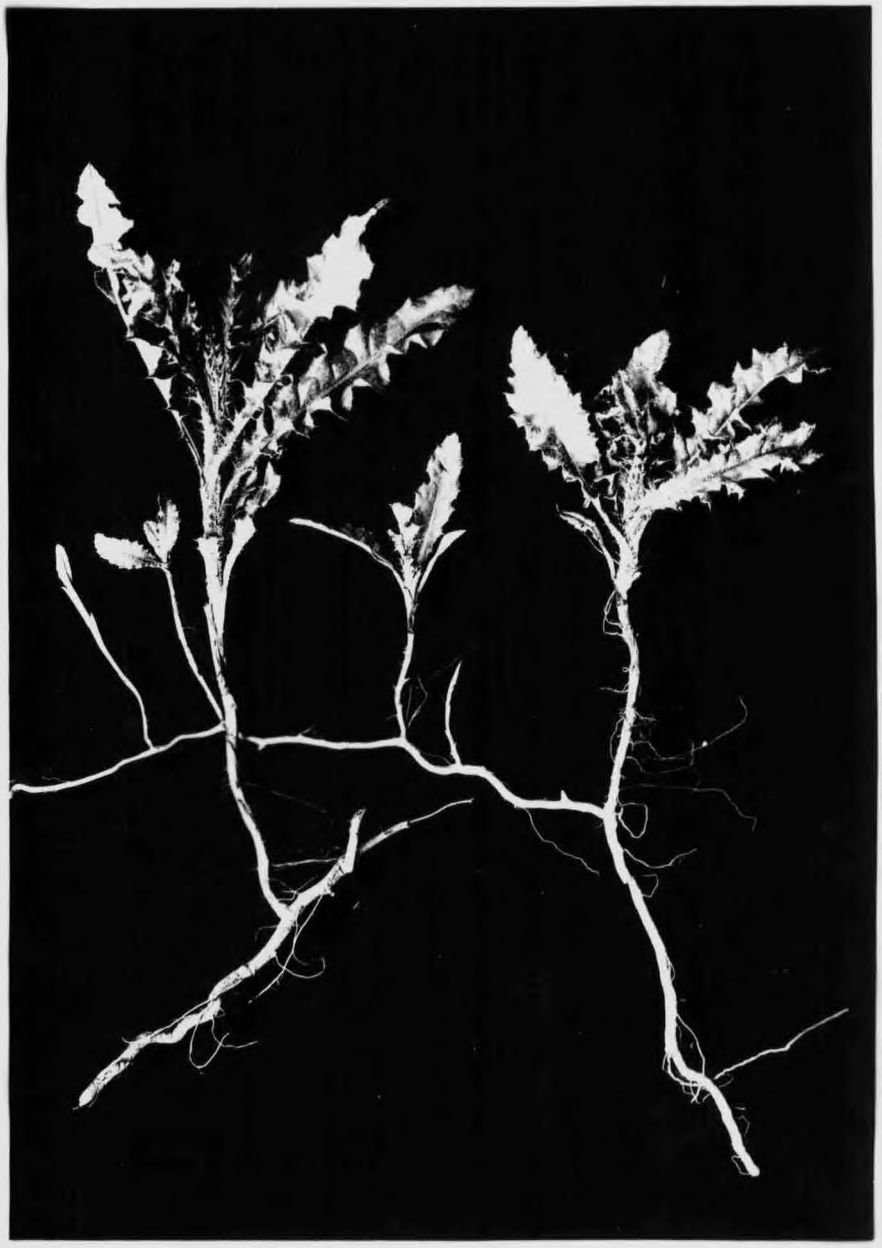
A morphological and histological study of the underground organs of the Canada thistle
by Chester W Griffin

A THESIS Submitted to the Graduate Committee in partial fulfillment of the requirements for the Degree of Master of Science in Botany and Bacteriology
Montana State University


Abstract:
1. The underground creeping storage organs of the Canada thistle are true roots, because they exhibit typical root structures both externally and internally, 2. The young roots show the diarch arrangement of vascular tissues, 3, The branch roots originate in the pericycle of the mother root, 4, The origin of the adventitious shoot primordium is in the pericycle of the underground storage roots, 5, Adventitious roots originate in one to three cells of the inter-fasicular cambium in young, etiolated thistle shoots, 6. The typical root structures are formed in the primordium of an adventitious root before it breaks through the epidermis of the stem* 7. The vascular system of the root is a continuation of the tissues of the two fibrovascular bundles between which it arises, 8. The underground storage roots give rise to etiolated shoots early in the spring and these shoots develop adventitious roots in abundance, 9. The plant propagates itself by the horizontal root system, or segments of it, and by the shoots which may have become severed from the storage roots, 10, In nature, the shoot normally remains attached to the underground roots. The first adventitious roots, which arise on the young stems, are intemodal and just above the axils of the leaves, later, numerous roots develop along the internodes, 11, Numerous adventitious roots can be forced at the internodes by severing the shoot from the underground root and placing It in darkness and excessive moisture*



Cirsium arvense Tourn.
(Canada thistle)

The adventitious shoots of the "Canada thistle" develop upon the extensive creeping root system, and give rise to numerous adventitious roots.

# A MORPHOLOGICAL AND HISTOLOGICAL STUDY OF THE UNDERGROUND ORGANS OF THE CANADA THISTLE

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Bozeman, Montana
June, 1934

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# A MORPHOLOGICAL AND HISTOLOGICAL STUDY OF THE UNDERGROUND ORGANS OF THE CANADA THISTLE

## INTRODUCTION

The creeping underground portions of Cirsium arvense (L.) Scop., which function as storage organs and as a means of propagation, have been referred to in the literature both as "underground roots" and "root-stocks." It is evident from the confusion of terminology pertaining to these underground portions, that no histological work has been reported which shows that they are "underground roots", or, that they are "root-stocks." The writer has found no records showing the anatomy of the Canada thistle with reference to the origin of the branch roots, the origin of the adventitious shoots, or the origin of the adventitious roots which develop upon the adventitious shoots. In the study reported in this paper, the writer has investigated: (1) the external and internal structure of the creeping underground storage organs of the Canada thistle; (2) the origin of typical branch roots; (3) the origin of adventitious shoots from the underground storage organs; and (4) the origin of the adventitious roots which arise from the adventitious shoots.

## NOMENCLATURE

In 1623, Caspar Bauhin (2) called the plant Carduus in avena proviens. Bauhin was the first man to use the generic name Carduus for this plant. In 1687, Theodorus Jacobus Tabernaemontanus (29) described and illustrated this thistle under the name Carduus arvensis. In 1700,

Joseph Tournefort (30) named this thistle Cirsium arvense. According to Britton and Brown (3), Linnaeus, 1753, called the plant Serratula arvensis in his "Species Plantarum." In 1772, Johann Anton Scopoli (24) restored the name Cirsium arvense Tourn. In 1777, Steven Robson (22) referred to the thistle as Carduus arvensis, thus reviving the name previously used by Tabernaemontanus (29). In 1804, George Hoffman (14) published the name Cnicus arvensis.

Cirsium arvense Tourn., Carduus arvensis (L.) Robs., and Cnicus arvensis Hoffm., are used in the various manuals of flowering plants. Britton and Brown (3) separate the genus Cnicus from the genera Cirsium and Carduus by the manner in which the achenes are inserted upon the receptacle. In both Cirsium and Carduus, the involucral bracts are not hooked and the leaves are bristly. The separation of these two genera is based upon the characteristics of their pappus bristles. The pappus bristles of the genus Cirsium are plumose, while in the genus Carduus, they are not plumose.

Detmers (8) made a critical comparison of the characters of these named genera as given in the manuals, and she states that the Canada thistle belongs in the genus Cirsium. Jackson (16), in compiling the genera and species for the Index Kewensis, recognized the name Cirsium arvense Scop. Detmers (8) states that Scopoli (24) revived the name Cirsium arvense which had previously been used by Tournefort (30) in his description of the Canada thistle.

In this paper, the name Cirsium arvense (L.) Scop., which is in

harmony with International Rules of Botanical Nomenclature, is adopted as the correct name for the plant which is commonly known as the Canada thistle.

## HISTORICAL

Tabernaemontanus (28) described the Canada thistle as "having a fusiform tap root with many smaller root branches." Knight (17) mentioned the occurrence on the stems of certain varieties of apples of "rough excrescences, formed by congeries of points which would have become roots under favorable circumstances." Lemaire (18) was concerned with the origin of naturally occurring endogenous adventitious roots in hypocotyls, stolons, and rhizomes of herbaceous dicotyledons. He made a study of the origin of adventitious roots in several families which included the following species: Veronica beccabunga L., Veronica officinalis L., Mimulus luteus L., Valeriana dioica L., Hippuris vulgaris L., Primula elatior Jacq., Polemonium reptans L., Epilobium tetragonum L., Circaea lutetiana L., Ranunculus aquatilis L., Callitriche stagnalis Scop., Chrysosplenium oppositifolium L., Montia rivularis Gm., Mentha arvensis L., Alchimilla vulgaris L., Mercurialis perennis L., Hedera reticulata DC., Oxalis stricta L., Lotus uliginosus Schk., Viola palustris L., Vinca major L., Asperula odorata L., and Nasturtium officinale R. Br. He grouped the plants studied into the following four classes, of which the first is the most common: (1) all tissues of the root originating in the pericycle of the stem; (2) the central cylinder of the root coming