Winterfat diaspore morphology

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Abstract

Diaspores are disseminules specialized for dispersal and for other functions contributing to seedling establishment and seedling vigor. The winterfat (Eurotia lanata) diaspore consists of hairy bracts enveloping a utricle. Testa, embryo, and perisperm make up the enclosed seed. This general diaspore morphology also occurs in Atriplex and Grayia. The potential for seedling establishment is not equal between diaspores and diaspore subunits; therefore, authors should take care to use terminology that refers to the correct entity.

Key Words: fruit, utricle, seed, bracts, disseminule, Eurotia, Atriplex, Grayia

Good communication among scientists is promoted by appropriately used terms in scientific literature. This requires people to be aware of terminology germane to the sciences contributing to their fields of interest. It also requires a consensus of term definitions. The purpose of this note is to discuss some botanical terminology, to correct some errors that have occurred in the literature with reference to winterfat diaspores [Eurotia lanata¹ (Pursh) Moq.; Ceratoides lanata (Pursh) J.T. Howell], and to review winterfat diaspore morphology.

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Diaspore is defined as a disseminule, especially one specialized for dispersal (Gove 1981). In other words, diaspores are seeds, fruits, fruits with attached structures, or even whole plants (Salsola), if in each case the unit is dispersed and is for the purpose of reproduction. Like disseminule, diaspore is derived from a word meaning seed, the Greek "sporos". Diaspore was first published by Sernander in 1927 (van der Piil 1982), and is used in discussing the ecology of dispersed reproductive units (Grubert 1974; van der Pijl 1982; Peart 1979, 1981, 1984; Matlack 1987). Increasing acceptance and use of the term is due to advancing knowledge of the ecology of seed dispersal and of seedling establishment. Plant structures attached to some seeds, can influence plant establishment in both natural and artificial seed dispersal. Significant differences in seedling establishment between diaspores and threshed seed have been reported for several species (Simpson 1952, Sankary and Barbour 1972, Booth and Schuman 1983, Stevens et al. 1986, Romo and Haferkamp 1987). Various diaspore functions promote seed success and are the reasons for plant-establishment differences between threshed seeds and diaspores. Diaspore functions have been recently discussed by Booth (1987).

Use of the term diaspore may alleviate confusion caused by lack of a consensus definition for the term fruit. Fruit has been variously defined as: (1) "the ripened ovary and any other structures that enclose it at maturity" (Harrington 1964), (2) "The ripened pistil with all its accessory parts" (Munz and Keck 1968), (3) "A ripened ovary along with any adnate structures which mature with it" (Smith 1977). Since the enclosing bracts of winterfat diaspores

Proposals for conservation of this long-used generic name have been invited (Brummitt 1978).

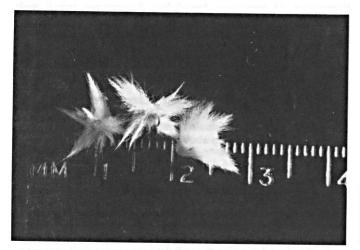


Fig. 1. Winterfat diaspores (scale is in mm).

are subtending (to stand below and close to) and are attached (adnate) to the pedicle rather than to the pericarp (ovary wall), the bracts would be termed part of the fruit by Harrington, but not by Smith.

Confusion results from the winterfat fruit being described as a *utricle*, which is uniformly defined as a bladdery, one-seeded fruit. Because botanical descriptions refer to diaspore bracts as "fruiting bracts", or describe bract size when "in fruit" (meaning at maturity), readers have concluded that the united bracts, rather than the pericarp, form the utricle (Springfield 1974, Kay et al. 1977, Stevens et al. 1977, Dettori et al. 1984).

To remove the confusion existing between botanical and range science descriptions of the winterfat diaspore, a stereo (dissecting) microscope was used to examine various diaspores collections, both imbibed and dry, and to compare the diaspores with descriptions in the botanical and range science literature cited above. A morphological description, photographs, and drawing were prepared and sent to Dr. E.M. Gifford, Professor of Botany, Univ. of California, Davis, for his expert review, and are now offered here.

As described in floras of western America (Kearney and Peebles 1942, Harrington 1964, Munz and Keck 1968, Britton and Brown 1970), the pistillate (female) flower of winterfat has 2 exerted styles from an ovary which is enclosed by 2 united, subtending bracts. At maturity the bracts form a silky-hair covered sac; the bract hairs are 2 to 8 mm long, and arranged in spreading tufts (Fig. 1). Within the bracts is a pubescent-covered utricle (Figs. 2 and 4), which



Fig. 2. Bracts of winterfat diaspore parted to show utricle (scale is in mm).

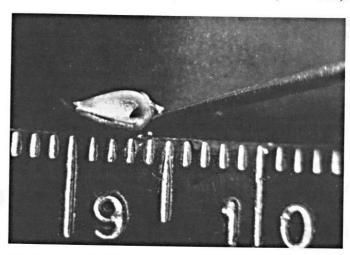


Fig. 3. Threshed, imbibed, winterfat seed with part of testa torn away (at point of needle—scale is in mm).

encloses a seed composed of testa (seed coat), embryo and associated perisperm (food storage tissue derived from the nucellus). The embryo lies obovoid around the perisperm (Figs. 3 and 4); and the acute end of the seed, located at the point of attachment, is formed by adjacent radicle and cotyledon tips. The testa is the third

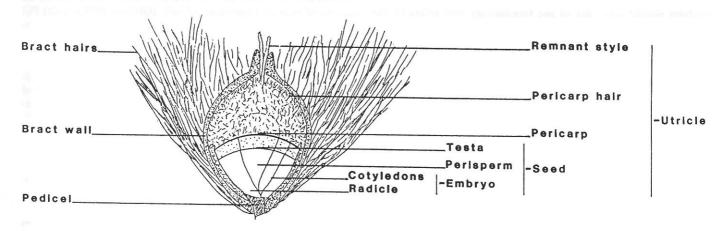


Fig. 4. Sectional schematic showing a winterfat diaspore with the bracts partly removed. The lower part of the pericarp and of the tests are also cut away.

tissue layer surrounding the embryo (i.e., bract wall, pericarp and testa, Fig. 4). On the dry seed, the testa is thin, transparent, and generally indiscernible to the unaided eye. It can be seen on fully imbibed, or germinating seeds (Fig. 3).

This general morphology of a well developed embryo encircling perisperm, a thin testa, and a utricle enveloped by united bracts, is common to the diaspores of several Chenopod shrubs. These include important rangeland species in the genera Atriplex and Grayia, besides Eurotia (Munz and Keck 1968). To say that "utricles" of these species were used (planted, germinated etc.), is to infer that the bracts were removed from around the utricle. This may be desirable for some experiments since the bracts can interfere with some tests. However, in the case of winterfat, removing the bracts significantly reduces seedling establishment and reduces seedling vigor (Booth and Schuman 1983, Booth 1984). Therefore in most experiments and in most—if not all—winterfat revegetation field trials, the use of any unit less than the intact diaspore is inappropriate.

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