SPECIFIC GRAVITY AS A TEST FOR CONE RIPENESS WITH RED PINE

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The use of the specific gravity test for determining the ripeness of pine cones has been described in forestry literature for several years. In order to make a local test with red pine, which is commonly collected
in New York State, a test was made in 1952, using S. A. E. #20 Lubricating oil as a test liquid. The specific gravity of S.A.E. #20 is quoted with a value of .88. Using this as a test liquid when cones float they have a specific gravity of less than .88; and when they sink, the specific gravity is more than this amount. Cone collections were made at intervals on seven different occasions from July 30 to September 25, 1952. The specific dates are shown in the tables below.

The red pine cones for this test were collected from a highway wind
break located near Glenfield, New York. There were a limited number of cones available on the trees, so that at each collection only 50 cones were gathered. These cones were picked each time from representative parts of the trees. Samples of the cones collected were tested immediately in S. A. E. #20 oil. On the same day, the cones were hauled to the Saratoga Nursery laboratory where the weight and volume were determined, along with notes made on size and color. The cones were air dried until November 15, and then were extracts of seed, which was given a germination test.

The following tables summarize the information obtained from this series of collection.

Table No. I

The Cone Color and Floatation at Various Dates of Collection

Date of Collection	Calculated (1) Specific Gravity	Cone Floatation in S.A.E. #20 Oil	Cone Color	
			External	Internal
July 20	1.01 (2)	sank	yellowish green to dark green. Tips purple.	dirty grey
Aug. 8	1.09	sank	as above	as above
Aug. 20	1.01	sank - some floated in water	dark green some purplish brown	yellowish brown
Aug. 27	.87	green cones sank in oil; greenish brown cones partly floated on bottom. Brown cones floated in oil.	green, with some purple & some brown	chocolate brown
Sept. 4	.84	all floated	most cones dark green with large patches of purple. Some all brown	as above
Sept. 12	.70	all floated	as above	as above
Sept. 25	—	all floated	all cones brown, some started to open on tree	as above

(1) Specific gravity calculated by the weight and volume displacement method.
(2) The measure of 1.01 for specific gravity is lower than expected, and may be due to some error in sampling, or over drying before testing.

Table No. I, shows that the cones collected prior to August 27 all sank in No. 20 S.A.E. oil. Their calculated specific gravity was above one, so that they should sink in water, and were also well above .88, and would therefore sink in oil. The date of August 27 was the turning point. At that time the cones not only floated partly in oil, but showed more external and internal signs of maturity. Cones collected on September and on subsequent dates all floated in oil and were presumed to be mature. On this basis, a cone is mature and ready for collection when it floats in No. 20 oil. At the same time the cones have a purplish or brown exterior and a chocolate brown interior.

Table No. II

The Seed Color, Size and Viability at Various Floatations and Dates of Collection

Date of Collection	Specific Gravity		Seed Color	Number Seed Per Pound	Number Hollow Seed in a 400 Sample	Germination % at 30 Days; 400 seeds per Sample	
	Cal.	Flo.				Apparent	Real (1)
July 20	1.01	.88+	shining brown	---	59	1.50	1.76
Aug. 8	1.09	.88+	"	55,115	22	15.50	16.40
Aug. 20	1.01	.88+	dull purplish brown with dark mottling	49,956	30	87.00	94.05
Aug. 27	.87	.88+	"	45,360	41	86.75	96.66
Sept. 4	.84	.88-	"	47,349	28	89.75	96.51
Sept. 12	.70	.88-	"	49,520	32	91.50	99.46
Sept. 25	--	.88-	"	49,358	39	88.25	97.65

(1) Real germination percentage is calculated upon the number of full seed. The seven day count (not included here) shows respectively less rapid germination for those collections made prior to Sept. 12.

Table No. II, shows tests of the seed and indicates the same degree of maturity, with the exception that the cones collected on August 20 produced seed, which germinated nearly equal to any subsequent dates. While such seed germinated well when fresh, it may not keep well in storage.

This year's test recalled an earlier test made in 1937. At which time Mr. C. E. Heit, then in the Conservation Department collected red pine cones at intervals in August, September and October. He made germination tests at the time as shown in Table III. Recently, samples. of these collections were again tested. The results are shown in comparison with the early tests in Table III.

Table No. III

The Relationship of Time of Collection on the Viabil[illegible] of Red Pine Seed After 16 Years Storage

	Germination							
	After 5 days		After 7 days		After 10 days		Final	
Date of Collection	1937	1953	1937	1953	1937	1953	1937	1953
August 17	0	0	23.0	2.0	62.0	2.0	67.5	2.0
September 1	6.0	0	93.0	5.0	97.0	10.0	97.5	10.0
September 18	70.0	3.0	94.0	17.0	95.0	24.0	97.0	32.0
October 2	88.5	26.0	99.0	71.0	99.0	78.0	99.0	83.0

1937 Germination based on 200 seeds per sample
1953 Germination based on 100 seeds per sample
Germination temperature for both of these tests was 77 degrees F.

The results show that the later the collection, the better the seed keeps in storage after 16 years. Also, that the five day count indicates quite well the keeping quality of fresh seed.. Those seed which show the most vigor at 5 days are apt to keep better in storage. While the storage tests indicate that cones collected just before their natural opening on the tree, (that is, in late September or October) produces the very best seed, there are practical considerations that demand a longer collecting season. It is believed that cones collected when the specific gravity drops to .88, and continuing until the cones start to open is the proper time for cone collection in New York State.