GIBBERELLIC ACID INDUCES GERMINATION AND GROWTH OF DORMANT BLACK CHERRY SEED

R. E. FARMER, JR., and G. C. HALL [1]

Chemically induced germination of unstratified black cherry *(Prunus serotina* Ehrh.) has two possible uses. First, by eliminating stratification one might obtain seedlings immediately after seed maturation. Second, wide familial variation in germination time might be reduced by chemically treating either partially stratified or unstratified seed.

Gibberellic acid (GA_3) has been used as a substitute for stratification with horticultural cherry species (Fogle 1958, Fogle and McCrory 1960, Nekrasova 1960, Pillay et al. 1965) and forest trees (Bachelard 1967, Burns 1967). In cherry it is necessary to remove the seed endocarp before treatment. Huntzinger (1968) obtained negative results with whole black cherry seed, and Nekrasova (1960) noted that ineffective treatment of whole seed was probably caused by poor GA_3 penetration. Fogle (1958) and Fogle and McCrory (1960) noted that GA_3 applied to seed did not overcome the rosetting tendency of resulting plants, but subsequent treatment of these seedlings with foliar sprays of GA_3 reduced this tendency. Zagaja (1962) also noted that GA_3 stimulated growth of dwarfed cherry seedlings. The objective of this study was to induce germination of dormant black cherry embryos with GA_3.

Methods and Results

Seed pericaps were removed. Embryos used in tests were those undamaged by cracking and still enclosed in their seedcoats. In preliminary work, unstratified embryos from several trees were germinated in petri dishes on filter paper moistened with an aqueous solution of GA_3 (10 p.p.m.). While germination [2] ranged from 7 to 50 percent depending on the parent tree, subsequent mortality was high because of fungal and bacterial infections. Seed treated with 100-p.p.m. GA_3 (24-hour soak) and planted directly in potting soil also rotted. The problem of fungal and bacterial infection was ultimately solved by planting treated seed in coarse sterile sand. This procedure was followed in the remainder of the tests.

In March 1969, partially stratified (3 months) seed from 14 families were removed from cold storage, endocarps were removed by cracking, and 10 to 20 seeds from each family were assigned to each of the following three treatments:

1. Control: 18-hour soak in distilled water, followed by a 20-minute soak in Captan (1 gram per liter of water).
2. Gibberellic acid: 18-hour soak in 100-p.p.m. GA_3.
3. Gibberellic acid-Captan: 18-hour soak in 100-p.p.m. GA_3, followed by 20-minute soak in Captan.

After treatment, seeds were planted approximately 5 mm. deep in flats of coarse sand, treated with Pan-O-Drench .[3] Flats were placed in a greenhouse and watered with distilled water as needed to keep the sand moist. The following germination percentages were observed 3 weeks after planting:

	Control	*GA_3*	*GA_3-Captan*
Test mean	**1**	**41**	**48**
Family range	**0-10**	**10-75**	**8-75**

GA_3 stimulated germination, but Captan did not significantly enhance this effect or prove essential in reducing seed infection. After germination was evaluated, seedlings were gently washed from the sand and transplanted to loam-filled clay pots where about 95 percent of them developed into normal plants.

In a second test, conducted in late summer with freshly collected fruit, seed from five trees were given the same three treatments used above. The experiment was a randomized complete block with five 10-seed replications of each tree-treatment combination. Mean germination percent at 3 weeks was almost identical to that in the previous test:

	Control	*GA_3*	*GA_3-Captan*
Tset mean	**> 1**	**42**	**49**
Family range	**0-5**	**20-72**	**32-82**

1 Respectively, plant physiologist and botanist, Tree Improvement and Nutrition Section, Division of Forestry, Fisheries, and Wildlife Development, Norris, Tenn.

2 In petri dish tests, radical growth was considered evidence of germination. In sand-flat tests, germination was noted when plumule emerged above sand.

3 Cyno (methylmercui) guanidine.

While survival of transplanted seedlings was good, these plants exhibited severe rosetting (fig. 1). In mid-October, 46 of these plants were paired according to size, and one member of each pair was sprayed with 100-p.p.m. GA_3 on 3 successive days. They were then grown in the greenhouse under natural photoperiods. All treated plants resumed apical growth by late October; 2 of the 23 untreated controls renewed growth. By early December, new shoot growth on treated plants ranged from 7 to 46 cm. and averaged 25 cm. Apical buds were again dormant at this time.

Root and shoot weights (ovendry) and leaf areas were determined for nine randomly selected pairs:

	Control	*GA_3*
Weight (g.):		
Root	1.4	1.5
Stem	.2	.9
Leaf	.8	1.6
Total	2.4	3.9
Shoot/root ratio	.7	1.9
Leaf area, sq. cm.	152	441
Leaf weight/sq. cm. (mg.)	5	4

Typical plants are illustrated in figure 1. While leaf, stem, and total dry weight of GA_3-treated plants was greater than that of controls, root weights were not significantly different. This relationship is reflected in shoot-root ratios and has been reported by Hull and Lewis (1959). Final leaf area for GA_3treated plants was about three times greater than for controls, but their leaf weight per unit area was less.

Discussion and Conclusions

Results of these tests demonstrate that GA_3 can be effectively used under greenhouse conditions to obtain plantable black cherry seedlings from unstratified or partially stratified seed. GA_3-induced germination of freshly harvested seed followed by GA_3 treatments of the seedlings will result in 1-foottall plants before December. Such plants could be sufficiently chilled in time for spring outplanting. This procedure produces plantable seedlings in 6 months instead of 18 months as experienced in normal nursery production of stock. This gain in time is probably of little consequence in commercial production, but it could be important in reducing the time to initial flowering of seedlings and for use with potentially valuable experimental material. While all families sampled in the study responded to GA_3, the average germination percent was less than that normally observed after stratification. This should be considered if the technique is used to produce seedlings for genetic studies.

Figure 1.—Black cherry seedling: *left,* rosette; *right,* typical GA-induced shoot growth.

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