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EXTRA-FLORAL NECTARIES IN BRYOPHYLLUM CALYGINUM

JAMES H. CRAFT

Among the interesting features of *Bryophyllum calycinum* Salisb. is the occurrence of foliar embryos in the notches of the leaf (Fig. 3) which under favorable conditions will give rise to new plants. In the apices of the crenations are hydathodes (Fig. 3) whose structure has been described by Berge (1877) and Yarbrough (1932, 1934). A hydathode typically occurs at a vein ending in a leaf margin, but in *Bryophyllum calycinum* the hydathode consists of a vascular plexus surrounding an epithem which is associated with a special group of stomata on the lower side of the leaf. The cells of the epithem superficially resemble those of the foliar embryos in that they are of approximately the same size and shape and have conspicuous nuclei and dense cytoplasm.

In the summer of 1940 crystal-clear droplets (Fig. 1) were seen on the uppermost leaves and subfloral bracts of *Bryophyllum calycinum* plants flowering in the University of Iowa greenhouse. They differed from water of guttation in several ways: 1) they appeared on all parts of the leaf instead of on the crenations alone; 2) they were very sticky, sweet-tasting, and gave strong positive reactions for glucose when tested by both the Flückiger and osazone methods; 3) they remained on the leaves for several weeks whereas water of guttation seldom remains more than a few hours; 4) these droplets always appeared in plainly visible pits (Fig. 4) about two millimeters wide and half a millimeter deep. In contrast, hydathodes of *Bryophyllum* are not ordinarily visible to the naked eye unless the leaf has been cleared (Fig. 3).

The pits and droplets, which occur in the manner described, appear only during the flowering phase and have been observed in abundance on three occasions. Small Diptera were attracted by the droplets at the only instance that insects were present when the *Bryophyllum calycinum* bloomed. This appears to support the view that the droplets, while attractive to certain insects, are not the result of insect injuries. The possibility that the droplets were of traumatic origin was tested by wounding, with a sterile needle, the uppermost leaves of *Bryophyllum calycinum* plants which had not yet reached the flowering phase. Only wound tissue was formed

on leaves thus treated. Leaves and bracts bearing the pits and droplets showed no evidence of wound tissue.

Pitted areas were sectioned in paraffin and stained with safranin and fast green. Lying immediately below the center of each pit

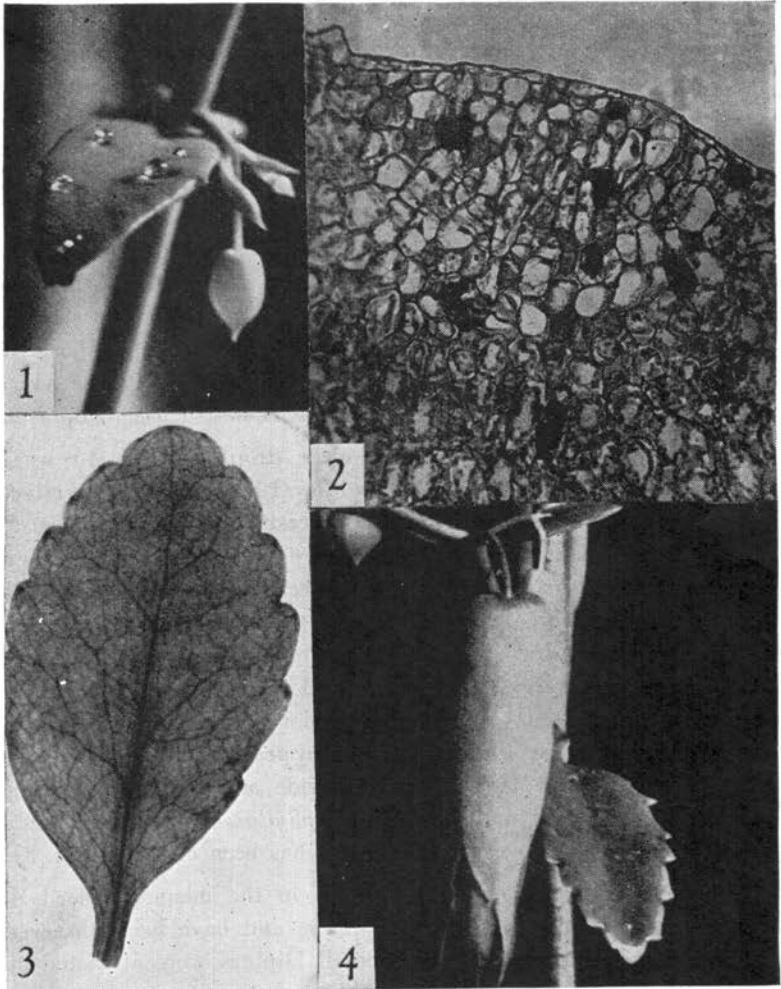


Fig. 1-4 *Bryophyllum calycinum*.—Fig. 1. Subfloral bract showing droplets secreted by nectaries. 2X.—Fig. 2. Vertical section through an extra-floral nectary. 300X.—Fig. 3. Cleared leaf showing hydathodes in the notch apices. 2X.—Fig. 4. Subfloral bract showing pits. 1X.

was a mass of glandular tissue consisting of large thin-walled cells with conspicuous nuclei (Fig. 2).

It is believed that the structures described and illustrated are not hydathodes, but are instead extra-floral nectaries. This belief is supported by the following facts:

1. It is only at the flowering phase that pits and droplets appear on the bracts and uppermost leaves.
2. The pits and droplets are not regularly associated with a vascular plexus in the crenations as are the hydathodes, but instead occur in an apparently random manner on all surfaces of the bracts and uppermost leaves.
3. The cells of the secretory tissue below the pit are typically glandular, whereas the cells of the epithem of the hydathode superficially resemble the cells of the foliar embryos.
4. The occurrence of these nectaries is apparently not associated with the presence of insects. Neither are the nectaries the result of slight mechanical injuries.

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