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NOTES ON THE EMBRYOLOGY OF THE CARYOPHYLLACEAE

MEL. T. COOK.

Some years ago the writer undertook a comparative study of the morphology of several species belonging to the family Caryophyllaceae and related families for the purpose of demonstrating the constancy or variability of these internal characters and thus reaching some conclusions as to their value in phylogenetic studies. In connection with this work two brief papers were published* at that time. A change of location and lines of work necessitated the discontinuance of this line of study and the writer has not had an opportunity to take it up again. However, it has been thought desirable to offer these accumulated notes.

The *Vaccaria vaccaria* (L.) Britton was collected by Mr. H. H. York near Greencastle, Indiana, in 1903. It is an European species which has become rather widely distributed throughout the country.

The *Silene conoidea* L.† was collected on the Agricultural Experiment Station farm at Newark, Delaware. Only two specimens were found and the seed of these were supposed to have been introduced in Alfalfa from some of the Rocky Mountain States. However, it proved to be a south European species and it may have been introduced through an entirely different source. It was collected primarily for class study, since the embryos of members of this family are especially good for class work.

*The development of the embryo sac and embryo of *Claytonia virginica*, OHIO NATURALIST, Vol. III, No. 3, pp. 349-353, 1905. The development of the embryo sac and embryo of *Agrostemma githago*, OHIO NATURALIST, Vol. III, No. 4, pp. 365-369, 1905.

† Determined by Dr. J. N. Rose, National Museum, Washington, D. C.

The most striking characters noted in the study of the *Agrostemma githago* referred to above were (a) the formation of an inner and an outer nucellar zone, (b) the growth of the nucellus so as to leave the embryo sac deeply embedded, (c) the formation of a nucellar beak which projects through the micropyle, and (d) a filamentous embryo with the large basal cell.

Since the publication of the above paper, L. S. Gibbs has published a paper on "Notes on the Development and Structure of the Seed in Alisnoideae"† in which the characters were very similar to *A. githago*. The development of the embryo sac was the same, also the two zones, which are referred to as nucellar layers, and the beak like projection of the nucellus through the micropyle which is somewhat more pointed than in *A. githago* and is referred to as a papilla. There is no lateral pouch-like enlargement of the sac as in *A. githago*. The development of the embryo is practically the same.

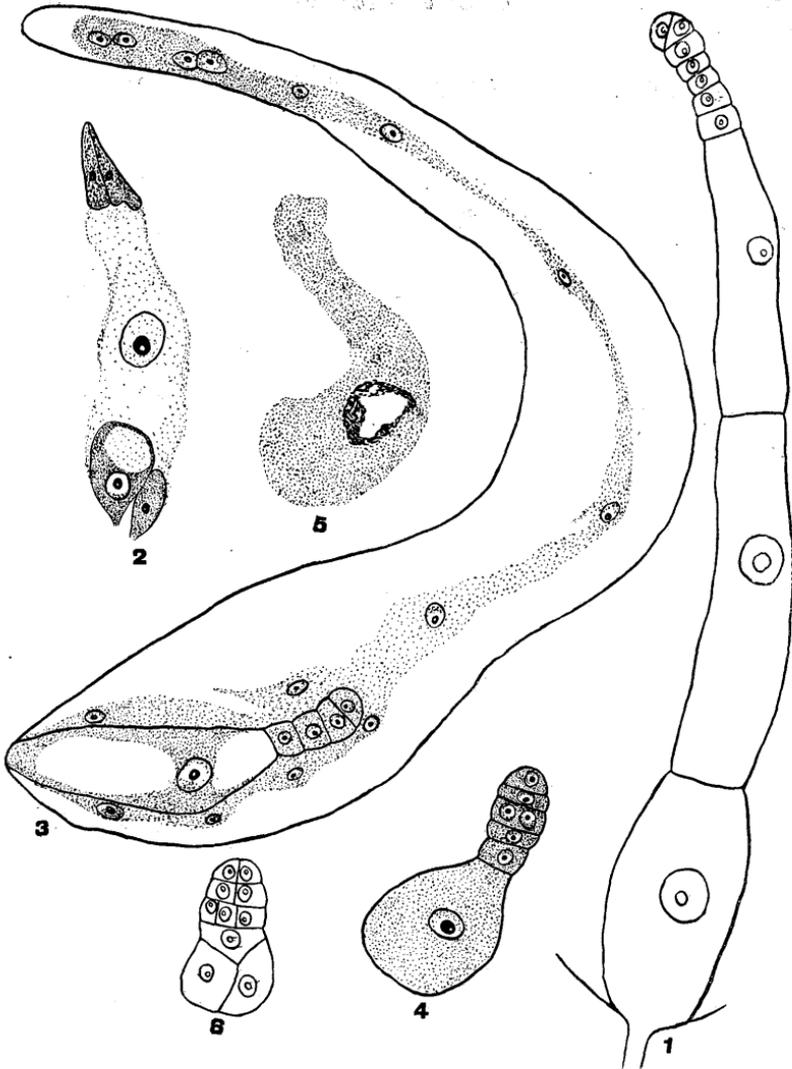
No attempt was made to trace the early history of the embryo sacs in either species. In both species the two nucellar zones and the beak were very evident; the sacs are located deep in the nucellus but there was no pronounced lateral enlargement as in the case of *A. githago* although in some instances there was a slight enlargement of this kind. In both species the embryos were filamentous in their early stages and possess the large basal cells.

In *V. vaccaria* the embryo was exceptionally long (Fig. 1), the length being due to the excessive length of the three lower cells. The basal cell becomes very large, stains readily and has very much the appearance of the corresponding cell in *A. githago*. It is also directly connected with the passage through which the pollen tube entered and which is now filled with protoplasm. Gibbs says that in *Stellaria* this basal cell is "elongated so much that it forms a haustorium at the micropolar end, which projects beyond the embryo sac into the nucellar tissue." Gibbs also says that "the nucellus is very large and active in appearance, and the cell suggests an absorbent organ."

In *Silene conoidea* the embryo is not so long as in *V. vaccaria* but is almost identical in development with *A. githago* (Fig. 3). However, instead of the cell next to the apical cell being the first to divide, it is usually the second from the apical cell (Fig. 4). The large basal cell eventually disintegrates (Fig. 5) and the further history of the embryo is practically the same as in *A. githago*. In one instance an abnormal embryo (Fig. 6) was observed.

The endosperm in both species was non-cellular (Fig. 3) and identical with the endosperm in *A. githago*.

† *Annals of Botany*, Vol. XXI, pp. 25-55, 1907.



COOK on "Caryophyllaceae."

EXPLANATION OF PLATE XXII.

- Fig. 1. Filamentous embryo of *Vaccaria vaccaria*.
- Fig. 2. Eight nucleate embryo sac of *Silene conoidea* showing the egg, one symmergid, two antipodals, and the endosperm nucleus.
- Fig. 3. Embryo sac of *S. conoidea* with filamentous embryo and endosperm.
- Fig. 4. Normal embryo of *S. conoidea*.
- Fig. 5. Disintegration of the basal cell of the embryo of *S. conoidea*.
- Fig. 6. Abnormal embryo of *S. conoidea*.

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