

Jim Hancock

Department of Horticulture, Michigan State University, E. Lansing, MI, USA, 48824, hancock@msu.edu

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## 1. INTRODUCTION

The commercial strawberry, *Fragaria x ananassa* Duchesne in Lamarck, has a very narrow germplasm base (Hancock *et al.*, 1993; Sjulín and Dale, 1987), even though its progenitor species have an extensive geographical range across North and South America. It originated about 250 years ago when a few New World clones of *F. chiloensis* and *F. virginiana* accidentally hybridized in European gardens (Wilhelm and Sagen, 1974). Thomas A. Knight began the systematic breeding of strawberries in England in 1817, but he had only a small number of native and cultivated clones at his disposal. Likewise, North American genetic improvement began in the mid-1800s with a restricted group of European *F. x ananassa* cultivars, South American *F. chiloensis* (L.) Miller and North American *F. virginiana* Miller (Darrow, 1966). The cultivars originating from this background played the predominant role in most public and private breeding programs for the next 100 years.

The majority of the genes in modern North American cultivars still come from only a handful of nuclear and cytoplasmic sources (Sjulín and Dale, 1987; Dale and Sjulín, 1990; Hancock and Luby, 1995), even though numerous germplasm collection trips have been undertaken in the Americas (Cameron *et al.*, 1993; Dale *et al.*, 1992; Darrow, 1957; Hancock *et al.*, 1990; Luby *et al.*, 1991). This paper describes the amount of diversity found in the *Fragaria* of the Americas, and catalogues some of the most promising breeding parents. It is hoped that this information will stimulate the broader utilization of the wild germplasm.

## 2. THE AMERICAN STRAWBERRY SPECIES

There are four native strawberry species found in North and South America: the diploid *Fragaria vesca* L, which has 14 chromosomes, and the octoploids *F. chiloensis* (L.) Duch., *F. virginiana* Duch. and *F. x ananassa*, which have 56 chromosomes (Staudt, 1999).

There are three subspecies of the wood strawberry, *F. vesca*, found in North America (Staudt, 1962): 1) *ssp. americana* (Porter) - woods of eastern North America to British Columbia, 2) *ssp. bracteata* - woods of western North America, and 3) *ssp. californica* - California. Several ecotypes have been described within *ssp. californica*, including headland scrub, coastal forest and Sierran forest (Hancock and Bringhurst, 1978). All of these subspecies are hermaphroditic and self-fertile, except for *ssp. bracteata*, which has both hermaphrodites and occasional females (Staudt, 1989).

There are four subspecies of the beach strawberry, *F. chiloensis* (Staudt, 1962): 1) *ssp. lucida* (E. Vilm.) - coast of Pacific ocean from Queen Charlotte Island to San Luis Obispo, California, 2) *ssp. pacifica* Staudt - coast of Pacific ocean from Aleutian Islands to San Francisco, California, 3) *ssp. sandwicensis* (Decaisne) - Hawaii, and 4) *ssp. chiloensis* (L.) Duch. - beaches and mountains of South America. Two forma of this subspecies are recognized, the cultivated *F. chiloensis ssp. chiloensis f. chiloensis* and the native *F. chiloensis ssp. chiloensis f. patagonia*. Recent morphometric and RAPD analyses of interspecific variation in *F. chiloensis* have indicated that *ssp. lucida* and *pacifica* might intergrade too much to be considered separate subspecies, but *ssp. sandwicensis* and *chiloensis* are distinct (Catling and Porebski, 1998; Porebski and Catling, 1998). The major characteristics used to separate the subspecies were hair length, leaflet size, plant color, petal number and whether the hairs on the leaf stalk were ascending or spreading. Hair orientation was the only reliable way to distinguish *ssp. lucida* from *pacifica*.

Several ecotypes of *F. chiloensis* have been identified in North America. Distinct dune, coastal strand, headland scrub and woodland-meadow types are found in California (Hancock and Bringhurst, 1979b). They are distinguished primarily by flower number, leaf width, leaf biomass, runner width and resistance to salt and drought stress. The woodland-meadow types may be stabilized hybrid derivatives of *F. chiloensis x F. virginiana*.

Wild populations of *F. chiloensis* are either dioecious, gynodioecious or perfect flowered, depending on geographical location. North American *F. chiloensis* are primarily dioecious, with staminate plants being about 10% more common than pistillate (Hancock and Bringhurst, 1979a, 1980). In some cases, apparent males are polygamodioecious and bear a few early fruit. Small numbers of highly fertile hermaphrodites have been found in California at Año Nuevo and Pigeon Point, and in the northern islands off the coast of British Columbia. In Chile, *F. chiloensis* is largely gynodioecious, as most wild plants are either pistillate or



*F. chiloensis* - beach strawberry, California  
(photo by J. Hancock)