

## Teratological Androecia of *Saponaria officinalis*

GAYTON C. MARKS, Valparaiso University

*Saponaria officinalis* (Bouncing Bet) is commonly found in our range in the "double" condition (4) (5). The Caryophyllaceae in general is noted for genera which sometimes possess petaloid staminodes (6).

A manifestation of this "double" flower may be the diversity of anomalies found in the androecium. While many investigators have concluded that most petals are derived from stamens (1), others such as Engard believe that it is quite possible that stamens have no homologies with vegetative organs in the past and should be regarded as *organa sui generis* (3). The relationship of stamen to leaf seems less clear. While Canright (2) believes that only the broad microsporophylls of the Ranales to be primitive, it is generally accepted that most stamens, at least in the primitive families, have had their origin in leaves.

A clone of "double" flowered *Saponaria* was found in the town of Schererville, Lake County this summer. Collected specimens revealed upon examination, deviations from normal staminate structures. These abnormalities were reflected in the corolla only, with no observable malformation of the leaves.

The transformation of stamens into petals by genetic mutation in the roses and camellias was accomplished by broadening of the filaments or anthers of all or most of the stamens according to Benson (1). Middleton believes that in *Saponaria* petal stamens and petals arise from the same primordial tissue (7). The unpublished work of Smith (8) favors this viewpoint.

Thomson strengthens this position by her work with the vascular system of the Caryophyllaceae (9). In *Dianthus* or *Gypsophila* she observes that either petals or stamens may be derived from the extra strand of vascular tissue provided by the splitting of a stamen trace. She also observes that the vascular supply for the petals consistently arises as a single strand but suggests that the dichotomies in petal venation is a secondary elaboration in response to the demands of an expanded organ.

The "double" *Saponaria* examined point to a relationship of specific structures of the corolla with the androecium. Many petal-like parts bear irregular patches of sporogenous tissue which might suggest that such structures are primarily petaloid and secondarily microsporophyllous.

The normal flower of *Saponaria* is borne in cymes, more or less congested. It is pentamerous with two whorls of stamens, one antesealous, the other antepetalous. Each stamen consists of two pollen chambers on each side of small connective and a free filament somewhat triangular in cross section and enclosing a single vascular strand. The sometimes bilobed calyx is of five sepals united into a tube. The two (sometimes three) slender styles terminate the cylindrical ovary of two carpels. The hypogynous gynoecium is usually one celled and completely

ovuliferous. Each petal consists of a proximal claw and a distal limb or blade (lamina) notched at the apex. Two awl-shaped appendages (variously described as ligules, corona or paracorolla), two to three millimeters in length, are found at the juncture of the claw and limb. These seem to arise from two prominent wings or keels which extend from the base of the appendages proximally to the base of the claw. These keels seem to coincide with the base of the triangular filament in petaloid stamens.

A profusion of petaloid parts are found in the abnormal "double" flower seemingly as a result of the shortening of the axis of the inflorescence. Several dichotomies may be found within one calyx. This does not seem to be the phenomenon of petaloid described for other members of the Caryophyllaceae (8). One flower yielded plus or minus sixty petaloid structures. Many of these were microsporophyllous and thus it is virtually impossible to draw a sharp line of demarcation between the androecium and the corolla. Some members were clearly petal-like but bore microsporangia in varying degrees and form. In sharp contrast to previous reports (8) that other members of the family when "double" were primarily pistillate, a preponderance of microsporangia and pollen indicated that the opposite must be true. This was substantiated by the lack of fertile ovules or the set of fruit on any of the examined plants. Apparently unrelated, was the discovery of a pair of stipule-like structures at the base of some petals.

Other petal-like members bore one, two, three, and sometimes four elongate pollen sacs medially and parallel to the long axis of the "petal." In still others, the long axis of the microsporangium displayed complete disregard for polarity.

Paradoxically those microsporophylls which were most stamen-like exhibited the most teratology. The least complex of these approached the normal stamen except for the smaller and misshapen parasitic microspogenous lobes randomly attached to the usual two pair of pollen sacs. Another variation of the near normal stamen produced attenuate petaloid apices on the anther. Linear petal-like strands, in a few instances, bore typically normal anthers. Other stamens appeared to be completely doubled with eight anther lobes and bilobed filament. This may be attributed to splitting described by Smith (8).

Most unique were the small mounds of meristematic tissue found on the adaxial side of the "petal." In some, these graded into normal appendages with apparent maturity. In other floral members, this transition was anomalous, three and four appendages being produced. Most significant was the transition of four sterile appendages into four normal appearing anther lobes. In certain instances only one or more of the appendages became microspogenous while the other(s) remained sterile. The perfectly developed anthers were most frequently located at the site of the appendages of the normal petal. When filaments appeared with the anther on the anomalous petal, their origin seemed to correspond to the position of the wings or keels. Middleton observes that in the normal flower, the wings guide the filament of the antepetalous stamen (7).

In summary, the "double" flower of *Saponaria* strongly suggests a definite relationship of the appendages and the wings of the petals to the androecium. A transition is evident of either sterile appendages to fertile anthers or fertile anthers to sterile appendages. Engard believes that since most organs are outward transformation within a field, the necessity for stating the direction of the transformation is alleviated (3). In any case, the microsporophyll seems to exhibit so much variation that it is extremely difficult to distinguish between the corolla and the androecium. Whether this is an expression of palingenesis of evolutive metamorphosis or it is immediate metamorphosis (3) is a problem of intrigue that may be resolved by future investigation.

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