Determining the quality of white ash seed lots by X-ray analysis

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White ash *(Fraxinus Americana L.)* seed production in 197-1 in northern Ohio was spotty and generally of low quality. As part of a larger study it was necessary for us to obtain as high a percentage of filled, viable seed as possible for subsequent treatment. X-ray analysis seemed to offer good possibilities for upgrading the quality of our seed collections for later experiments. We therefore determined the correlation between seed appearance on X-rays and subsequent germination.

Seed was collected in late September 197.1. and stored in plastic bags at 22°C for 1 month. Three 1,000-seed samples were withdrawn, stuck on flexible mylar sheets (250 seeds/sheet), and X-rayed as described by Kriebel (l) using Kodak Industrex AA film. Seeds were divided into seven classes, based on appearance on X-rays, as follows:

Class	*Appearance*
1	Seed cavity completely filled.
2	Endosperm slightly separated from seedcoat: does not appear shriveled, but does not fill seed cavity completely.
3	Endosperm shrunken. 25-75 percent of seed cavity empty.
4	Seed contents shriveled and shrunken, with very low opacity to X-rays.
5	Seed coat empty.
6	Seed coat, cavity, and endosperm deformed by bulges caused by insect feeding or egg laying.
7	Insect larvae present in seed cavity contents partially consumed.

Examples of each seed class are depicted in figure 1. In addition, three 250-seed X-rays were examined and the percentages of seeds in each seed class were tallied.

After X-ra,,irci. 100 seed, of each clan-%%ere soakrd for 21 hours in distilled water, drained, and stratified at 5`C for 75 days. Following stratification. the seed lots were sown in random plots in a flat containing a mixture of topsoil, sand, and peatmoss (2:1:1). The flat was watered when the soil surface became dry. Seeds were considered germinated when cotyledons appeared above the soil surface. Germination was observed for 60 days.

(Continued on page 23)

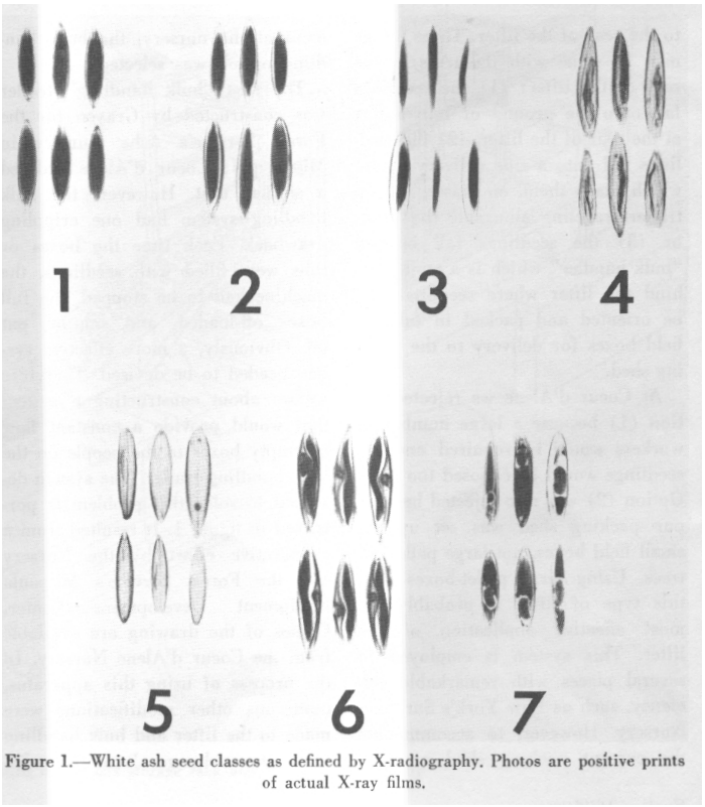

Figure 1.—White ash seed classes as defined by X-radiography. Photos are positive prints of actual X-ray films.

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Results and Discussion

Class 1 seeds germinated 66 percent compared to less than 16 percent for the other classes (table 1). The poor germination of Class 2 seeds was not expected because the seeds appear to be essentially nor*mal,* both on *X-rays* and when the seeds are cut. The low germination for seed classes other than Class I suggests that when seed physiology studies are contemplated, only seeds in Class 1 should be used. The data also suggest that cutting tests to determine percent filled seed in low-quality seed lots such as these may be in error *by* as much as 100 percent or more. Also included in table 1 are the percentages of seed in each seed class in the original sample, based on X-ray analysis.

Table 1.—Percent germination anddistribution for white ash seed quality classes

Class	Percent Germination	Percent of Total Seed in Sample [1]
1	66.0	10.8 (range = 8–12)
2	15.8	17.4 (17–18)
3	11.6	32.2 (30–36)
4	2.6	12.3 (10–16)
5	0.0	5.1 (4–6)
6	7.5	6.7 (6–7)
7	0.0	15.5 (14–16)
		100.0

[1] Average of three replicate 250-seed samples.

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1966. Technique and interpretation in tree seed radiography, pp. 70-75. *In* Joint Proceedings. Second Genetics Workshop of the Society of American Foresters and the Seventh Lake States Forest Tree Improvement Conference, USDA, Forest Service, Res. Paper NC-6.

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(Continued from page 11)

Questions that remain unanswered are:

1. What is the optimum duration of the stratification treatment?
2. Are there other treatments that will produce even better germinatinn?

As a means of partially answering question number 1, seed will be stratified starting in November 1975 for July 1976 sowing.

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