

## Removing Cull Acorns From a Water-Willow Oak Acorn Lot Using Salt Solutions<sup>1</sup>

**G. R. Johnson, Jr.**

*Graduate Research Assistant,  
North Carolina State University, Raleigh*

---

*Upgrading water-willow oak acorn lots by flotation in a salt solution is superior to flotation in water or no flotation at all.*

---

The percentage of sound acorns in water-willow oak acorn lots can usually be increased by floating off the culls in water. A majority of cull acorns float to the top where they can be removed, but acorns with partially decayed cotyledons sometimes sink to the bottom where they mix with the sound acorns. If an acorn lot is collected after a wet autumn, cull acorns may not float because they are saturated with water. In an effort to find a more effective method of removing cull acorns, a study was initiated to examine the feasibility of floating acorns in salt solutions of varying densities. Although sycamore and yellow-poplar seedlots have been upgraded by separating out seeds of lower density on a gravity separator (1, 2), use of a gravity separator on acorn lots is impractical for nursery personnel. However, flotation in a salt solution is simple and can be done with minimum equipment.

### Procedure

Water-willow oak acorns were obtained from a collection made in November by Union Camp Corp., Franklin, Va. The seeds were stored in sealed plastic bags at 3° C. and 98-percent relative humidity from the time of collection until the study was initiated the following April. One-half of the seedlot was soaked in water for 4 days to saturate and sink all acorns. The remaining half was retained in the condition common to storage.

For each acorn lot, acorns were placed in 700 milliliters of water, and salt (NaCl) was added in 30-gram increments. At the start and after each addition of salt, acorns that floated were classified as decayed, partially decayed (some yellow cotyledon present), and sound (cotyledon completely yellow).

After examination of the data, a specific ratio of salt to water that would remove most of the culls and leave a high percentage of the sound acorns was chosen. For the unsaturated lot, 230 grams of salt per liter was chosen; and for the water-saturated lot, 285 grams of salt per liter was chosen. Additional saturated and unsaturated acorn lots were floated in water and in the specified salt solution as a test. All acorns were then cut and classified for viability.

### Results and Discussion

**Unsaturated acorn lot.** The results of floating 87 unsaturated acorns in various concentrations of salt solutions are summarized in table 1. Eight fully decayed acorns floated immediately in tap-water. After 60 grams of salt were added, two more fully decayed and one partially decayed acorn floated. At this point, all the fully decayed acorns had been removed, but 93 percent of the partially decayed acorns had not floated. After 150 grams of salt were added, 25 percent (four) of the partially decayed acorns floated. The addition of more salt floated both partially decayed and sound acorns.

No sound acorns were floated from the addition of 150 grams of salt, but 13 percent (eight) of the sound acorns floated after 180 grams of salt were added. To try to maximize the number of floating cull acorns and minimize the number of floating sound acorns, a solution of 230 grams of salt per liter of water (160 g/700 ml) was used to separate another randomly chosen, unsaturated acorn lot of 236 acorns (table 2).

When the acorn lot was floated in water, the percentage of sound seeds increased from 83 to 88 and no sound seeds were lost. When the same acorn lot was floated in the salt solution, the percentage of sound seeds increased to 93 with only 2 percent of the sound seeds removed.

---

<sup>1</sup>Paper number 8718 of the Journal Series of the North Carolina Agricultural Research Service, Raleigh.

Floating acorns in water increased the percentage of sound seeds by 5, and an additional 5-percent increase was obtained by floating acorns in the salt solution.

**Water-saturated acorns.** The results of floating 92 water-saturated acorns in various salt solutions are summarized in table 3. Neither decayed nor sound acorns

would float after 0 to 75 grams of salt were added. After 105 grams of salt were added, the decayed acorns began to float. After the addition of 195 grams of salt, all fully decayed acorns (three) and 43 percent (three) of the partially decayed acorns floated. When 225 grams of salt were added, two more culls floated, but 13 percent of the sound acorns had floated as well.

Two hundred eighty-five grams of salt per liter of water (200 g/700 ml) floated a large percentage of cull acorns without floating many viable acorns. No acorns floated in tapwater, so the salt solution was the only way to remove the culls. By floating acorns in the salt solution, the percentage of sound seeds was increased from 81.5 to 93 with a loss of only 2.5 percent of the sound acorns (table 4).

**Table 1.**—*Unsaturated acorns floated using various amounts of salt (NaCl) in 700 milliliters of water*

Grams of salt added	Floating acorns			Nonfloating acorns classified sound
	Decayed	Partially decayed	Sound	
0	8	0	0	77
30	1	0	0	78
60	1	1	0	80
90	0	0	0	80
120	0	2	0	82
150	0	1	0	84
180	0	3	8	85
210	0	3	18	85
Nonfloating acorns after 210 grams NaCl added	0	6	35	— <sup>1</sup>
Total in acorn lot	10	16	61	—

<sup>1</sup>— = not applicable.

**Table 2.**—*Acorn counts after flotation in 230 grams of salt per liter of water for an unsaturated seedlot*

	Floating acorns			Nonfloating acorns classified sound	Sound seeds lost by floating
	Decayed	Partially decayed	Sound		
In water	15	0	0	88	0
In salt solution	20	7	4	93	2
Remaining acorns	1	13	191	— <sup>1</sup>	—
Total	21	20	195	—	—

<sup>1</sup>— = not applicable.

**Conclusion**

Floating cull acorns in water is not a thorough and sometimes not a feasible way to separate cull and sound acorns, especially if the acorns are water-saturated. By using a salt solution, more cull acorns can be removed. For water-saturated acorns, where no acorns float in water, a salt solution can float a large proportion of the cull acorns and still remove very few sound acorns. Because this can be done quickly and acorns can be washed clean of salt almost

**Table 3.**—*Water-saturated acorns floated using various amounts of salt (NaCl) in 700 milliliters of water*

Grams of salt added	Floating acorns			Nonfloating acorns classified sound
	Decayed	Partially decayed	Sound	
0 to 75	0	0	0	89
105	2	0	0	91
135	0	1	1	92
165	0	0	1	92
195	1	2	2	95
225	0	2	7	97
255	0	1	24	98
Nonfloating acorns after 255 grams NaCl added	0	1	47	— <sup>1</sup>
Total in acorn lot	3	7	82	—

<sup>1</sup>— = not applicable.

**Table 4.**—*Acorn counts after flotation in 285 grams of salt per liter of water for water-saturated seeds*

	Floating acorns			Nonfloating acorns	
	Decayed	Partially decayed	Sound	classified sound	Sound seeds lost by floating
In water	0	0	0	81.5	0
In salt solution	16	14	5	93	2
Remaining acorns	2	12	188	— <sup>1</sup>	—
Total	18	26	193	—	—

<sup>1</sup>— = not applicable.

immediately, the remaining acorns should not be damaged by the salt solution.

For unsaturated acorns stored at 3° C. and 98-percent relative humidity for 5 months, a solution of 230 grams of salt per liter of water is recommended for separation. Tests indicate this solution can increase the percentage of sound seeds by an additional 5 percent over water flotation. Separation of water-saturated acorns can be best accomplished by floating them in a salt solution of 285 grams of salt per liter of water. This gave an 11-percent increase in the percentage of sound seeds.

**Literature Cited**

1. Bonner, F. T.; Switzer, G. L. Upgrading yellow -poplar seeds. Res. Note 129. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station; 1971.
2. Bonner, F. T. Collection and care of sycamore seeds. South. J. Appl. For. 3(1): 23-25; 1979.