POLLINATION DROPS IN CERTAIN CONIFERS

PHYLLIS L. COOK

University of Illinois, Urbana, Illinois

The occurrence of drops of liquid at the tips of the ovules of conifers at pollination time has been recorded for a number of species (Chamberlain, 1935)[1]. Very little, however, has been said concerning the time of their formation, their size, duration, nature, and actual function as part of the pollination mechanism. During the last season, I had occasion to observe the ovules of *Biota orientalis* and *Thuja occidentalis* closely, and the formation and behavior of pollination drops in these species was noted incidentally.

These two species, the Chinese and the American arbor vitae, are both planted in Illinois as ornamentals. Central Illinois is almost at the northern limit of the range of the Chinese arbor vitae and at the southern limit of that of the American arbor vitae. Both species do fairly well, however, and they cone freely annually. The ovulate cone axes elongate in January in the greenhouse and in late February or early March outside; and the protecting leaves separate exposing the cone scales. In *Biota*, fig. 1, the cone scales become thick and fleshy throughout, and as they expand, the tips flare backwards, thus freely exposing the six upright ovules. The ripe cone of *Biota* is one of the most beautiful among the conifers in its symmetry, coloring, and waxiness. The cone of *Thuja occidentalis*, fig. 2, differs from that of *Biota* in that the cone scales remain thin and stand erect, so that the six to ten ovules per cone are not as freely exposed. When the cones of both species are at the stage of development described, drops of liquid appear at the tips of the micropyles. These drops occur first about a week before pollen is shed. The diameter of the drops becomes several times larger than that of the micropyles, reaching 0.5 mm.; and as the drops stand poised upon the ovules they reflect everything about them in miniature. Depending upon the humidity of the surrounding air, a drop may disappear and reappear an indefinite number of times on the same ovule, or

[1] Chamberlain, C. J. 1935. Gymnosperms. Structure and evolution. University of Chicago Press.

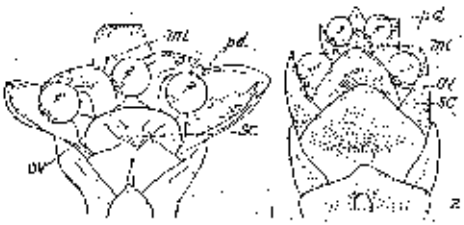

Fig. 1 (left).—Ovulate cone of *Biota orientalis* at pollination time.

Fig. 2 (right).—Ovulate cone of *Thuja occidentalis*, Champaign, University of Illinois, February 24, 1938.

Both figures x 10⅔. Abbreviations: sc, scale; ov, ovule; mi, micropyle; pd, pollination drop.

it may remain apparently unchanged for a number of days. I have watched drops on the same ovules in the laboratory for nine days. It may be that some of the liquid evaporates while the volume of the drop remains constant through the addition of fresh liquid from the ovule. The drops continue to be present or to form afresh, while pollen is being shed and even for a few days after all the microsporangia are empty; so that their period of formation and duration covers from ten to fourteen days.

The behavior of the pollen grains in the liquid of the drops is interesting. When numerous grains are shaken by hand on the ovules bearing drops, it is apparent even to the naked eye that the liquid is very quickly absorbed by the grains. If grains are present in sufficient numbers, they absorb the liquid and form a tiny yellow plug at the tip of the micropyle. In natural pollination, of course, only a few grains fall upon each drop.

When pollen was morphologically mature but still unshed in 1938, drops were present in great abundance. They adhered easily to a dissecting needle, and so were collected and placed upon a glass slide under the microscope. Pollen grains were then mounted in the liquid and observed. Immediately the intines began to take up the liquid in such quantity and with such rapidity that they burst the exines with almost explosive force; and the pinnicladia grains with their thick intines floated out, leaving collapsed and wrinkled exines. When pollen that was shed naturally was mounted in the liquid, it behaved similarly but more slowly. After ten minutes, however, most of the grains had freed themselves from the exines. The dryness of the shed pollen may account for its slowness in swelling. In ovules sectioned a few hours after pollination, grains with swollen intines and cast-off exines were present in the micropyles and on the disintegrating nucellar surfaces.

It seems feasible to assume that in the Chinese and American arbor vitae, at least, the liquid of the pollination drops originates from the breaking down of the surface cells of the nucellus; and that the behavior of the grains in the drops is part of the normal process of the development of the male gametophyte.