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## THE RAPID EXTENSION OF WEEDS IN MICHIGAN.

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In volume five of the Michigan Academy of Science, may be found an approximately correct list of weeds indigenous to Michigan. This list consists of about thirty-five species only. The same report contains a list of seventy-eight species of weeds introduced from Europe and Asia.

For use in the laboratory, I have a list of two hundred and six species of weeds to be found thriving in this state, and I feel sure that if this state was thoroughly searched, fifty or more additional ones would be found, and where the limit will eventually be, I dare not predict.

## HOW ARE WEEDS INTRODUCED AND HOW ARE THEY SPREAD?

1. By live stock, carried in the hair or fleece or carried by the feet; in some instances passing alive with the excrement.
2. By unground feed stuff purchased.
3. By adhering to the insides of sacks where they were placed with grain.
4. In barnyard manure drawn from town.
5. In the packing of trees, crockery, baled hay and straw.
6. By wagons, sleighs, threshing machines.
7. Sometimes by plows, cultivators and harrows.
8. By railway trains passing near a farm.
9. By ballast of boats at wharves.
10. By wool-waste at factories.
11. By birds, squirrels, and mice.
12. By water of brooks, rivers, by washing and by irrigating ditches.
13. By the wind aided by little wings and by drifting on the snow.
14. By dropping seed to the ground from extending branches and repeating the process.
15. By creeping rootstocks, as June grass, quack grass and toad-flax.
16. By piercing potatoes, carrots, etc. Quack grass, June grass, Bermuda grass are sometimes carried to other fields or farms where the tubers and roots are planted.
17. As every kind of weed goes onto a farm to stay there, it follows that as a country becomes older the greater the number of kinds of weeds. As a rule, each farm is annually getting more sorts of weeds, and as each farmer is cultivating weeds, they are more freely distributed in every field and along every roadside, and by exchanging seeds, they are carried to neighboring farms.

A great many farmers buy and sow whatever the merchant offers them under the name mentioned. For example, I have a sample of something called clover seed, sold by a dealer in this state. It contains about 40% of narrow-leaved plantain, which I consider one of the worst of clover weeds. A large majority of weeds hail from older countries, more especially from Europe.

There are a few weeds, like Canada thistle and quack grass, that may infest any crop of farm or garden, but in most cases, whether to call a weed



very bad depends on the nature of the crop grown, the size of the seed, and their time of ripening.

Some weeds have a very wide distribution, thriving all around the world in temperate climates, while others are more limited in range; some thrive only in dry, thin soil and others in wet soil. To some extent the presence of a few weed seeds is almost as objectionable when once on the farm, as though there were more, because these few thrive and seed freely.

In many respects the list of weeds for New Jersey is different from the list in Michigan, while half the weeds of Nevada or Oregon are not known in our state.

Chess, cockle, red root, rye are liable to be troublesome in fields of winter wheat, because the seeds are more or less difficult to separate from this grain and for the reason that they require a portion of two years to come to maturity. When the thrifty farmer screens out the smaller grains of wheat to get the large grains for seed, by the same process he has screened out seeds of cockle, and unintentionally bred up a race that bears larger seeds.

Meadows and pastures, especially where the land is not fertile, abound in weeds that require two or more years to produce seeds, such as narrow-leaved dock, bitter dock, bull thistle, carrot, teasel, two kinds of mullein, night-flowering catchfly, evening primrose, several kinds of fleabane, ox-eye daisy, orange hawkweed, two or three kinds of plantain, Canada thistle, hound's tongue, stick seed, sow thistle, horse nettle, buttercups, toad flax, silvery cinquefoil, and many more, not excluding some annuals, like crab grass, tickle grass, the pigeon grasses. As crops of corn, potatoes, beans, turnips, beets, squashes are ready to harvest at the close of one growing season they are molested more or less by pigeon grasses, several pigweeds, purslane, crab grass, barnyard grass, tickle grass and a number of others.

#### WHAT ENABLES A PLANT TO BECOME A WEED?

1. Sometimes by producing an enormous number of seeds. A large plant of purslane produces 1,250,000 seeds; a patch of daisy fleabane, 3,000 seeds to a square inch.

2. In other cases by the great vitality of their seeds. Shepherd's Purse, purslane, mustard, mayweed, pepper grass, evening primrose, smart weed, narrow-leaved dock, chickweed, pigweeds, pigeon grass, survive for 25 years or more, as I have proved by testing them.

3. Some plants are very succulent, and ripen seeds even when pulled. (Purslane).

4. Often by ripening and scattering seeds before the cultivated crop is mature. (Red root, fleabue).

5. Sometimes by ripening seeds at the time of harvesting a crop, when all are harvested together. (Chess, cockle).

6. Some seeds are difficult to separate from seeds of the crop cultivated. (Sorrel, mustard, narrow-leaved plantain and the two pigeon grasses).

7. Some weeds are very small and escape notice. (Mullein, fleabane).

8. Some plants go to seed long before suspected, as no showy flowers announce the time of bloom. (Pigweeds).

9. In a few cases the plants break loose from the soil when mature and become tumble weeds. (Some pigweeds, Russian thistle, winged pigweed).

10. Some remain with the dead plant long into winter, and when torn off by the wind or by birds, drift for long distances on the snow, often from one farm to another. (Pigweeds).

11. Some seeds and seed-like fruits are furnished each with a balloon, or a sail, or with grappling hooks. (Dandelion, sticktight, burdock).



12. Two seeds in the fruit of cockle bur are so placed that one grows the first year, and the other remains dormant till the second year.

13. Some have creeping rootstocks or tubers. (Quack grass, nut-grass).

14. Some weeds defend themselves with forks and bayonets. (Thistles).

15. Stout rooted plants are skipped by the cultivator. (Dock).

16. Most of them are disagreeable in taste or odor, so that domestic animals leave them to occupy the ground and multiply. (Jamestown weed, stink grass, milkweed).

I have recently examined 122 samples of clover seeds, which contained 51 kinds of weed seeds; 9 samples of this number contained no weed seeds.

Seventy samples of clover seed contained seeds of *Chaetochloa viridis* (green foxtail).

Sixty samples contained *Plantago lanceolata* (buckhorn).

Fifty-eight samples contained *Plantago Rugelii* (Rugel's plantain).

Fifty samples contained *Rumex crispus* (narrow-leaved dock).

Forty-six samples contained *Rumex acetosella* (sheep sorrel).

Thirty-six samples contained *Polygonum Persicaria* (lady's thumb).

Thirty samples contained *Chenopodium album* (lamb's quarters).

Twenty-three samples contained *Plantago major* (one of the broad-leaved plantains).

Twenty-three samples contained *Panicum Crus-galli* (barnyard grass).

Twenty-one samples contained *Ambrosia artemisiaefolia* (common rag-weed).

Seventeen samples contained *Panicum capillare* (hair grass).

Sixteen samples contained *Panicum sanguinale* (crab grass).

Fifteen samples contained *Potentilla Monspeliensis*.

Fourteen samples contained *Amaranthus retroflexus* (our most common rough pigweed).

Thirteen samples contained *Lepidium Virginicum* (one of the pepper grasses).

Nine samples contained *Chaetochloa glauca* (yellow foxtail).

Nine samples contained *Alsine media* (our most common chickweed).

Eight samples contained *Nepeta Cataria* (catmint).

Seven samples contained *Lepidium apetalum* (a small pepper grass).

Six samples contained *Prunella vulgaris* (self heal).

Five samples contained *Cerastium vulgatum* (mouse-ear chickweed).

Four samples contained *Bromus secalinus* (common chess).

Three samples contained *Rumex obtusifolius* (broad-leaved dock).

Three samples contained *Anthemis Cotula* (Mayweed).

Three samples contained *Onagra biennis* (evening primrose).

Three samples contained *Daucus carota* (wild carrot).

Two samples contained *Panicum lineare* (narrow-leaved panicum).

Two samples contained *Lithospermum arvense* (red root).

Two samples contained *Lolium perenne* (perennial rye grass).

Two samples contained purslane.

Two samples contained *Cichorium Intybus* (chickory).

Two samples contained *Brassica nigra* (black mustard).

Two samples contained *Carduus arvensis* (Canada thistle).

Two samples contained *Cuscuta arvensis* (dodder).

Two samples contained *Verbena urticifolia* (nettled-leaved verbena).

One sample contained *Medicago lupulina* (black medick).

One sample contained *Ranunculus bulbosa* (bulbous crowfoot).

One sample contained *Ranunculus repens* (creeping crowfoot).



One sample contained *Sinapis arvensis* (white mustard).  
One sample contained *Verbena hastata* (blue vervain).  
One sample contained *Chaetochloa Italica* (Hungarian grass).  
One sample contained *Carduus lanceolata* (bull thistle).  
One sample contained *Arenaria serpyllifolia* (a chickweed).  
One sample contained *Amaranthus graecizans* (a tumble weed).  
One sample contained *Solanum rostratum* (beaked nightshade).  
One sample contained *Lepidium campestre* (a common peppergrass).  
One sample contained *Silene vulgaris* (bladder campion).  
East Lansing, April 1, 1909.

## THE EFFECT OF LONGITUDINAL COMPRESSION UPON THE PRODUCTION OF MECHANICAL TISSUE IN STEMS.

[Abstract.]

L. H. PENNINGTON.

This work was undertaken to determine whether a pressure exerted in the direction of the long axis of a growing stem may act as a stimulus to cause the plant to produce more or stronger mechanical tissue in the part under compression.

For each experiment a series of plants of the same age and of uniform size were selected. The height and at least two diameters of each plant were measured, one diameter of the part to be compressed and the other of the part a short distance above the compressed portion. At a suitable distance from the ground, loops were tied around each stem, which was protected from injury by pieces of soft cloth. Each plant was then securely fastened in a perpendicular position by stakes to prevent bending or swaying, and weights were suspended from the loops upon half of the plants while the other half were left without weights to serve as controls. At the conclusion of the experiment the plants were measured as at the beginning of the experiment and each stem was tested to determine its resistance to bending and to crushing. From suitably prepared and stained cross sections of the stems, measurements were made to determine the relative amount of mechanical tissue.

Both woody and herbaceous plants were used. The woody plants were sprouts and seedlings of the common locust, *Robinia Pseudo-Acacia*, sprouts of the Aspen, *Populus tremuloides*, and both young and one-year-old sprouts of Sumach, *Rhus glabra*. The herbaceous plants were the common Sunflower, *Helianthus annuus*, the Castor-oil Plant, *Ricinus communis*, and the broad bean, *Vicia faba*. In the case of woody shoots, the experiments were begun in the spring before growth began and continued until autumn, additional weights being added as the stems became able to bear them. In some series of herbaceous stems, very young plants were used, in others older plants were used; some series were kept under compression for a short time, ten to fifteen days, others for longer periods.

In no case however, did the average of a series of experimental plants show a gain in strength or in mechanical tissue over a like series of control plants.

Ann Arbor, April 12, 1909.