

replacing flowers, and Plukenet¹ states that the flowers of our *O. violacea* are sometimes succeeded by bulblets,—an occurrence that cannot be common in the wild plant.

The flowers are typically open funnel-shaped, expanding in sunshine, the degree of warmth playing a very important part in this process, at least in some species². The stamens are in two sets of unequal length, as in *Geranium*, etc., while the styles appear to be typically about equal to the longer set. But in the majority of species the flowers of different individuals are quite dissimilar in this respect, so that these species are what Hildebrand³ and Darwin⁴ have called heterostyled, or Gray⁵, heterogone. In *Oxalis* the heterogony is typically trimorphism, three forms of flowers existing in about equal numbers on different plants of a given species, the pistils of one being shorter than the shortest stamens (short-styled), those of the second being intermediate between the two sets (mid-styled), while those of the third are longer than either set of stamens (long-styled). Connected with these differences in the length of the pistil are differences in the stamens, so that the two sets of either form of flower correspond in length respectively with the pistils of the two other forms. Hildebrand, who examined the specimens of *Oxalis* in several large herbaria, has recorded his observations on this point in detail⁶. But while the appearance in a majority of cases was that of trimorphism, only one or two forms of flowers were found in many of the species examined. In most instances, however, these correspond to one of the three forms that I have characterized. The same may be said of the many figures of Jacquin⁷ and others who have illustrated this genus. It was also shown by Hildebrand⁸ that, in some trimorphic species submitted to experiment, the greatest fruitfulness resulted only from the fertilization of a pistil by the pollen from stamens of its own length,—a rule that has been found to apply generally to heterogone plants⁹; and Hildebrand has recently again remarked on the frequent self-sterility of a single form¹⁰. The pollen and stigmas of such trimorphic species as have been examined in this respect, also show the differentiation usual in trimorphic plants, the pollen grains of the long stamens being largest, those of the short stamens, smallest, and those of the mid-length, intermediate in size; while the stigmatic papillae of the long-styled flowers are longest, those of the short-styled, shortest, and those of the mid-styled, of intermediate length.

In the examination of herbarium or greenhouse material of trimorphic species, the number of specimens being limited, it may readily happen that only one or two of the forms are found, when a search in the field among hundreds of individuals would reveal all in approximately equal numbers. But even under these conditions, one or more of the forms may not be found in localities where an introduced species has multiplied non-sexually¹¹, or where but two forms have been introduced; for these, propagated sexually, but without the intervention of the other forms, may possibly reproduce only themselves¹². Hence the presumable trimorphism of such species as were known to have one or two of the forms of flowers usual in such cases has not been generally disputed.

Some years since, having access for the first time to numerous wild plants of a sup-

¹ Abnages-tum Bot. 1. Pl. 102, fig. 1.

² Cf. Pfeiffer: Physiol. Unters. 1873.

³ Monatsber. Berlin. Akad. 1866, 369.

⁴ Different Forms of Flowers, various places.

⁵ Amer. Journ. Sci. and Arts, 3 Ser., xiii, 82.

⁶ Monatsber. Berlin. Akad., 1866, 351.

⁷ *Oxalis* Monographia, 1794.

⁸ Bot. Zeitung, 1871, 415, 431.

⁹ Darwin: Different Forms of Flowers, etc., Chapter 5.

¹⁰ Hildebrand: Bot. Zeit. 1887, nos. 1-3.

¹¹ Darwin: Different Forms of Flowers, 182.

¹² Hildebrand: Monatsber. Berl. Akad., 1866, 373; Bot. Zeit., 1887, 5; Darwin: Different Forms of Flowers, 268.

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