ARNOLDIA

A continuation of the
BULLETIN OF POPULAR INFORMATION
of the Arnold Arboretum, Harvard University

VOLUME 9 | NOVEMBER 4, 1949 | NUMBER 10

GROWING RHODODENDRONS FROM SEEDS

Seed Collection and Storage

THE fruit of the rhododendron is a five to ten celled capsule. Every capsule normally contains many seeds. In the case of true species, each viable seed will reproduce substantially the same characteristics as the parent plant. Named varieties and hybrids will not, of course, come true from seeds. These special forms, however, may be grown from seeds in an effort to secure new and better varieties.

The best date for collecting rhododendron seeds will vary somewhat with the species and with the season. Thus, in 1948, *Rhododendron dauricum* capsules had dehisced on October twenty-first, while *R. obtusum kaempferi* capsules were still green. In 1947, *R. calendulaceum* were well ripened on October twentieth, but in 1948, they were still green on the same date. The ideal time for collection is when the capsules are just beginning to dehisce. It is usually possible, however, to collect well developed capsules for later dehiscence in bags or packets. This eliminates the risk of losing the seeds and frequently makes it possible to collect both early and late maturing species on the same date. In the Arnold Arboretum, seeds of most rhododendron species can be collected during the last three weeks of October.

If rhododendron seeds are dehiscing when collected, they may be packeted at once and stored in a cool, dry place. Unopened capsules will release their seeds more rapidly in a warm, dry room. They may be spread out on paper or packed in porous cloth bags. Capsules which fail to dehisce may contain good seeds. Such seeds can be obtained by crushing the capsules and screening out the debris. If it is too difficult to do this, the seeds may be sown uncleaned. Rhododendron seeds will keep well for several months in ordinary envelopes or seed packets. If seed is to be kept for longer periods, it should be tightly sealed in glass bottles and preferably stored in a refrigerator.

Soil for Seeds

Rhododendron seeds will germinate in a wide variety of soils, but a rather acid, sandy soil is best. Plenty of organic matter and good drainage are both necessary for successful growth. A mixture containing about equal parts of sandy soil, sand and leafmold or peatmoss should give good results. Many successful growers use pure sphagnum peatmoss. At the Arnold Arboretum, we have had excellent results with equal parts (by volume) of coarse sand, Canadian peatmoss, and horticultural grade vermiculite.* This mixture has the advantage of good aeration while retaining sufficient water for good growth. We add one level tablespoon of a complete fertilizer (5-8-7) to each standard flat (3x12x24 inches) of this mixture.

Damping-Off

Seeds are usually planted in soil which is already populated by many other organisms. Most of these organisms, such as nitrifying bacteria, are useful to plants, but many others, such as the fungi which cause damping-off, are definitely harmful. Since the damping-off organisms are present in most soils, even in good "clean" sand, damping-off is the most widespread and serious juvenile disease of plants. Seedlings may be attacked both before and after emerging from the soil.

Many of the failures which are attributed to poor seeds are doubtless caused by pre-emergence damping-off. The toppling over of young seedlings has been observed by most gardeners. The fungus hyphae grows both through and between the cells and the young stem soon becomes fatally weakened. The disease may be confined to a small area, but once established in a seed pan or flat, it will often spread very rapidly. A thousand seedlings can be reduced to a dozen survivors within a few days. Since the disease is soil borne, it can be most effectively controlled by treating the soil.

Heat treatment: The damping-off fungi can be destroyed by heat. A temperature of 180° F. for one hour is effective. Soil which is to be pasteurized by heat should be fairly moist before the treatment is begun. Small quantities may be treated in an oven or by drenching with boiling water. Treated soil must be allowed to cool before planting. The heat treatment has the added advantage of killing weed seeds. The chief disadvantage is that the treatment may seriously upset the balance of soluble mineral nutrients in the soil.

Chemical treatments: There are numerous chemicals which will assist in the control of damping-off, but formaldehyde gas is probably the most effective. This gas is readily available as commercial formalin, which contains about 40% formaldehyde dissolved in water. It must be emphasized that the fumes of formaldehyde are very injurious to growing plants, although relatively harmless to dormant

* Vermiculite is a micaceous ore which contains a small amount of water. The raw ore is ground into particles which are then exploded by heat. There is a water resistant type which is not suitable for most horticultural purposes. Vermiculite is widely distributed under such trade names as Terra-lite and Mica-Gro.

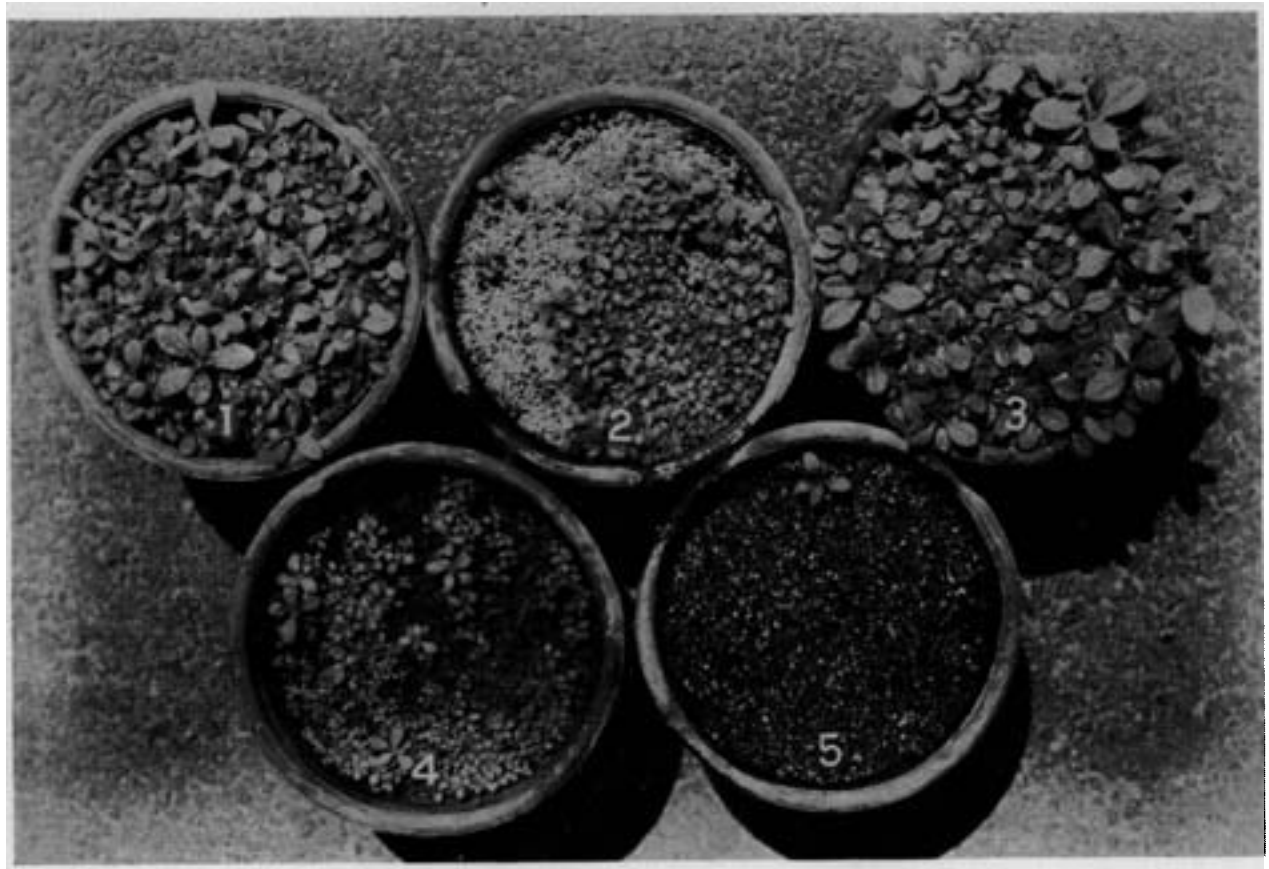

PLATE VIII. *Rhododendron calendulaceum.* Five pans sown February 12, 1949, photographed June 15, 1949. All seedsoil treated with formalin. In each case, the layer of the antibiotic used on top of the treated seedsoil, was about one inch thick. 1, Horticultural grade vermiculite. 2, Flowerite. 3, Sphagnum moss. 4, Soft-wood sawdust. 5, Formalin treated seedsoil only. See Table I for summary of results with this and other species.

seeds. At full strength, formalin will burn the skin and long exposure to the fumes may irritate the eyes. It is not a dangerous chemical, however, and it is reasonably agreeable to work with. At the concentrations recommended in this article, it is possible to sow rhododendron seeds in treated soil immediately following treatment. There are two methods of applying formalin to seedsoil. It may be added full strength in the process of mixing, or it may be used as an aqueous solution in watering seeded pots or flats. A liberal initial watering with a solution containing one teaspoon of formalin to two gallons of water will give good protection. In the experiments reported below, the formalin was added directly to the seed soil at the rate of one teaspoon per three standard flats (3x 12x24 inches). The formalin was first mixed with a small amount of soil and this small amount was then mixed into the entire batch. When antibiotics were used for additional protection, no formalin was added to them directly. They would, of course, receive plenty of gas from the treated soil.

Seeds which germinate in one day, such as willow and poplar, would be destroyed by this treatment. It is necessary to wait a few days before planting such quick germinating seeds in treated soil. (In an outdoor treated seed bed, it is best to wait several days before sowing any seeds. Formalin volatilizes much more slowly under outdoor conditions. The aqueous solution is most convenient for treating soil in cold frames, etc). Rhododendron seeds germinate rather slowly. Even the most rapidly developing species will be relatively inactive for the first few days. Meanwhile the damping-off organisms will have been killed and the seedlings may have time to grow through the most susceptible stages without injury.

The soil will usually become re-infested within a very few weeks, since the effect of the treatment does not last long. Indeed, this short-term protection is the chief disadvantage of the treatment. The long-term protection required by most woody plants, including rhododendrons, makes it desirable to sow the seeds on a layer of material, which will resist the growth of the damping-off and other harmful organisms, but at the same time permit the successful development of the desired seedlings. Such substances are called antibiotics because they resist the growth of the organisms which cause damping-off.

Antibiotics: During the past two years, the writer has experimented with growing rhododendrons in five antibiotic substances. These substances were sphagnum moss, soft-wood sawdust, fly-ash, vermiculite, and Flowerite.* In 1948, nine important species were grown on the first four of these substances. Flowerite was substituted for the fly-ash in 1949 and five other species of rhododendrons were included. Seeds of each species were grown in five seed pans, four pans with antibiotic substances and one pan as a seedsoil control.

Some of these substances such as sphagnum moss, soft-wood sawdust and prob-

* Flowerite is the trade name of a very lightweight granular material which is described as a sterile mineral sponge. It may be obtained from the Floral Mart, Portland, Oregon.

TABLE I

SUMMARY OF RESULTS WITH NINE SPECIES AND VARIETIES OF RHODODENDRONS

Sown February 12, 1949; observed June 20, 1949

Lot Number	*Species or variety*	Substances used as one-inch layers on top of formalin-treated seedsoil				
		Horticultural grade Vermiculite	*Flowerite*	*Sphagnum moss*	*Softwood sawdust*	*Formalin-treated seedsoil only*
71-49	R. calendulaceum*	Excellent	Poor	Excellent	Poor	One seedling
72-49	R. gandavense "Charlemagne"	"	"	"	"	Few seedlings
73-49	R. gandavense "Compte de Flanders"	"	"	"	"	" "
74-49	R. gandavense "Flamboyant"	"	"	"	"	Excellent
75-49	R. vaseyi	"	"	"	"	"
76-49	R. albrechti	"	Fair	"	"	"
77-49	R. "	"	Excellent	"	"	"
78-49	R. obtusum **kaempferi**	"	Fair	"	"	"
87-49	R. luteum	Good	"	Good	"	Fair
90-49	R. schlippenbachi	"	Poor	"	"	Very poor

*See Plate VIII for aid in understanding terms.

ably fly-ash are true antibiotics, while the others, vermiculite and Flowerite, may owe much of their effectiveness to their initial sterile condition. In any event, seedlings developed well in all of these substances insofar as control of damping-off was concerned. There are important differences, however, in the growth rate of the seedlings. Growth has been very poor in fly-ash and poor in soft-wood sawdust. The fly-ash used was too fine to permit good aeration. It is quite possible that a comparatively coarse grade would have produced better results. Hard-wood sawdust, which is preferable to soft-wood, would undoubtedly have produced good seedlings.

During the first few weeks, the seedlings developed very slowly in Flowerite, but after several months, they were nearly as good as the best seedlings in vermiculite and sphagnum moss. The reasons for this early inhibition and later relatively rapid growth are unknown to this writer. Although very slow growth of seedlings in the early stages may make pure Flowerite an unsatisfactory substance in which to germinate rhododendron seeds, it is an interesting material which may yet prove very useful in other phases of rhododendron production.

Of the five substances under consideration, only vermiculite and sphagnum moss produced a satisfactory development of seedlings under the conditions of these experiments. Both from the standpoint of seedling emergence and subsequent growth, there appears to be no important difference between them.

Sowing Seeds

Rhododendron seeds may be sown at any time from November to May and sowing dates will vary greatly from grower to grower. Since most growers work in greenhouses or conservatories where spring comes early, many rhododendron seeds are sown in mid-February. This is the standard practice at the Arnold Arboretum. There is probably no reason, however, why good seedlings should not be produced in a sheltered cold frame. If seeds are to be planted in a cold frame, sowing should be delayed until April or May, depending upon locations and seasons. Antibiotics should be equally effective both out-of-doors and in greenhouses.

Preparation of pots or boxes: If an antibiotic is to be used, the flats or pots should be filled to within about one and one quarter inches of the top with good seedsoil. This soil should be evenly distributed, carefully levelled and slightly firmed. An additional three quarters of an inch of vermiculite, or sphagnum moss, will make an excellent seed bed. Vermiculite should never be firmed, but merely made smooth and level. Sphagnum moss may be slightly firmed. It is advantageous to have these materials reasonably moist before use. Horticultural grade vermiculite requires no screening, but sphagnum should be rubbed through a one-quarter-inch mesh. If no antibiotic substance is available, the flats or pots should be filled with formalin treated seedsoil. Good control of damping-off may sometimes be secured through the use of formalin alone, but both formalin and anti-

biotics were used in these experiments. After the surface of the material has been firmed or smoothed, it will be ready to receive the seeds.

Sowing the seeds: Rhododendron seeds vary in size. *Rhododendron calendulaceum* produces relatively coarse seeds and *R. vaseyi* comparatively fine seeds. With most rhododendrons, sufficient clean seeds for a five-inch pan can easily be grasped between the thumb and first finger. The finer the seed, the easier it is to sow it too thickly. Thin, even sowing is the goal.

A liberal watering, immediately after sowing, will wash the seeds into the surface of the bed. If formalin has already been added to the soil, use plain water; if not, use formalin solution. Covering is not necessary and not desirable at the beginning, although a little fine material may be added after the seedlings have begun to emerge.

The time required for germination will vary with the species. *Rhododendron schlippenbachi* should be in the seed-leaf stage in about ten days. Most other species require more time. In general, the seedlings should develop two or three true leaves and be ready for transplanting in six or eight weeks.

General Culture

Rhododendron seedlings will develop in a wide range of temperatures, but 60 to 70° F. is probably ideal. The young seedlings may be injured by high temperatures, especially if they are not carefully shaded. If, as is usually the case, they are being grown in a greenhouse, extra heavy shade should be provided during the first few warm days of spring.

The seedlings require plenty of water; lack of water is one of the main causes of failure. It is best to water seed pans from below either by partial immersion in water, or by placing the pans on sand which is always kept very wet.

A piece of glass laid flat on the rim of the pan will help to conserve moisture. This may be of great value under average home conditions, although it will not be necessary in most greenhouses. The glass should be turned every morning to prevent excessive condensation on its lower surface. If this glass is used too long after the seedlings have begun to emerge, they will be spindly.

Growth of rhododendron seedlings will often be improved by an occasional watering with Dunlop's nutrient solution. This solution contains one level teaspoon each of ammonium sulphate and potassium nitrate in one gallon of water. If the seedlings are developing too slowly, this solution should be used once every ten days. It is especially valuable when antibiotics are used, since these may contain little or no mineral nutrients. Once the seedling roots have reached the fertilized seedsoil, the nutrient solution will probably be unnecessary.

Although rhododendron seedlings have been successfully grown by using a wide variety of methods and materials, the procedures recommended here have proven very satisfactory at the Arnold Arboretum. A later bulletin will discuss the development of the rhododendron plant beyond the small seedling stage.

RICHARD H. FILLMORE