Some characteristics of fruitfulness and seed germination in red maple

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Red maple (Acer rubrum L.) is one of the most wide-ranging, and reproductively unique species of trees in eastern North America. Its competitive status is the forest is enhanced not only by its vigorous sprouting ability but also by a capacity to produce large and frequent crops of seeds which mature, disseminate. and germinate during a few- weeks in late spring and early summer. Little is know of the quantitative aspects of red maple's fruitfulness or of the germinative potential of its seed. This Hole reports the results of a pilot study to investigate these characteristics.

Procedure

Several forest-grown red maple trees near the University of Massachusetts. Amherst, were selected in mid-May 1971, and observed frequently for fruit development. After their samaras had begun to turn red and appeared nearly mature, seven trees were felled for fruit collection. When cut, the five smallest ones were lowered to the ground, thus leaving all fruits attached. but the two largest specimens were felled on polyethlene tarps to facilitate recovery of any fruits shaken loose upon impact with the ground. The trees were limbed and their fruit clusters removed by hand. These freshly-picked fruits were then placed in plastic bags and brought into the laboratory for counting. After the total fruit mass of each tree was weighed. 20-gram samples were taken for counting to determine due number of seeds per gram. Five samples were counted from each of the six smallest trees and 25 from the largest one. Also 1,000 fruit-clusters were selected at random from each tree and the number of double samaras per cluster recorded.

During the first week in June, when red maple fruits were fully matured and had begun to disseminate, seeds from 10 additional trees, 5 to 8 inches d.b.h., were collected for making germination tests. Two hundred intact samaras (400 seeds) from each tree were tested in unlighted germination ovens at a constant temperature of 20 degrees C. Another 25 samaras (50 seeds) from each tree were pre-chilled for 35 days at 5 degrees C. prior to testing under the same conditions.

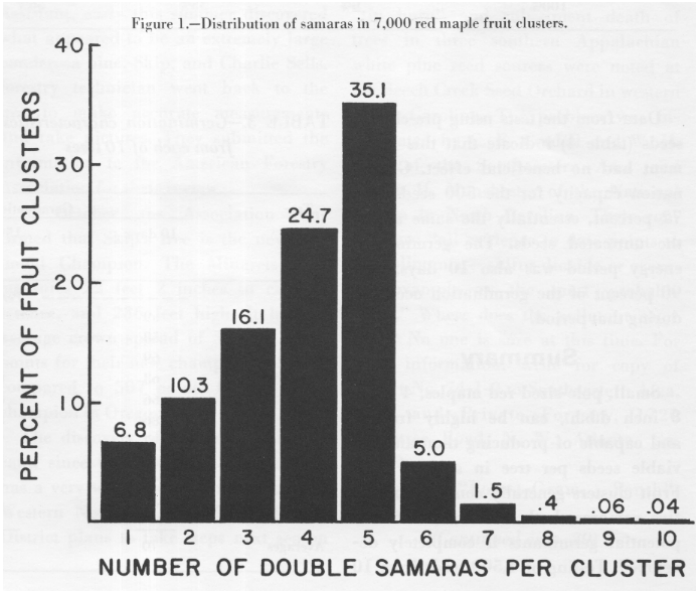
Results

Seed production of the seven trees studied is presented in Table 1. These data show that individual trees 2 to 8 inches d.b.h. yielded crops of 12,000 to 91,000 seeds and the 12 inch tree produced nearly a million.

Of less practical value, but perhaps of some botanical interest, is the number of samaras found in individual fruit clusters (fig. 1). Although these ranged from one to 10, 76 percent of the 7,000 clusters examined contained three to five samaras and 60 percent had either four or five.

Testing of the 200 untreated samaras showed that 56 percent had both seeds viable and 35 percent only one. In the latter ease, the non-viable seeds were usually tint lulls developed. Neither seed germinated in 9 percent of the fruits. The number of germinants among the 10 trees ranged from 240 to 350 (60-87 percent germination capacity)

Figure 1.—Distribution of samaras in 7,000 red maple fruit clusters.



with the best performing tree having the lowest number of completely nonviable fruits. Conversely, the poorest performer had the fewest samaras with both seeds viable and the highest number with none (table 2). Germination of these 4,000 seeds averaged 73 percent and was essentially completed within 15 days. Ninety-five percent of all viable seeds germinated during the first 10 days of the test, a trait which varied but little between trees (table 3).

TABLE 1.—*Seed production of seven red maple trees*

Tree No.	Height	D.B.H.	Crown Class	No. of Double Samaras/tree	Total No. Seeds/tree
	Feet	*Inches*			
1	42.3	6.1	CD	24,883	49,766
2	20.0	2.1	I	5,955	11,910
3	33.2	4.1	CD	8,434	16,864
4	28.5	5.0	CD	37,879	75,758
5	44.9	4.8	D	27,130	54,260
6	45.0	8.0	CD	45,699	91,398
7	60.5	12.2	D	477,883	955,766

TABLE 2.—*Distribution of seed viability within 2000 samaras from 10 red maple trees*

Tree No.	Number of Double Samaras tested	with no viable seed	with one viable seed	with two viable seeds	Total No. of Germinating Seeds	Germ. capacity
						Percent
1	200	16	70	114	298	74.5
2	200	37	86	77	240	60.0
3	200	16	85	99	283	70.7
4	200	18	87	95	277	69.2
5	200	31	67	102	271	67.7
6	200	1	48	151	350	87.5
7	200	8	68	124	316	79.0
8	200	14	61	125	311	77.7
9	200	19	55	126	307	76.7
10	200	24	76	100	276	69.0
	2,000	184	703	1,113	2,929	----
	100%	9%	35%	56%	73.2%	73.2

Data from the tests using pre-chilled seeds (table 4) indicate that this treatment had no beneficial effect. Germination capacity for the 500 seeds was 72 percent, essentially the same as for the untreated seeds. The germination energy period was also 10 days, and 90 percent of the germination occurred during that period.

TABLE 3.—*Germination characteristics of 4,000 untreated red maple seeds, 400 from each of 10 trees*

Tree No.	Germination capacity 10 days	15 days	35 days	Viable seeds germinating in 10 days
	----------	*Percent*	----------	*Percent*
1	69	74	75	93
2	58	60	60	95
3	69	71	71	97
4	63	69	69	93
5	66	68	68	98
6	86	88	88	98
7	77	79	79	97
8	68	78	78	88
9	74	77	77	96
10	66	69	69	96
Averages	70	73	73	95

Summary

Small, pole-sized red maples, 4 inch8 inch d.b.h., can be highly fruitful and capable of producing thousands of viable seeds per tree in a good year. Fruit clusters generally contain three to five samaras, both seeds of which are potential germinants if completely developed. Testing of 4,500 seeds from 10.

TABLE 4.—*Germination characteristics of 500 pre-chilled red maple seeds, 50 from each of 10 trees*

Tree No.	Germination capacity			Viable seeds germinating in 10 days
	10 days	15 days	35 days	
	Percent			*Percent*
1	92	92	92	100
2	82	82	82	100
3	56	64	66	85
4	78	82	84	93
5	74	82	82	82
6	68	76	78	87
7	54	56	56	96
8	36	42	42	86
9	74	84	86	86
10	48	56	56	86
Averages	66	72	72	90

trees gave an average germination capacity of 73 percent and a germination energy period of 10 days. Treatment by pre-chilling did not improve germination, which suggests that fully ripened red maple seeds possess little if any dormancy in the Northeastern region.

News Et Reviews

(Continued from p. 21)

Aerial Seeder Wins Award

An aerial row seeder developed at Auburn University in cooperation with the Southern Forest Experiment Station has been cited as one of the 100 most significant new technical products designed during the past year.

With the device, approximately 9,000 pine seeds per minute can he planted from a helicopter or airplane. In contrast, an experienced planter working long hours would do well to plant 2,000 seedlings in a day.

The award was presented in Chicago by INDUSTRIAL RESEARCH magazine to Dr. M. A. Cutchins. associate professor of aerospace engineering at Auburn, who designed the seeder under a research grant sponsored by the USDA Forest Service and the Southern Station.

An advisor board of INDUSTRIAL RESEARCH selected the winning products for their importance, uniqueness, and usefulness from a technical standpoint. On the hoard are Wernher von Braun and more than 20 other distinguished scientists.

(From Forest Research News for the MidSouth, SO Station)

Championship Pine on Sierra

The Minarets Ranger District, Sierra National Forest, is the proud home of the National Champion ponderosa Pine tree.

Skip Sevedge, District Silviculture Assistant, early this summer discovered what appeared to be an extremely large ponderosa pine. Skip, and Charlie Sells, forestry technician went back to the tree to make accurate measurements and take pictures. They submitted the information to the American Forestry Association for their review.

In October, the Association confirmed that Skip's tree is the new National Champion. The Minarets Pine measures 22 feet 2 inches in circumference, and 236 feet high. It has an average crown spread of 51 feet. Total points for their new champion is 515.5. compared to 507 points for the listed champion in Oregon.

The discovery of this tree is significant, since the ponderosa pine species has a very wide distribution throughout western North America. The Minarets District plans to take steps next season to protect the tree and make it a point of public interest.

The Case Of The Crippled

In recent years, pronounced needle tip burn" and subsequent death of trees in three southern Appalachian white pine seed sources were noted at the Beech Creek Seed Orchard in western North Carolina. The problem was investigated by C. E. Cordell and W. II. Sites of the Southeastern Area and Edwin II. Manchester of the National Forests iii North Carolina. Their conclusions: "all evidence to date points to air pollutants - sulfur dioxide or ozone. for example-as tile most probable cause. "Where does the pollutant come from? No one is sure at this time. For more information, write for copy of Report No. 74-1-9 to Southeastern Area, State and Private Forestry. 1720 Peachtree Road. N. W. .. Atlanta, Ga. 30309.

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