

TECHNICAL NOTES

Winterfat Seeds Undergo After-Ripening¹

H. W. SPRINGFIELD

Range Scientist, Rocky Mountain Forest and Range Experiment Station,² Albuquerque, New Mexico

Highlight

Seed characteristics of winterfat are being investigated because this shrub species has value in revegetation. Seeds collected 4 consecutive years in New Mexico were tested for viability at 1- to 4-week intervals after collection. After-ripening was completed within 10 weeks for all except one collection, which required 25 weeks. Variation in the after-ripening process among years probably resulted from differences in environmental conditions during seed formation. Seed technologists and others working with winterfat need to be aware of the after-ripening requirement.

Due to increasing interest in winterfat (*Eurotia lanata* (Pursh) Moq.) as a desirable shrub for revegetation, we need to know more about its seed characteristics. After-ripening has been suspected because of erratic germination of freshly collected seeds in previous studies (Springfield, 1968a). Some collections of seeds germinated slowly and incompletely, whereas others germinated rapidly and completely, under the same moisture and temperature regimes.

After-ripening has been defined as any changes in seeds during storage that improve germination, or as "... those processes that must occur in the embryo, can occur only with time, and cannot be caused by any known means other than suitable storage" (Mayer and Poljakoff-Mayber, 1963). In many species, germination is prevented by blocking mechanisms, and the seed re-

mains in a resting or "blocked dormant" state until changes (after-ripening) remove the blocks (Pollock and Toole, 1961). According to Koller et al. (1962), post-harvest dormancy of seed is wide-spread and complex; the loss of dormancy (after-ripening) manifests itself as a gradual relaxation in strictness of requirements for germination. Evenari (1965) mentioned inhibitory substances and physiological or morphological immaturity as possible reasons for embryo dormancy at dispersal time.

Studies were initiated in 1967 to determine if winterfat seeds undergo after-ripening.

Methods

Seeds were collected in late October or early November of 1967, 1968, 1969, and 1970, from a group of about thirty representative plants within an experimental site 15 miles west of Corona, New Mexico. Elevation of the site is 6300 feet, annual precipitation 15 inches, and the soil is a sandy loam. Principal associated species are one-seed juniper (*Juniperus monosperma*) and blue grama (*Bouteloua gracilis*). Date of collection depended on when the cottony fruits began to shatter and fall to the ground. Only fruits that offered no resistance to removal from the plant were gathered. After collection, the fruits were put in paper bags and stored in a refrigerator at 36 to 44 F (Springfield, 1968c).

Germination tests were started at 1- to 4-week intervals after each seed collection. At the start of each test, seeds

were threshed from the fruits by hand. Fifty seeds were placed on germination blotters in petri dishes which contained 100 ml of vermiculite and 60 ml of distilled water. The blotters remained moist throughout the test. Treatments were replicated 4 times. The 1967 seeds were tested at constant temperatures of 44 and 56 F without light in modified refrigerators. In subsequent years, seeds were germinated only at 56 F, which was expected to be near-optimum (Springfield, 1968b). Seedlings were counted at 1- or 2-day intervals. Seeds were considered germinated when seedlings measured ½ inch long, and both the cotyledons and radicle were detached from the seed coat.

Results and Discussion

After-ripening of the 1967 seeds apparently was not complete until 25 weeks after collection (Table 1). Seeds tested 13 weeks after harvest germinated 92% in 30 days at 56 F, while those tested 25 weeks after harvest germinated 98% in 10 days. Germination generally improved from week to week regardless of temperature, indicating changes in the physiological makeup of the stored seeds. Somewhat unexpected were the 30-day germination percentages for seeds tested at 44 F; for the first 9 weeks after collection, more seeds germinated in 30 days at 44 than at 56 F. The moist, cold conditions may have stimulated biochemical processes involved in after-ripening.

Seeds collected in 1968, 1969, 1970

Table 1. Germination (%) of winterfat seeds collected 11/1/67 and germinated at 1- to 4-week intervals at 44 and 56 F.

Age of seeds (weeks from collection date)	44 F germ temp			56 F germ temp		
	10 days	20 days	30 days	10 days	20 days	30 days
1	2	4	18	8	14	21
3	6	35	67	20	36	49
6	8	46	72	32	50	60
9	24	66	82	47	65	74
13	43	73	83	82	88	92
17	75	86	88	81	85	90
21	87	91	97	82	94	97
25	81	92	96	98	99	99

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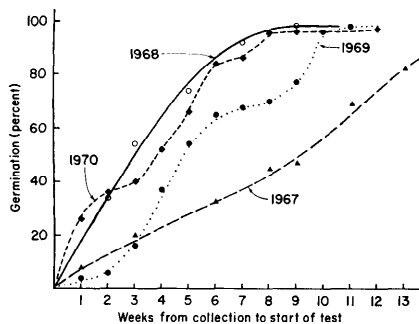


FIG. 1. After-ripening curves for winterfat seeds collected four consecutive years near Corona, New Mexico.

completed after-ripening within a relatively short time, compared with the 1967 seeds (Fig. 1). After-ripening of the 1968 and 1970 seeds was essentially complete 9 weeks after collection. Ten-day germination percentages were used in the last three years, mainly because winterfat seeds germinate promptly once they have finished after-ripening. After 6 months storage under refrigeration or at room temperatures, all viable seeds will germinate within 5 days at 59 F and within 7 days at 50 F (Springfield, 1972).

Variations in the after-ripening process among the winterfat seeds collected in different years are notable. These variations probably were due to differences in environmental conditions during the time of seed formation and maturation. Evenari (1965) claims the influence of the environment on the parent plant during the ripening of seeds is very pronounced, and determines to a great extent their germination behavior. Recent investigations in Canada with freshly collected green foxtail seeds from different locations indicated that degree of dormancy was not a fixed characteristic of each ecological strain, but was due mainly to differences in local weather conditions prior to collection time (Vanden Born, 1971).

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