Larger Seeds of Winterfat Germinate Better

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Highlight: *Seeds of winterfat (*Eurotia lanata*) were separated into three size classes and germinated under four temperature regimes. Large- and medium-size seeds germinated better and faster than small-size seeds.*

Larger seeds of a plant species usually produce more vigorous seedlings than smaller seeds (Kittock and Patterson, 1962). With some species—wheat, for example—seedling emergence also has been reported to be higher from larger seeds (Kittock and Law, 1968). Similar results were found with alkali sacaton (Knipe, 1970).

Germination, however, is not always greater from larger seeds. For example, little relationship was found between seed size and viability for mature seed of Hardinggrass (Whalley, et al., 1966). Likewise, size of fourwing saltbush seeds had no significant effect on germination provided the seeds contained embryos (Springfield, 1970).

The objective of this study was to determine the effects of size of winterfat (*Eurotia lanata* (Pursh) Moq.) seeds on their germination under four temperature regimes.

Ripe fruits of winterfat were collected in November from a group of plants near Corona, N. Mex. Four months later (when after-ripening was complete[1]), seeds were threshed from the fruits by hand, then separated into three size classes (Table 1).

Treatments consisted of six replications of 50 seeds each under constant temperatures of 45, 51, and 56 F in darkness and under an alternating regime of 76 F (12 hrs light) -60 F (12 hrs dark). Seeds were germinated in petri dishes filled with 100 ml vermiculite and 60 ml distilled water. Two layers of germination blotter were put on the vermiculite. The seeds, dusted with fungicide, were placed on the blotters, which remained moist throughout the experiment.

Germinated seeds were counted daily. A seed was considered germinated if the cotyledons and radicle together measured

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[1]Unpublished results of another experiment showed after-ripening of this collection of seeds was complete in 9 weeks.

Table 1. Characteristics of seeds.

	Large	Medium	Small
Number of seeds per lb.	150,000	199,000	310,000
Length of seed (mm)			
Average	3.3	2.8	2.4
(Range)	(2.9–3.6)	(2.5–3.1)	(2.0–2.6)
Width of seed (mm)			
Average	2.0	1.7	1.4
(Range)	(1.7–2.3)	(1.5–2.0)	(1.1–1.7)

Table 2. Germination of large, medium, and small seeds of winterfat at four temperatures.

Germination temperature (°F)	Percent germination (by seed size)			
	Large	Medium	Small	Mean[1]
45	98.0	96.0	76.0	90.0b
51	98.7	96.7	92.0	95.8a
56	99.3	99.3	94.0	97.5a
76–60	100.0	99.3	86.7	95.3a
Mean	99.0a	97.8a	87.2b	

[1]Means with the same letter are not significantly different at the 5% level according to Duncan's multiple range test.

1/2 inch and both were detached from the seed coat. Germination percentages were transformed to arc sin for analysis of variance.

Germination was complete within 7 days for all seed sizes and temperatures, except for a few small seeds that germinated the 8th and 9th day under the 45 F temperature.

Total germination was higher for large and medium seeds than for small seeds under all four temperature regimes (Table 2). The greatest difference between germination of small and large seeds came under the lowest temperature. Subtle biochemical differences related to size and influenced by temperature may explain why large seeds germinated 98% but small seeds only 76% under a temperature of 45 F.

The relatively low germination of small seeds under 76–60 F, compared with large and medium seeds, is not easily explained. Apparently the small seeds are more sensitive to external conditions and therefore are less likely to produce seedlings in a field environment.

The larger seeds germinated more rapidly than the small seeds under all four temperatures (Fig. 1). Differences in speed of germination between large and small seeds were greatest under temperatures of 45 and 51; for example, at 51, 93% of the large seed had germinated by the 4th day, as against only 41% of the small seed. The faster germination of the larger seeds may be attributed to greater amounts of essential constituents available to the developing seedling (Mayer and Poljakoff-Mayber, 1963). This is further implied through results with germinating wheat; significant relationships were found between seed size and tetrazolium reduction, a biochemical index of vigor (Kittock and Law, 1968).

Maximum germination of the smaller seeds may be possible only when external factors, like moisture and temperature, are nearly optimum. Results of other studies (Springfield, 1972) suggest that 45 F is below the optimum temperature range for germination of winterfat.

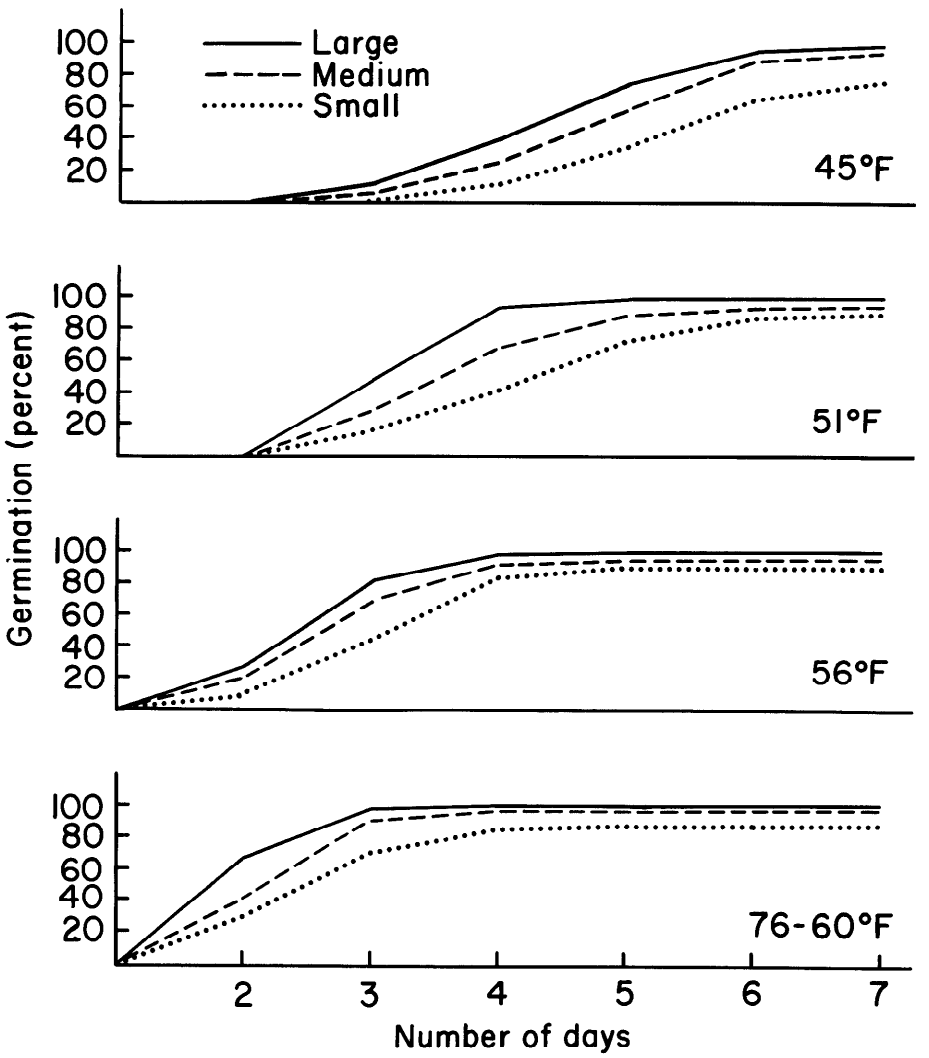

Fig. 1. *Speed of germination of large, medium, and small seeds under four temperature regimes.*

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