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SEEDY DIMORPHISM IN Hypochoeris glabra L.

In the botanical field a major focus of attention has been on the flower both taxonomically and aesthetically. The flower, after all, is the reproductive structure and vital to the continuation of the species, pleasing to look at, and often structurally interesting. Seeds, however, can be just as interesting. Their production and establishment are the next steps in the reproductive success of the species following flower pollination. Seeds are particularly interesting when two or more types are produced on a single plant. This phenomenon is called seed polymorphism. Seed polymorphism is common in a number of California species including members of the Asteraceae, Brassicaceae, and Chenopodiaceae.

My particular research is on Hypochoeris glabra L., ("Cat's Ears"), an introduced Mediterranean annual in the Asteraceae. This plant produces two types of achenes, the term used for seeds produced by the Asteraceae and some other families. One achene type is long with a beak, the other is short and beakless (Figure 1). Both have a plumed pappus but the beakless achene has the webbier, more plumose pappus of the two. The seed coat of the two also differs. These and other differences have a significant effect on the dispersal and establishment of the two achene morphs. Thus each one is adapted to slightly different conditions. This increases the flexibility of adaption to variable environments, which is important to a weedy species such as H. glabra. Hypochoeris glabra grows mostly in disturbed habitats where conditions are variable and unpredictable, so it is advantageous to be able to exploit a wide range of conditions.

Besides morphological differences the seed types may have different germination characteristics and dispersal modes, may be subjected to different degrees of predation and be produced by the parent plant in different proportions.

Differential germination means the seeds germinate at different times or under different conditions. Spacing germination this way assures that a catastrophe, such as a late freeze, will not wipe out a whole generation. The different morphology of the seed types determines their dispersal potential. One morph may be a poor disperser and fall close to where the parent plant grew while other morphs disperse farther and colonize new habitats. This maintains a population in an area where conditions have proven suitable and also establishes new colonies. Differential dispersal also spaces out plants which diminishes intraspecific competition.

The specific differences between the beaked and unbeaked morphs of H. glabra are summarized in Table 1. The beaked achenes germinate over a broader temperature range, thus they have less specific temperature requirements for germination. The different morphologies give the achene types different aerodynamic properties. Both physical structure and weight differences contribute to the terminal velocity (T.V.) differences. The beaked achene, with the lower T.V., being the more volant of the two. With regard to predation, harvester ants preferentially gather the beaked achene type. The ants can quickly cut through the beak removing the pappus from the seed part of the beaked achene. This cannot be done to the unbeaked achene. Thus it is a more awkward load and not as many are brought back to the colony. The two morphs are also produced in different proportions on the receptacle depending on the degree of stressful conditions in the environment. Production of the beaked achenes decreases rapidly, from 40 to 10 achenes per receptacle as resources become limiting. The unbeaked achenes, although produced in lower numbers, maintain a more stable production level.

The interaction of the above characteristics play a significant part in the ecology of the species. The achene dimorphism present in H. glabra is a means by which the reproductive output of the plant is maintained at an optimal level. When resources are limiting, the proportion of beaked achenes produced declines and energy is devoted to the achene type with a higher probability of survival. The characteristics which give the unbeaked achene the higher survival probability are restricted germination to the most favorable conditions, dispersal potential to safer sites, and lower attractiveness as a food source for ants.

Other plants which exhibit seed polymorphism are Cakile maritima (Brassicaceae), Heterotheca subaxillaris (Asteraceae), and many members of the Chenopodiaceae, some of which produce winged and wingless seeds and several color morphs.

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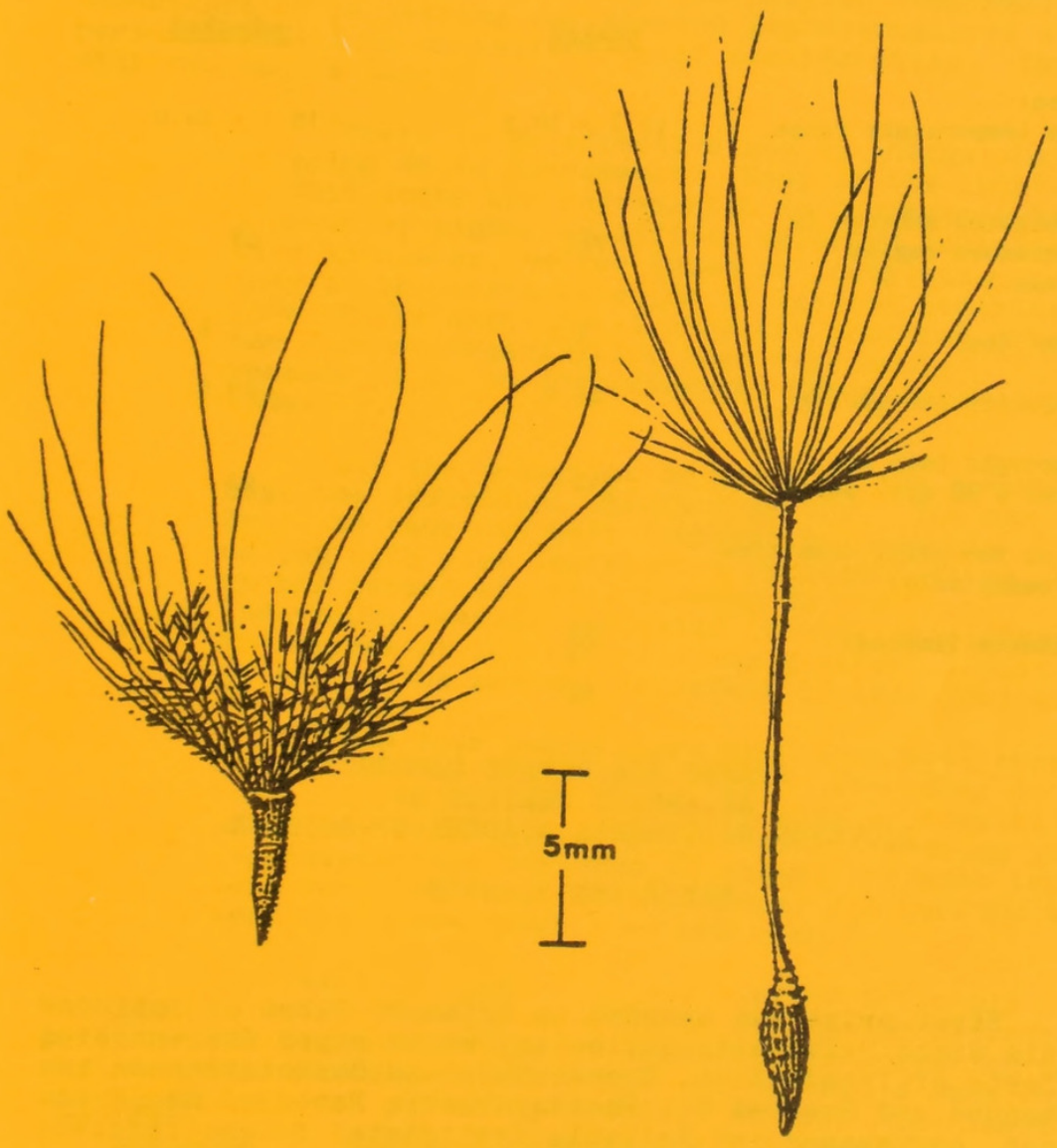

Fig. 1. The unbeaked achene (left) and beaked achene (right) morphs of Hypochoeris glabra.

Table 1. Summary data showing quantitative differences between the beaked and unbeaked achenes of *Hypochoeris glabra*.

achene characteristic	achene type	
	beaked	unbeaked
germination: mean maximum temperature range (°C)	19.7 - 30.5	19.7 - 24.0
Final % germinated achenes in warm temperature regime (30.5°C max.)	74	58
achene weight (mg)	1.1	1.6
terminal velocity ($cm\ sec^{-2}$)	45.4	68.9
# achenes brought into ant colony over a 30 min. period	334	63
production at two plant densities (achenes/receptacle)		
high (resource limited)	10	5
low	40	13

AWARDS FOR BOTANY PAPERS AT ANNUAL MEETING OF SOUTHERN CALIFORNIA ACADEMY OF SCIENCE

MAY 2 and 3, 1980

First prize was awarded to Brian R. Oates of California State University-Fullerton, whose paper was entitled: "Effects of Irradiation, Temperature and Desiccation on the Submersed and Emersed Net Photosynthetic Rates of *Hespereophycus harveyanus* and *Pelvetia fastigiata* f. *gracilis*." His award was $100.00 provided by the Academy.

Second prize was awarded to Sherleen H. Gudmunson of California State University-Long Beach, whose paper was entitled: "Factors Affecting Germination of the Seed of *Jaumea carnosa*." Her award was $50.00 provided by Southern California Botanists.

Fritz Zeylemaker, Barry Prigge and Takashi Hoshizaki of Southern California Botanists were judges of the papers.