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BY

GEORGE T. HASTINGS



John Torrey, 1796-1873

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## The Relation of *Cladonia* Mats to Soil Moisture

CEDRIC L. PORTER AND MARJORIE L. WOOLLETT

During the course of study of the establishment of seedlings in *Cladonia* and moss mats, data on soil moisture were obtained thru the summer of 1927. The areas under observation are located in the northern end of the southern peninsula of Michigan near the University of Michigan Biological Station. The soil is glacial sand. The areas were originally covered by a dense forest of white and Norway pines, *Pinus strobus* and *Pinus resinosa*. Following lumbering and repeated fires, they are now overgrown with aspens dominated by *Populus grandidentata* and bracken fern, *Pteris aquilina*. Where gaps appear in the vegetation, the soil is loose and sandy. In many such places large beds of almost pure *Cladonia rangiferina* are frequently found. These, for the most part, occupy open places nearly or quite unshaded by the surrounding trees. Seeds of herbaceous and woody plants are available in abundance, but seedlings usually fail to become established in *Cladonia* beds. The moisture content of open surface soil is very low. Often no moisture may be detected. The summer of 1927 was quite ordinary with but one short period of high temperature and the usual succession of fair, dry weather and light rainy days. There were no thoroughly dry periods, consequently the soil moisture during this year was reasonably favorable for the establishment of seedlings, yet the establishment as usual did not follow.

The soil moisture was determined by the alcohol method of Bouyoucos\* which briefly is a mixing of the soil with alcohol of known water content according to a definite plan and ascertaining by a hydrometer the water content of the alcohol after the mixing and multiplying by the factor which experience has shown proper. The samples were taken at the beginning and during rain storms to show particularly the effect of the *Cladonia* mat upon the soil moisture beneath it. Samples were often taken at short intervals during the course of the rain storm.

\* Bouyoucos, G. J. Rapid determination of soil moisture by alcohol. Science, 65: 375, 1927.

## DISCUSSION

It can be readily seen from the table that a cover of *Cladonia* prevented as rapid an absorption of rain by the soil as was possible in open areas. The rain falling upon the mat was absorbed by the lichen cover which swelled and held as much as  $4\frac{1}{2}$  times its own dry weight before allowing moisture to pass freely to the soil beneath. In one case 16 grams of dry *Cladonia* weighed 73.5 grams when wet. When the rain was short and

TABLE I

	Bed No.	Soil Moisture		Notes
		Open	Cladonia	
		Per cent	Per cent	
July 5	1	5.35	1.78	Light rain (2 hours)
	2	5.35	1.78	
July 6 (A.M.)	1	8.92	6.07	Light rain (12 hours) 1.41 cm
	2	8.16	5.35	
July 6 (P.M.)	7:25		5.35	Light rain .96 cm.
	7:35		5.35	
	7:45 (peak)		8.92	
	7:55	16.78	7.14	
July 26 (Before rain)			1.78	Light rain .41 cm.
	(After rain)		1.78	
July 30*			42.84	Between rains Big Stone Bay
Aug. 8		0	0.36	Dry spell
Aug. 9		0	0.71	Dry spell

\* This area is subject to moisture and wind from Lake Michigan.

light, no moisture at all reached the soil. From the figures given in the table, 2.26 times as much moisture was found on the average in the open areas as under *Cladonia* mats after rains. This prevention of the rain from reaching the soil easily explained the drying up of the seedlings which germinated beneath the *Cladonia* and of those which germinated within the *Cladonia* and became rooted in the soil beneath.

On the other hand, it is true that the *Cladonia* tends to hold whatever moisture there is present in the soil for a longer time than the moisture remains in a similar but open soil. The average amount of moisture found in the surface soil under the lichen cover was under 1% during dry spells, while in open areas

there was none present at all. And so, altho the *Cladonia* prevented as rapid evaporation from the soil, the slightly greater amount present under it was not sufficient to counterbalance the greater hindrance to the repletion of water content during light rains and dews on account of the absorption by *Cladonia*.

#### SUMMARY

A study of moisture content in open areas and under *Cladonia* mats in Cheboygan County, Michigan, during the summer of 1927 (an ordinary summer) supplies figures which show that the soil under the *Cladonia* mat contains more moisture during dry periods, but does not receive as much moisture from rain and dew as the open.

*Cladonia* may absorb as much as 4.5 times its weight in water before allowing moisture to pass to the soil beneath.

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#### *Epidendrum conopseum*, Ait. in Louisiana

H. M. DENSLOW

The note in *Torreyia* concerning the finding of this species in Louisiana is interesting but not quite accurate. It was collected in Plaquemine Parish in February and in August 1915 by Miss Eunice Treuil. I have specimens in my herbarium. This *Epidendrum* had been collected by B. F. Bush at White Castle, Louisiana, July 30, 1897. There is a specimen of this collection, No. 347, in the Herbarium of the New York Botanical Garden. It may be expected in other places in Louisiana. White Castle and Plaquemine are about ten miles apart and not far from Baton Rouge. West Feliciana Parish, from which Miss Koch sends this report, is about forty miles northward and to the east of the Mississippi River.

These collections at long intervals and in three localities emphasize the fact that species may be unknown, at least as to their distribution, because we do not search for them.

CHELSEA SQUARE,  
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