

Variations in Shape of PERENNIAL SOWTHISTLE

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A research grant by the Agricultural Research Service, USDA, on cytotaxonomy of weeds is making possible a study of variability among plants of perennial sowthistle (*Sonchus arvensis* L.). The objective of the research is to determine if sowthistles are variable in their susceptibility to herbicides and to identify the resistant plants on the basis of differences within their cells. Preliminary study has shown that sowthistles vary widely in physical appearance, suggesting genetic diversity.

Sowthistle plants were collected from natural infestations at several locations and transferred to pots in a greenhouse. The samples collected include 208 from 42 locations in North Dakota, 74 from 19 locations in Minnesota and 23 from five locations in South Dakota.

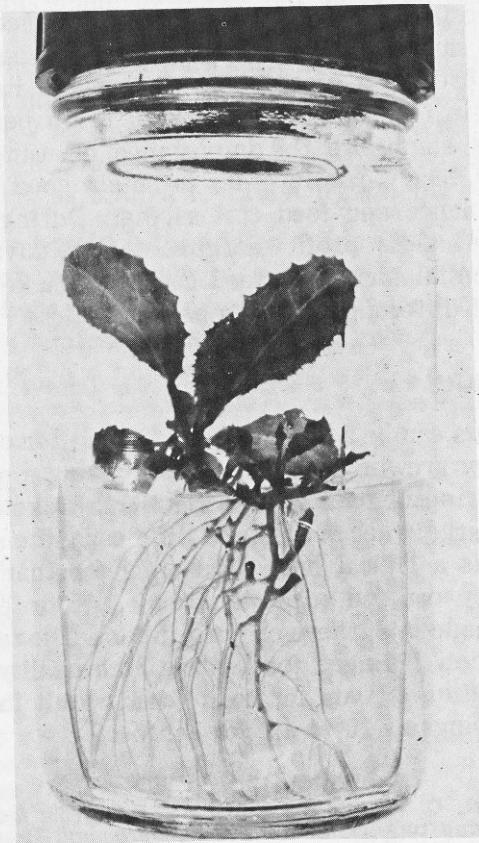


Figure 1. Sowthistle growing in nutrient agar showing adventitious buds on the roots.

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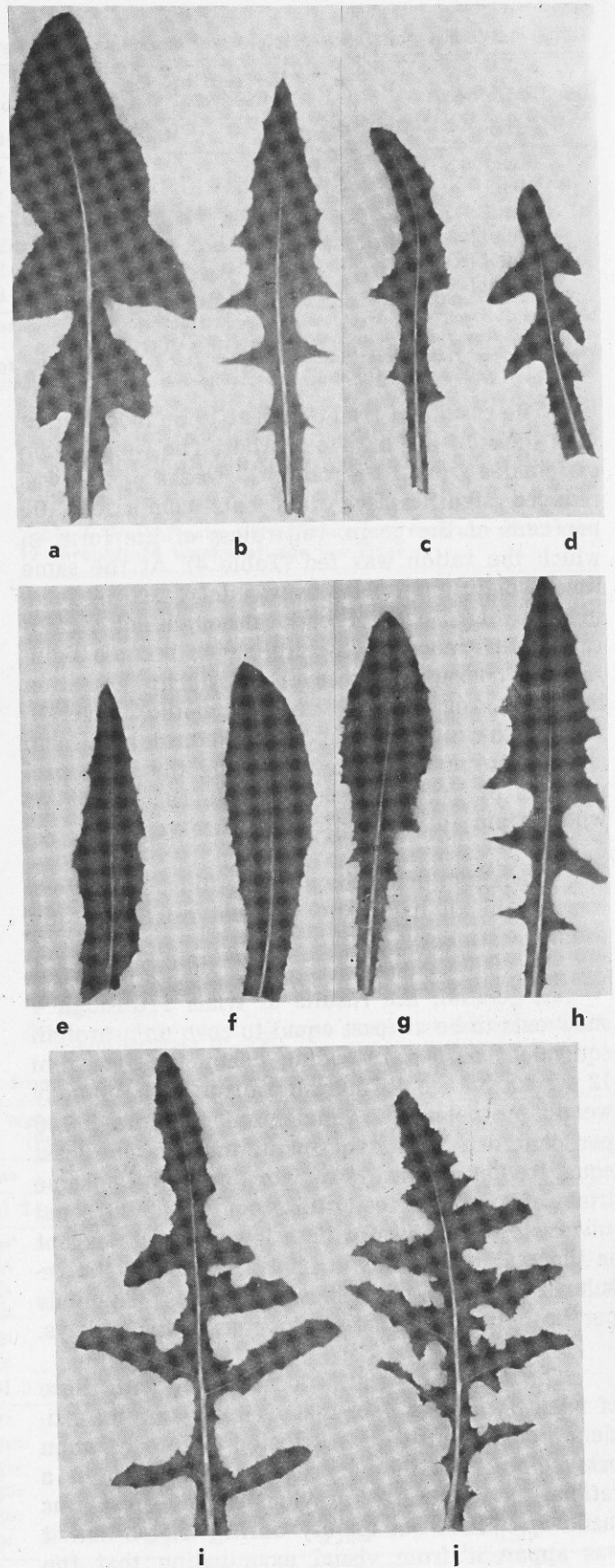


Figure 2. Leaves removed from the same relative position on different sowthistle plants.

DIVERSITY PERPETUATED

Sowthistles of widely varying appearance may occur at any particular location. Neither the pollen nor the ovules (seeds) of sowthistle flowers from different individual plants are genetically uniform. Therefore, the seed of one plant resulting from normal cross pollination will produce plants which differ genetically. Thus, diversity among sowthistle plants is perpetuated.

Sowthistle reproduces from adventitious buds on roots as well as from seed. The development of new plants from adventitious buds on the roots is shown in Figure 1. The plant in Figure 1 was started from an immature seed by embryo culture and is shown growing in a nutrient agar bottle (1). Plants which develop from adventitious buds would be similar in appearance to the original plant. Therefore, in a small undisturbed area or "patch" of sowthistle all of the plants may have had a common origin and have similar appearance. Several "patches" of different types of sowthistle may overlap, resulting in one "patch" containing plants which differ in morphology (shape) and possibly in tolerance to herbicides.

Variety and Shapes

Sowthistle leaves vary widely in morphology as indicated in Figure 2. Each leaf was taken from a different plant at the same relative position on the plant stem. The leaf margins may be relatively smooth as in **f**, irregular as in **e** and **g**, deeply lobed as in **i** and **j**, or shallow lobed as in **c**. The lobes may be broad as in **a** or narrow as in **b**. The angle formed between the midrib and a lobe may be acute as in **d**, obtuse as in **i** or a right angle.

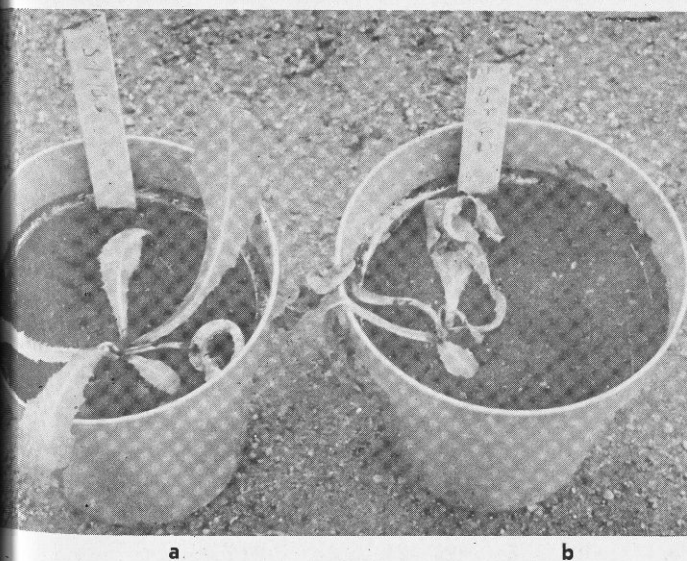


Figure 3. Sowthistle plants treated with $\frac{1}{4}$ lb./A of 2,4-D amine. Plant "a" is more resistant to the herbicide than plant "b".

The margins of a lobe may be parallel or form a triangle as in **a**. They may be relatively smooth as in **a** or irregularly serrated as in **i** and **j**.

As shown in **d**, the leaf base may be narrow, consisting of little more than a midrib. On the other hand, the base may be the widest part of a leaf.

In addition to the variation in shape, sowthistle leaves vary in texture. The leaves of some plants are thick and waxy while others are thin and wax free. Some young leaves are covered with many fine bristles while others have only a few.

In addition to the above morphological variations, leaves range in color from a relatively light green to dark green and some plants have red around the leaf midrib. According to O. A. Stevens (2), variation in morphology of sowthistle leaves is caused by nonuniform growing conditions as well as genetic diversity. However, in this study, the plants were placed in a greenhouse after collection, eliminating environmental variation. Therefore, the differences in leaf morphology can be attributed to genetic diversity.

Susceptibility Differs

The variability which exists in sowthistle morphology suggests that possibly variations in susceptibility to herbicides also exist. Preliminary investigations involving two different lines of sowthistle grown from root sections demonstrated a difference in susceptibility to low rates of 2,4-D amine (Figure 3). Plant **a** is from the more resistant line and plant **b** is from the more susceptible line. Should a wide variation in susceptibility exist among sowthistle plants, the use of a herbicide at the low rates commonly recommended in small grains and flax would kill only the more susceptible plants and leave the resistant ones.

If sowthistles which are resistant to low rates of a particular herbicide are allowed to reproduce, the infestation which results is likely to contain a higher percentage of resistant plants than before the herbicide was applied. Thus, through the process of selection, a sowthistle infestation could become more resistant to a herbicide. If a sowthistle infestation would build up resistance to a herbicide, higher herbicide rates or perhaps a new and possibly more costly herbicide would be necessary for effective chemical control.

LITERATURE CITED

1. SCHOOLER, A. B., 1962. Technique of crossing wild and domestic barley species. 22(7):16-17.
2. STEVENS, O. A., 1923. Growth and Reproduction of Perennial Sowthistle. Master's Thesis, NDAC Fargo, N. D.