Hermaphroditism in Pistacia

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Pistacia branch from a **P. vera** × **P. atlantica** seedling with pistillate (left) and staminate (right) inflorescences at adjacent nodes (also cover photo).

Pistacia species are normally dioecious. Three exceptions are reported here: (1) an apparent somatic mutation giving rise to a staminate bearing branch on an otherwise pistillate tree of **P. atlantica,** (2) a hybrid (**P. vera** × **P. atlantica**) bearing approximately equal numbers of pistillate and staminate inflorescences, usually on separate branches, and (3) a similar hybrid, predominately staminate, but with several branches bearing pistillate inflorescences.

ALL SPECIES OF *Pistacia* have been considered dioecious—producing male and female flowers on separate trees. Commercial pistachio (*P. vera*) orchards, therefore, usually contain 1 male tree for each 8 to 10 females. The pollen is dispersed by wind, and the planting arrangement of the male and female trees generally takes advantage of this fact. Although bees collect pollen from the staminate flowers, they are not attracted to the pistillate flowers and, therefore, play no part in pollination.

One of the first commercial pistachio orchards established in the United States was at Elk Grove, California, about 1905. The rootstock used in this orchard was primarily *P. atlantica*. Some of the *P. vera* buds failed to grow and, as a result, there are several large *P. atlantica* trees, staminate and pistillate, scattered throughout the orchard and in the fence rows. These trees were left intact by various owners over the years mainly because they provided a source of seeds for additional rootstocks.

Although *P. atlantica* generally blooms somewhat before *P. vera*, there is sufficient overlap in their bloom periods for some natural hybridization to occur. This, in fact, has taken place and an occasional volunteer hybrid is found in the orchard, although most are in the fence rows. Several of the original trees in the orchard died and were removed, leaving spaces where chance seedlings were allowed to grow.

While collecting pollen from trees in the orchard and fence rows for a study of pollen germination and tube growth, several floral abnormalities were found. These are briefly described and illustrated here.

Female *P. atlantica*

A female *P. atlantica* tree that had been growing in the fence row for 50 or more years, had a secondary scaffold branch that forked into 2 branches, the larger one producing staminate inflorescences only (photo 1). The staminate branch probably originated as a somatic mutation, because its point of origin precludes the possibility that it came from a bud inserted there by man. The leaves on the staminate branch appear identical to those on the remainder of the tree, each being composed of 5 pairs of lateral leaflets plus a single terminal one. Although the male flowers are generally functional somewhat ahead of the female flowers in *Pistacia*, the 1973 bloom periods of the

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Photo 1. Pistillate (left) and staminate (right) **pistacia** branches of **P. atlantica** from a single, predominately pistillate, tree. The staminate branch originated as a somatic mutation.

two types on this particular tree were identical.

A hybrid growing in the orchard 10 to 15 years had branches producing half male and the other half female inflorescences. Individual primary scaffold branches gave rise to secondary lateral branches, however, and some produced male inflorescences and others female inflorescences. An occasional secondary lateral produced staminate and pistillate inflorescences at adjacent nodes (cover). Furthermore, individual inflorescences were composed of staminate and pistillate flowers (photo 2).

Another hybrid tree about 30 years old, and predominately staminate, was left growing in the orchard, probably to serve as a pollinator. Several tertiary scaffold branches of this tree produce pistillate inflorescences that apparently vary in their potential to produce fruits (photo 3). Some branches bear inflorescences that produce completely developed fruits, whereas the inflorescences on others produce nuts that develop partially or not at all. Lack of pollination in the latter case is not responsible for lack of ovary development, because branches bearing the various types of inflorescences are adjacent to one another.

The floral anomalies in *Pistacia* reported here bear some analogy to the situation in the Oriental persimmon (*Diospyros kaki*). Flowers of that species segregate into five groups that range from completely pistillate to completely staminate, with gradations in hermaphroditism in between.

These naturally occurring sexual abnormalities in *Pistacia* suggest the possible use of this material in a long-term breeding program to develop a pistachio variety having both male and female flowers on a single tree. Development of such a variety yielding high quality nuts would be expected to increase nut yield by 10% or more as a result of eliminating the necessity for staminate trees in the orchard.

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Photo. 2. Inflorescence from a **P. vera** × **P. atlantica** seedling. **Pistacia** flowers are predominately pistillate but the lower right lateral has staminate flowers only.

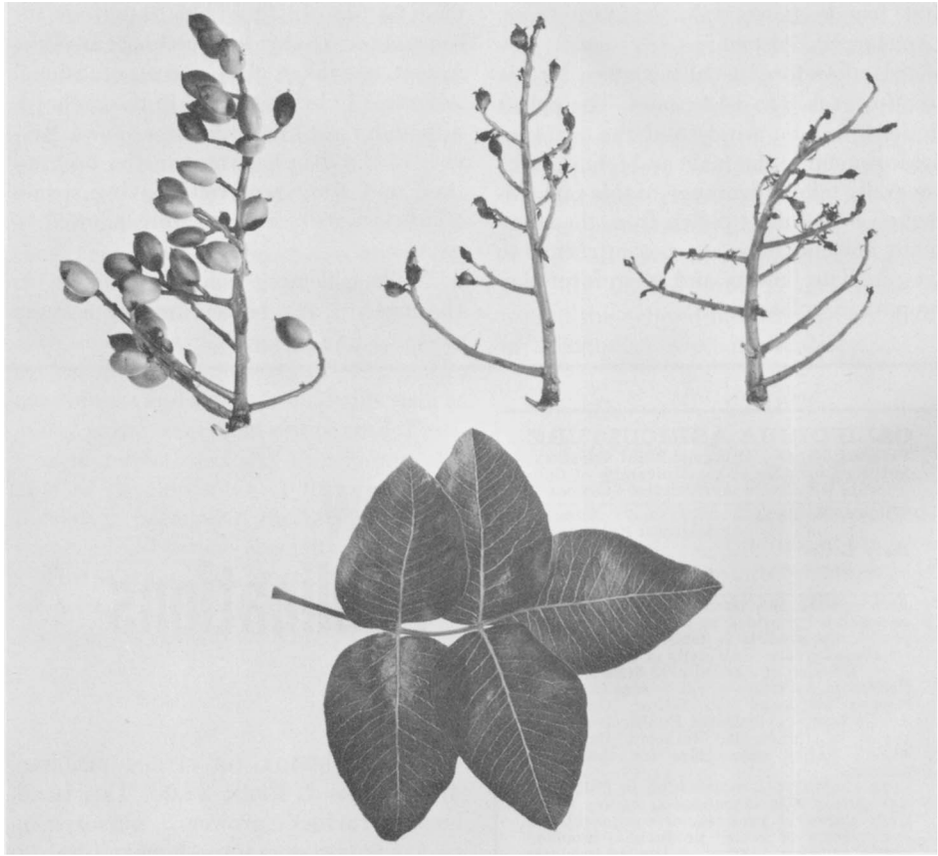

Photo 3. Leaf and differentially developed clusters of pistachio nuts from a **P. vera** × **P. atlantica** tree that is predominately staminate.