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THE DISTRIBUTION AND LIFE HISTORY OF THE
TRILLIUM NIVALE RIDDELL

JOHN N. MARTIN

Introduction

The *Trillium nivale*, commonly called the Snow Trillium, is the earliest of the vernal wild flowers in Iowa and probably throughout its range (Fig. 1). Records kept over a period of years at the Ledges State Park in Boone County, Iowa, show that the Snow Trillium begins flowering in that vicinity between the 10th and 25th of March. At its northernmost limit it is in full flower during April. Its ability to develop and flower under low temperatures is one of its remarkable features. The ground is still partly frozen or barely thawed about its corm when the Snow Trillium sends up its shoot and opens its flower. Sometimes its flowering shoot in an apparent thrifty condition can be found protruding through a blanket of snow. It is often caught when in flower by temperatures several degrees below freezing which it seems to endure without injury.

The Snow Trillium and the *Trillium rivale* Wats. are the smallest of the Trilliums. The height of the Snow Trillium above ground is commonly about four inches but ranges from approximately three to six inches. Its three snow white petals commonly an inch



Fig. 1. A group of Snow Trilliums photographed at Ledges State Park on the 24th of March.
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and a half in length contrast well with its three green leaves. Both the flower and the leaves of the Snow Trillium are proportionately large for the height and size of the stalk bearing them and make the plant conspicuous, notwithstanding its small size. Furthermore Snow Trilliums usually grow in clumps and this habit adds to their showiness.

In a conspectus of the North American species of trilliums by Gates¹ thirty-one species and nine varieties are recognized. Of



Fig. 2. Map of the United States showing the distribution of the Snow Trillium.

these species and varieties the *Trillium nivale* Riddell and the *T. rivale* Wats. are considered the most aberrant, both being distinguished by dwarfness. *Trillium nivale* is so distinct that it is impossible to confuse it with any other species. Gates has advanced the theory that the *Trillium nivale* originated by mutations from the *T. grandiflorum* (Michx.) Salisb. In his opinion one mutation for dwarfness and one resulting in a three lobed ovary, distinctness of styles, and other differences in floral features sufficed to produce the *Trillium nivale*.

RANGE OF THE TRILLIUM NIVALE

The Snow Trillium is not only confined to North America but to a limited area south of the Great Lakes as the map² in fig. 2

¹ Gates, R. R. A Systematic Study of the North American genus *Trillium*, its variability, and its relation to Paris and Medeola. *Annals, Mo. Bot. Garden.* 4:43 92. 1917.

² The information given by the map was obtained by a questionnaire to various herbaria and botanists of the United States and Canada.

shows. Excepting slight extensions into Pennsylvania, West Virginia, and Kentucky, its range is confined to the North Central States. Why it is so limited in its range when many of the other species have a wide range is inexplicable. The *Trillium grandiflorum*, for example, which apparently requires a warmer temperature in which to flower than *Trillium nivale* extends far into Canada.

The Snow Trillium, like other trilliums, is a woodland plant and thrives best where the woods is somewhat open. In the prairie states naturally it is confined to the wooded valleys and bluffs of streams.

The Snow Trillium is not limited to any particular type of woodlands for it occurs where maple, oaks, lindens, and other deciduous trees dominate, and also in timbered areas where evergreens, such as pines and hemlocks prevail. Neither is the Snow Trillium confined to a particular type of soil. Its range is confined very largely to the late glacial drifts but extends beyond the southern borders of the late drifts. In Iowa it occurs generally on sandstone formations while in Wisconsin it is reported to be common on limestone formations.

MORPHOLOGY

The fundamental structure in the Snow Trillium, as in all trilliums, is the perennial scaly bulb or corm which in the Snow Trillium in the flowering stage is about four inches below the surface of the soil. The corm, as shown in fig. 3, consists of segments each of which usually represents a years growth. At the apical end of the corm is a meristem which forms the aerial shoot

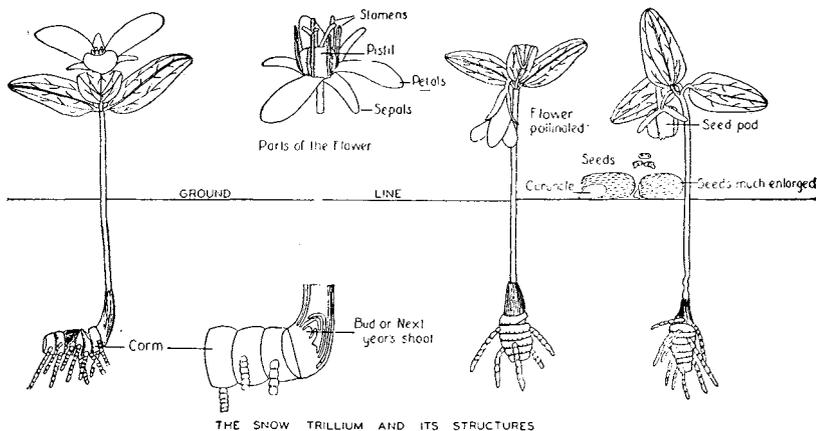


Fig. 3

that appears above ground each spring. The meristematic tip and the bud formed by it are well enclosed by the bases of the leaves and stems of previous years. The remnants of the old leaves and stems are the scales of the corm.

In late fall or early winter a lengthwise section through the bud at the apex of the corm reveals that the shoot which is to spring up the following spring is already formed, even to the pollen in the anther if the plant has attained the flowering stage. Meiosis and the formation of pollen occurs, in October or November.

As commonly reported in the Trilliums there are twelve pairs of chromosomes in the Snow Trillium. The chromosomes are extremely large, equalling or exceeding those of the lilies.

The ovary contains three locules and commonly produces twenty five or more seeds. The seeds are ellipsoidal, about two millimeters in length and one in width (fig. 3). They have brown, roughened, hard seed coats, and a prominent caruncle near one end (fig. 3).

LIFE CYCLE

The life cycle, beginning with the seed, is shown in figure 4. My efforts so far to germinate the seeds have failed. Like the seeds of most wild plants they apparently require the effects of weathering over winter. Evidently the seeds germinate early in the spring for very small seedlings with a corm consisting of one tiny segment and one small root can be found at the time the older plants are in flower. During the first year and a number of years following, the plant sends up only one simple leaf. Each year a new segment, usually larger than the preceding one is added to the corm. The new segment develops new roots, usually one, and also

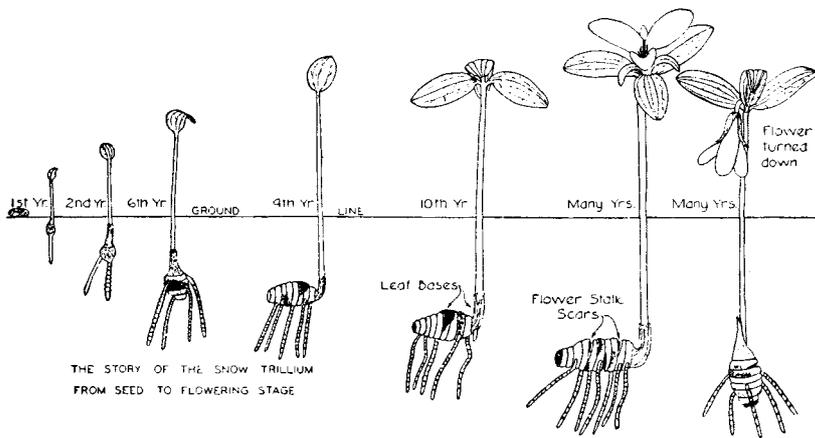


Fig. 4

a new bud at its forward end. After a number of years, commonly nine or more as estimated by the corm segments, the corm sends up a stem that bears three leaves but no flower (fig. 4). After a period of a variable number of years in which the corm has been increased annually by larger segments, a stem is produced on which a flower is borne in addition to the three leaves. Since the older segments of the corm die after a few years and their identity is lost, it is not possible to determine the age of plants when they attain the flowering stage, but the size of the segments of the corm at the flowering stage as well as the number still present suggest that the plants are generally twelve or more years of age before they venture to produce flowers.

Pollination is apparently accomplished by insects for the flowers are well visited by insects when the temperature permits. Soon after pollination the pedicel begins to curve and bring the flower beneath the leaves where the ovary and seeds mature (fig. 3). In early June in central Iowa and probably during June throughout the range of this trillium, the seeds are shed and the entire portion of the plant above ground suddenly disappears.

The seeds are probably carried beneath the leaves or other surface debris by ants or other insects which utilize the caruncle for food, and in this way the seeds are brought near to or in contact with the soil and where they are protected.

The remainder of the story of the life cycle of the parent plant occurs in the corm underground. During the remainder of the season after the Snow Trillium has shed its seeds and disappeared from view, the corm is utilizing the food made by the leaves during their short period of activity in forming the new shoot that is to appear the following spring. After a Snow Trillium has reached the flowering stage it can produce flowers an indefinite number of years.

LIFE PERIOD OF THE SNOW TRILLIUM

There is no evidence that the meristematic tip of the Snow Trillium ages. The meristems of plants in general do not age, but their death is caused by the death of the structures upon which they depend for water and food. In the corm of the Snow Trillium the older segments die but they are continually replaced by new ones at the forward end of the corm and the new segment formed each year and its meristem are as youthful as those of the preceding years. The new segment formed each year has its own root and bears the leaves and is therefore self supporting. There is

nothing in the constitution of the corm that limits its length of life. Barring external destructive agencies, the Snow Trillium is unlimited in length of life.

THE GRADUAL LOWERING OF THE CORM

It is to be noted in fig. 4, that the corm is situated a little deeper in the soil each successive year and that the roots appear segmented as well as the corm. The roots expand laterally and shorten longitudinally at regular intervals throughout their length and are thereby much shortened. By means of the contraction of the roots added each year the corm is dragged down from the surface of the soil where germination occurred to a depth finally of several inches.

SUMMARY

The *Trillium nivale* probably flowers the earliest of the vernal plants. It grows at temperatures near freezing, and its flowers and other portions of its aerial shoot can endure temperatures considerable below freezing.

It is peculiarly limited in its range, being confined largely to the vicinity south of the Great Lakes.

It is a woodland plant, but is not limited to any particular type of woods or soil.

The fundamental structure of the Snow Trillium is the perennial corm which adds a new segment each year and by means of an apical meristem provides a new aerial shoot each year.

The Snow Trillium has a one-leaf stage a number of years in length. The one-leaf stage is followed by a stage several years in length in which a stem bearing three leaves is produced.

Finally the flowering stage is reached in which a stem bearing both leaves and a flower is formed.

The Snow Trillium has an indefinite life period of many years or centuries barring external destructive agencies.

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