of Vigoro and water it in. When we are far enough along to apply the first fertilizer in June, another application is made not later than July 15.

We spray periodically with a mixture of Captan, Malathion and liquid fertilizer. It should be repeated every two weeks. Normally, no fertilizing of any kind is done in September. Irrigation is also tapered off in September.

By fall, plants have a large peat ball and little winter heaving occurs. When cold weather comes, we mulch with shavings or sawdust. In the spring, plants are ready for sale as liners or for replanting.

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MODERATOR SKINNER: Thank you Mr. Warner for your excellent discussion. I think we have time now for some questions before a little break, and before the last half of the program.

MR. JOHN D. NORTHRUP (Northrup's Nursery, Conneaut, Ohio): I have two questions. The first one has to do with the hardiness of the Knap Hill hybrids and the second one is, I would like a formula to make up an inexpensive liquid fertilizer for azaleas.

MODERATOR SKINNER: Suppose I try the first question on the Knap Hill hybrids. To my knowledge, the Knap Hills have not been sufficiently tested to be able to tell very much about their hardiness. They, of course, are improvements of the older Ghent forms of azalea. They are coming into this country and we suspect they will be fairly hardy.

There is the fact that both the Knap Hills and the Exburys have supposedly more blood of our western azalea than some of the old Ghents, and we know *Azalea occidentalis* is a poor grower in the East. It stands our winters but becomes chlorotic in the summer. For this reason, we have our fingers crossed a little. We believe many forms of the Knap Hills will be hardy. Has anybody had any experience with them?

MR. ROLAND deWILDE (deWilde's Rhodo-Lake Nurseries, Shiloh, N. J.): While I haven't had any great deal of experience, we made some experiments with Knap Hills and after the first year, when they were spotted in flats in the greenhouse, just as Mr. Warner has explained, we put them out in an open frame or without any shade whatsoever the following winter and we saw no appreciable difference between that and the ordinary *A. mollis*. They stood -4 degrees F. without any injury, so I would say they must be fairly hardy.

While I am on my feet, about *A. occidentalis*, I sowed seed in '52. That is now in the open field and went through one winter, last winter, without any protection and there was no dieback. They grew fairly well this summer, although they did have a good bit of shade, especially in the afternoon from the woods. That may be part of the answer. I would say they need a little more shade than the average man would give. How they will do this next year, I don't know. You can come and look.

MODERATOR SKINNER: There was a second part to this question —the formula for an inexpensive liquid fertilizer.

MR. JOHN D. NORTHRUP: Agrico has been recommended and I have used it, but I don't consider it particularly inexpensive. The price I paid was $110 a ton. If we can buy lower-priced forms of nitrogen and fertilizer and if we knew the proper ingredients, I believe we could build up a much lower-priced fertilizer.

MODERATOR SKINNER: Does anybody else have any information to offer?

MR. HARVEY GRAY (Long Island Agri. & Tech. Inst., Farmingdale, L. I., N. Y.): In answer to that question, I think I can throw a little light on it. I suggest you pay no attention to your phosphorous and potash in your fertilizer. You put that in your soil and then as far as your nitrate is con-

cerned, do that with urea in the liquid form. The rate of application was discussed last year. Urea, 45 per cent nitrogen, is quite inexpensive when you figure on the cost of nitrogen.

DuPont's Nu Green, which is a trade name, can be made up inexpensively by making an application through your irrigation, using two pounds of urea to each 1,000 square feet of area that you are covering, and there are techniques and devices on how to get this urea in your irrigation line. If anyone is interested, I would be glad to show them a little diagram as to how the thing could be set up.

MODERATOR SKINNER: Thank you, Mr. Gary. Is there another question?

MR. JAMES S. WELLS (D. Hill Nursery Co., Dundee, Ill.): Mine isn't a question; it is a comment on foliar feeding. I don't like foliar feeding. Jack Hill refers to my attitude as a "monastery gardener". I am a monastery gardener. I admit it without any quibble.

That people are using foliar feeding is obvious. That they are getting quite good results is obvious, but I think the whole thing is dangerous if we come to rely too much on this type of culture.

I prefer to prepare the ground well and to top dress my azaleas with tankage as an organic and slowly available form of nitrogen, which is reasonable in price—$65 to $70 a ton, and you don't need a battery of white-coated scientists to determine just what to put on.

MR. GRAY: Henry, I want to answer Jim, if his interpretation of my explanation made last night was foliar feeding. Did you get that idea?

MR. WELLS: No, I didn't.

MR. GRAY: No, it is irrigation rather than foliar feeding.

MODERATOR SKINNER: I think there is very good sense to foliar feeding. We know that it was developed as a quick shot in the arm for fruit trees without a carry-over effect. The importance of a soil application for prolonged growth is very well taken.

MR. CASE HOOGENDOORN (Hoogendoorn Nursery, Newport, R. I.): You mentioned raising azaleas from cuttings. A few years ago we rooted some *Azalea lutea*. After they were rooted and potted, they were rerooted. We carried them over to the sash house at 40 or 45 degrees F. and I don't think five per cent of them ever broke again in the spring. Will you give me the reason why?

MODERATOR SKINNER: I think it hinges on a point stressed at the end of my paper. Dr. Kraus pointed out that earliness of rooting is probably the secret of carrying over. I have rooted cuttings early in the season from plants in the greenhouse and there you have a cutting which can be established early. You may get some growth on it the first year, and I don't think you have trouble with over-wintering. I believe your trouble comes from taking cuttings too late in June or July and not getting any bud activity. They just won't carry over. If your cuttings are taken in May, I believe they will come through.

MR. ROGER COGGESHALL (Arnold Arboretum, Jamaica Plain, Mass.): We tried several years to root *Azalea calendulacea.* We found we could root them and not over-winter them. Last year for the first time, we succeeded in getting a fairly good percentage to live through the winter. I think it is primarily due to what you say; since the cuttings were made the last week in May in comparison with the last week in July. The July cuttings died almost completely, whereas, every single one rooted that were taken in May. That is the first time we have been able to do it.

MR. CARL WILSON (Cleveland, Ohio): When I was out to Mr. Warner's place I noticed he used sawdust quite extensively. Do you use it for replanting with azaleas or with such things as *Juniperus virginiana* or Pfitzer's juniper?

MR. WARNER: We generally make sure we have a higher nitrogen fertilizer, where we mulch the beds over and where they stay for another year we like to make an application of ammonium sulphate and some other nitrogen fertilizer.

I do think it is better to use shavings, chips, corncobs or peanut shells or anything that is larger and more porous and less solid and decomposes more slowly because sawdust, if it is several years old, even in a large pile will drop the nitrogen.

Could I ask a question while standing up? I was wondering if anybody has had any experience in this. In speaking of foliar feeding, I am not just thinking in terms of inducing growth. What about using liquid phosphorous as a means of slowing down growth in September when you are afraid you are going to have frost in two weeks. Has anybody had any experience with that?

MR. DE WILDE: I didn't use phosphorus but I used potash on the basis of some research. On tomato plants you can reduce phosphorus by the use of potash. A few years ago I fed these azaleas pretty hard and along about the first of September it looked as though I was going to have trouble, so I inquired around and the consensus of opinion seemed to be that the best thing to do was to use both nitrogen and potash, since if the nitrogen happened to be low, potash wouldn't be absorbed properly. But I don't think this is to be recommended. I think it is better to cut down feeding through your irrigation system sooner, even at the risk of getting plants a little underfed toward the end of the season, because you would have less bud trouble.

MR. JOHN VERMEULEN (John Vermeulen and Son, Neshanic Station, N. J.): I would like to make a comment rather than ask a question. I think in general we are putting too much emphasis on growing big and tall plants. We were taught to grow a sturdy plant and the size of seed didn't make any difference. We ship our plants all over the states and by growing too fast a plant in one season we take a certain amount of strength out and all people can't take care of it. I think if you get too much fertilizer you get it too big.

MODERATOR SKINNER: The next speaker on the program comes of a family that has been known for many years in nursery circles. As owner of Rhodo-Lake Nurseries at Shiloh, New Jersey, he has been active in the New

Jersey Nurserymen's Association and knows a great deal about azaleas, rhododendrons and their propagation.

It is my pleasure to introduce Mr. Roland de Wilde, who will talk to us about azaleas from cuttings.

Mr. Roland de Wilde presented his paper, entitled: "Azaleas from Cuttings". (Applause).

AZALEAS FROM CUTTINGS

ROLAND DE WILDE

de Wilde's Rhodo-Lake Nurseries, Shiloh, New Jersey

I am not going to spend too much time on the propagation of the Kurumes and that type of azalea because of the fact that a great many people know how to do it. As a matter of fact, in our part of the country every cross-road farmer has a batch of azaleas and they are as common as weeds, and I am afraid they will be pretty nearly as cheap as that before too many years. However, we like to do things just a little different from the common practices, so I will just briefly explain our method.

First with Kurume cuttings and *Rhododendron kaempferi*—the standard practice is to make the cuttings from wood that has nearly finished growing. It is not important to do that.

We stick the cuttings in sand and peat in a cold frame. The cold frame is constructed out of a 4-inch wide concrete box two blocks high and filled up with a medium of half sand and half peat. We try to be a little heavy on the sand, especially if we use the peat dry and the peat swells when it gets wet and increases in volume.

After the cuttings are stuck, we put the sash on tight. We make the frame air-tight with the aid of some burlap around under the sides of the sash and in between the sash we weatherstrip. We whitewash the glass and put a shade on it. In addition to that, we have what you might call a lath house, for built over the frame is an iron plate with wire-bound shade. That is about six feet or more over the top of the frame. The only reason we do it is that it helps keep things a little cooler when you have the frame up, to stick the cuttings. The boys like it and it is not a lot of work.

When the cuttings are set, we stick them well down, practically flood them, put the sash on and leave it on for the next six or eight weeks. If it is dry, like this summer, we open it up and give them a drink.

Normally, we get a stand that varies between 80 and 100 per cent. Sometimes it is a little less. Occasionally, you may get a few rotten cuttings. There is practically no work to it and that is the way we do it.

The plants are left in the frame all winter long. We put a mat on top to help prevent freezing. Back in the early thirties we used to have winters when the weather man reported it might go to zero, so we had that to keep the things from freezing.

They stay in that frame until after we finish shipping, which may be the first of June. By that time, they usually have made some growth. We