

## PHYLLOTAXIS OF SPECULARIA PERFOLIATA.

F. M. ADREWS, Indiana University.

Leaf arrangement in plants has always been a point of interest and has been the subject of much study. Some plants have a very open or loose arrangement of their leaves as when they are separated by considerable distances on the stem as in some alternate or opposite leaves. The number or arrangement becomes greater and denser in other plants until their leaves form rosettes or culsters as in the common Houseleek. Or again as in the cones of the genus *Pinus* whose scale-like leaves often form conical-like cylinders of closely set divisions. Various theories were long ago advanced to explain the arrangement of leaves on the stem and especially by Cesalpino and Bonnet that the arrangement on the stem is in keeping with definite "geometrical rules". Also many others among them A. F. Schimper had formulated a theory on the subject. An excellent summary of many of the facts on this subject has been collected by Sachs. But the effort of the plant is to arrange the leaves on its stem in such a manner that they will have the best exposure to the light. Also the question of structural physical factors in the plant itself enter into the placing of leaves on the stem. The arrangement which a given species shows is followed by all individuals of that species although, as will be seen later, this may be departed from to a certain extent. This difference I found rather markedly shown in the spiral arrangement of the leaves of *Specularia perfoliata*. Gray<sup>4</sup> describes *Specularia perfoliata* as follows: "Somewhat hairy, 1-9 dm. high, leaves roundish or ovate, clasping by the heart-shaped base, toothed, flowers sessile, solitary or 2-3 together in the axils, only the upper or later ones having a conspicuous and expanding corolla, capsule ellipsoid, short, straight, opening rather below the middle; seeds lenticular".

Nothing is said by Gray, Britton, or Wood about the rather marked and regular arrangement of the leaves on the stem of this plant in spirals. This arrangement together with the form of the leaves is a striking characteristic of *Specularia perfoliata*, and reminds one but to a much less degree of the unusually "spirally twisted raceme" of flowers of *Spiranthes gracilis*.

When making a trip into Brown County, Indiana, during the summer of 1920, I noticed by the roadside about one mile from Belmont, near the studio of the artist, Dr. T. C. Steele, a large number of specimens of *Specularia perfoliata*. Most of these plants were of normal size and appearance. Their leaves were arranged on the stem in the usual way and as to number showed four to a single turn of the stalk which is the ordinary number. Also ordinarily three circuits of the stem must be made before a leaf will be found that will stand on the stem directly above the first leaf with which the count was begun. In other words the twelfth leaf, counting the one at the starting point, will stand directly over this first one where the spiral was originally started toward the base of the stem. In this arrange-

<sup>1</sup>Sachs, J. History of Botany 1875 P. 163.

<sup>2</sup>Sachs J. History of Botany 1875 P. 162.

<sup>3</sup>Sachs, J. History of Botany 1875, Chapter 4, PP. 155-181.

<sup>4</sup>Gray, A. New Manual of Botany, 7th edition.

ment of leaves of *Specularia perfoliata* the circumference of the stem was divided up equally for the leaf insertion.

Among the large number of the plants above mentioned, however, I saw five other specimens of *Specularia perfoliata* which looked somewhat different from the others. On examining these more closely I found them to have more leafy stems and by counting the leaves in a spiral as I did with the others I found that there were five leaves to a spiral counting the first one instead of the usual four of the other plants. Also I saw in these specimens, that it was necessary to make four circuits of the stem, instead of three as in the other plants before I found a leaf which stood directly over the first leaf with which the count was begun. The five specimens, just mentioned, of *Specularia perfoliata* grew about the center of a considerable number of other specimens of the same species as well as other plants. They were some larger than other specimens of the same species, but attracted my attention at close range first on account of the fact that they were some taller than the others and then on account of their denser foliage. The leaves of these specimens also divided the circumference of the stem equally as regards the insertion of the leaves. Those five plants having the greater number of leaves showed therefore a very delicate balance and arrangement with reference to the light which is extremely important for leaves of autotrophic plants.