Geographic Source Differences Noted in Black Cherry Seed Weight, Germination

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The Woody-Plant Seed Manual (USDA, 1948) is the recognized authority for seed characteristics, particularly for forest tree species. The manual reports that the yield of cleaned seed per pound for *Prunus serotina* Ehrh., the wild black cherry, ranges from a low of 3,100 to a high of 8,100 seeds. The *average* number of cleaned seeds per pound is the figure most frequently used in calculating nursery seedbed sowing rates and in direct seeding projects. The Manual, on the basis of 18 samples, reports the average for *P. serotina* as 4,800 seeds per pound. Germination, based on seven tests of 30 days duration, is reported to average 63 percent, ranging from 21 to 87 percent.

This limited sample has been the basis for most references to seed size and germination in black cherry. Recently Cech and Kitzmiller (1968) added to the knowledge of black cherry seed characteristics. Seed collected from five trees in each of 33 stands, rejresenting the greater part of the natural range of black cherry, were analyzed for seed weight, seed coat thickness, seed diameter, and correlations between seed characters and seedlings. Cech and Kitzmiller reported a range of 3.29 to 12.71 grams weight per 100 seeds based on 165 seedlots. The average was 8.01 grams per 100 seeds. These data are equivalent to 3,569 to 13,787 seeds per pound and an average of 5,661 seeds per pound. The smaller seeded samples were possibly collected from *P. serotina* var. *alabamensis* (Mohr) Little (Little, 1953). Inclusion of these varietal samples would tend to raise the numbers of seeds per pound.

In the same study, Cech and Kitzmiller reported germination ranging from 0 to 97 percent, but did not state average germination.

In connection with a program for the genetic improvement of black cherry, we collected seed from 270 individual trees, in 76 stands located in two States. Results reported in this article are based on these collections.

Seed Collection

Seed was collected from individual trees in 1967 and again in 1968. In 1967, we obtained seed from 93 parents, representing trees of excellent, average, and poor timber quality in a total of 31 stands. Fourteen of these stands were located within the Allegheny National Forest, Pennsylvania, and 17 stands were located within the Monongahela National Forest, West Virginia.

In 1968, seed was collected from 177 parents in 59 stands. Thirteen of these stands were repeats of the 1967 collections on the Allegheny. On the Monongahela, we collected seed in one stand where we had collected in 1967. However, the parents were not always the same in these stands resampled. A total of 30 trees were sampled in both years:

Numbers of trees from which seed was collected

	Year		Combined
Forest	1967	1968	Totals
Allegheny	42	132	174
Monongahela	51	45	96
Totals	93	177	270

Fruits collected in 1967 were depulped by hand in a food mill similar to those available in many hardware stores. The pulp and empty seeds were flushed off under cold running water and the filled seed spread on paper toweling, airdried for 3 to 4 hours until surface moisture was no longer apparent. One hundred seeds were randomly counted from each seedlot and weighed.

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The 1968 collections were depulped in a mechanical seed cleaner developed by Dorn and Flick (1969). This device consisted of a standard 5-gallon metal container fitted with a four-bladed paddle which was driven by a small electric motor. The container wall was drilled at close intervals. Metal burrs resulting from the drill passing *through* the metal provided a maceration function, shredding the pulp as the paddles carried the fruits about the interior of the drum. Water was fed into the drum to flush out the pulp and residues.

Following depulping, each seedlot was spread out and allowed to dry for 3 to 4 hours. Random samples of 100 seeds from each seedlot were weighed.

Cleaned seed was treated with a fungicide and stratified in moist peat moss for 130 days at 35° F. Seed was then sown in individual peat pots in greenhouses at two locations.

Results and Discussion

Seed weights were grouped into 0.5 gram classes. Thus the 7.0 gram class included values from 6.8 to 7.2 grams. The frequency of seedlots falling within each class was plotted over seed weight (fig. 1).

The distribution was skewed to the left, the mode being 10.5 grams and the mean, 11.0 grams. The standard deviation was 2.0 grams per 100 seeds.

Analysis of variance showed highly significant differences in seed weight between stands, but differences in seed weight among parents was not significant.

Analysis of variance of hundred seedweight for 270 seedlots of black cherry

Source	*df*	*MS*	*F*
Stand of origin	89	5.47	1.64
Parent within stand	2	.78	.23
Error	178	3.33	
Total	269		

We collected our seed from 270 trees within the range of optimum growth development for the species. The seeds were larger and heavier, and consequently we report fewer seeds per unit weight. Cech and Kitzmiller observed that seeds from the southern and southwestern parts of the natural range were smaller and lighter. Since these provenances were included in their sampling, the numbers of seed per pound is higher.

The numbers of clean seed per pound in our study do not agree with those reported in the WoodyPlant Seed Manual or with those reported by Cech and Kitzmiller.

Numbers of clean seed per pound —black cherry

	Pitcher & Dorn	Cech & Kitzmiller	Woody-Plant Seed Manual
High	6,574	13,787	8,100
Mean[1]	4,106 ± 88	5,661	4,800
Low	2,520	3,569	3,100

[1]Standard error = 0.122 gram.

We collected seed from 30 trees in 1968 which were also sampled in 1967. Weight of 100 seeds varied between years, with 11 trees showing heavier seeds, 17 trees showing lighter seeds, and two trees having the same seed weight in both years. The parent study from which this report is derived revealed highly significant geographic source differences in seed weight. The Allegheny sources were usually lighter in weight per 100 seeds than the Monongahela sources. Analysis of variance revealed highly significant differences due to seed source (F = 5.12 with 29 and 29 df) but not due to collection in different years (F =2.76 with I and 29 df). We therefore conclude that the results presented here are valid estimates of the mean seed weight of the population sampled, and should not change from year to year.

We suspected that the large seed source differences encountered were mainly due to stand of origin rather than to parents within a stand. Because not all stands were completely sampled in both

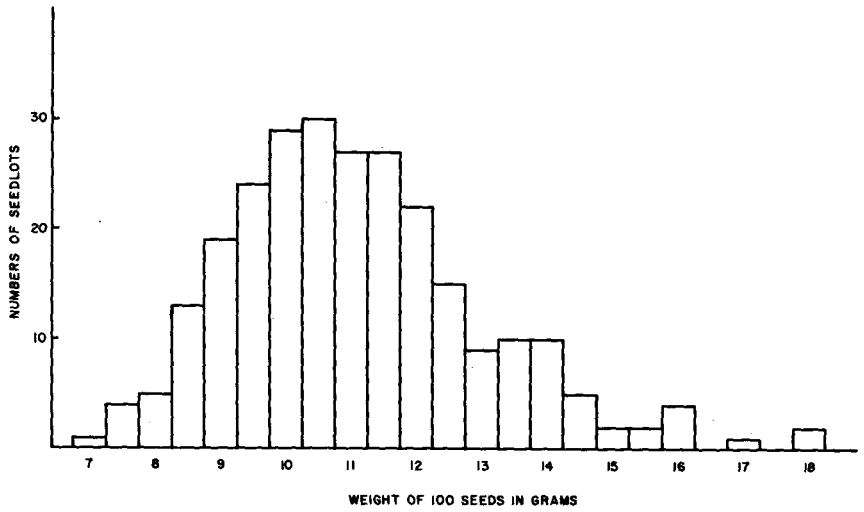

Figure 1.—Distribution of 100 seedweight by 0.5 gram classes for 270 black cherry seedlots within the commercial range of the species.

years, the variation due to stand of origin for the entire 30 seedlots was not calculated. Further analysis of variance, based upon six stands and 18 seedlots, supports our earlier conclusions. Seed weight did not vary significantly among parents within stands or between years of collection. The between stand component of variation was again the only significant one for seed weight.

The 1967 collections were stratified for 130 days at 350 F. Germination ranged from 0 to 96 percent, with a mean of 49.6 percent. Of the 93 seedlots tested, 24 failed completely to germinate at one location and 22 failed at the second location. Seventeen seedlots did not germinate at either location.

Analysis of variance for hundred seedweight of 18 seedlots from six stands collected in 2 consecutive years—Allegheny National Forest

Source	*df*	*MS*	*F*
Year	1	1.69	1.18
Stand of origin	5	4.48	3.13
Parent in stand	12	3.37	2.36
Error	17	1.43	
Total	35		

The 1968 collections were treated in a similar manner but germination was better, probably due to improved handling of the seed after collection. Of 177 seedlots tested, only six failed to germinate at location 1 and four at location 2.

Location 1 was a nursery seedbed. The cleaned seeds were sown in late November. Lower germination percentages reflect losses due to nursery techniques and variable environment within the seedbed. Germination in the greenhouse ranged from 0 to 100 percent. Average germination in the 1968 collections was 61.4 percent, which agrees closely with the value reported in the Woody-Plant Seed Manual.

Conclusions

Sampling of seed weights within a restricted portion of the natural range of black cherry showed a range of 4,054 seeds per pound, compared to ranges of 5,000 and 10,218 seeds per pound reported in the literature (see tabulation on p. 8). Our sampling included seedlots from 270 trees within the recognized commercial range of the species. We discovered a new lower value well below values reported elsewhere. Seed collected from the same trees in two separate years did not differ significantly in seed weight.

Germination varied between years of collection but differences were most likely due to handling of the fruits before cleaning. Our average germination percentages agree with those reported in the Woody-Plant Seed Manual.

In view of the significant geographic source differences in seed weight of black cherry encountered in this study, we recommend that the nurseryman or forester determine the number of seeds per unit weight *before* sowing. When this cannot be done, a value of 4,100 seeds per pound and 61 percent germination should be used as the best estimate of black cherry seed for Pennsylvania and West Virginia.

Numbers of seedlots by germination percentage classes

Percentage Germination Class	1967 Greenhouse Loc. 1	1967 Greenhouse Loc. 2	1968 Nursery Loc. 1	1968 Greenhouse Loc. 2
0	24	22	6	4
1 - 25	25	19	16	15
26 - 50	19	14	34	21
51 - 75	19	23	75	56
76 - 100	6	15	46	81
Totals	93	93	177	177

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