# A STUDY OF THE INHERITANCE OF LEAF FORM IN TARAXACUM PALUSTRE VAR. VULGARE LAM.

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It is a matter of common observation that among different plants of *Taraxacum palustre var. vulgare Lam.* there is a great variation in leaf form. When all are growing under the same environmental conditions, we cannot attribute these differences to factors of the environment. Sears[2] carried out experiments to determine the role of senescence and rejuvenescence in producing variations in the leaf form of *Taraxacum vulgare* (Lam.) *Schrank* now *T. palustre var. vulgare Lam.* and *T. laevigatum* (*Willd*) *D. C.* and found that senescence produces steady increase in the degree of dissection of the leaves while rejuvenescence, such as when multicipetal branching occurs, brings about a return to the juvenile form. He concludes that environmental factors are of secondary importance in influencing leaf form. Stork[6] carried out cultural experiments with eight leaf forms of *T. vulgare* and found that the seedlings varied among themselves as well as differing from the parent plants.

## METHODS

Unopened seed heads of thirty-six different leaf types of *T. palustre var. vulgare*, together with one or more typical leaves from each plant were collected near the University of Wyoming Science Summer Camp, August 10-15, 1936. The plants were growing together in an area of about one hundred square feet.

Seeds from each head were planted in separate Dixie cups the ninth of February. Sixteen cups produced good stands of seedlings which were thinned to four or five in each cup to avoid overcrowding. The cultures were kept in a greenhouse under as uniform conditions as possible and observations were made frequently.

## RESULTS

From the first there was a great deal of variation among the different sets of seedlings. Some were dark green with a short, thick hypocotyl, while others were tall and slender and light green. There was also considerable difference in the size of the cotyledons.

The first true leaves appeared on all seedlings at about the same date. Two sets of seedlings had first leaves with one pair of rudimentary lobes, one set had leaves with one or two pairs of rudimentary lobes, six sets had two pairs of rudimentary lobes, three sets had two or three pairs of lobes, and three sets had three pairs of rudimentary lobes. There was no noticeable difference in size or shape of the leaves in each set but there was great variation between the different sets of seedlings.

Among the specimens, numbers 8, 18, 22, 23, and 31 developed rather highly dissected leaves early while the remaining cultures varied from entire to moderate dissection.

The cultures were transferred to open ground out-of-doors June 1, and seemed to do well until August 1. The plants increased greatly in size and would doubtless be blooming soon if they had survived an attack of worms which destroyed the roots.

At the last observation, the degree of dissection of all sets of plants had greatly increased but in all cases the tendency was for the members of each set to resemble the parent plant producing them rather than the members of the other sets of plants.

## DISCUSSION

If the environment were the controlling factor in producing the various degrees of dissection of leaves or *Taraxacum*, then plants of the same age under the same environmental conditions should have very similar leaves, such was not the case among the different sets but was the case among the members of each set.

If cross or self-pollination were successful, the range of leaf forms would be limited within the species. Resemblance between parent and offspring would be no more than between any two plants. Since the leaves of all the seedlings from each head were apparently alike at each stage and since they grew to resemble the parent plant, there must be no genetic mixing occurring during reproduction.

Sears[3], [4] studied reproduction in *T. palustre var. vulgare Lam.* and found that parthenogenesis was the rule. He reviews the literature bearing upon the problem of parthenogenesis in *Taraxacum* and presents evidence from other workers; Anderson and Hesselman found arctic species of Taraxacum producing no pollen but producing fruit. Raunkier carried out castration experiments with various Danish Taraxaca and found that viable seed was produced. Kirchner made extensive studies of the stigmas of Taraxacum but although pollen was abundant, none was found germinated. Juel, in 1904, found that the embryo sac was produced with only one maturation division, although the prophase resembled the heterotypic division. He found that Taraxacum shows a diploid number of univalents instead of the haploid bivalent chromosomes in diakinesis.

Stork[6] worked on T. laevigatum and found the species to be ooapogamous.

Sears[4] found that two maturation divisions did occur and that in the early prophase of the first maturation division, a split thread is produced from which 26 univalent chromosomes are produced. In the second maturation division, almost typical reduction may occur, with perfect end to end pairing of the univalents, or a qualitative division may occur, resulting in diads from which the functional embryo sacs arise. The latter process is the one which results in reproduction, since it is the only mechanism found, which provides the chromosome complement typical of the species. Sears proposes the term *ameiosis* for this method of reproduction (ameiotic parthenogenesis).

Since the pollen does not germinate and the flowers produce viable seed when the anthers and stigma are removed, parthenogenesis must occur. If this is true, then the progeny of each plant would show, unaltered, any genetic peculiarities found in the parent and we could have a great many races or types of plants maintaining themselves from generation to generation, as by vegetative reproduction. The results from this experiment seem to show that this is the case.

It should be noted that Sears[4] found that there are at least four courses that may be followed in the chromosomal behavior in maturation, one of which results in successful parthenogenetic reproduction. In this experiment, only 16 heads produced viable seed out of a total of 36 heads and that in the 16 heads with viable seed, germination varied from 20% to 100%.

## CONCLUSIONS

Among seedlings of the same age from different leaf types of *T. palustre var. vulgare*, there is variation in the time of appearance, degree of dissection, and form of leaves.

Among seedlings from the same head, such variations are strikingly lacking. Under the same environmental conditions, seedlings from the same head are very much alike.

Regardless of the final degree of dissection, a regular sequence of leaf forms, from the nearly entire of youth to the highly dissected of maturity at blooming are produced by *T. palustre var. vulgare.*

Finally, since amiotic parthenogenesis is essentially a vegetative method of reproduction, there is no reason why the form of the parent should not be transmitted to all descendants unchanged. There seems to be evidence that such is the case with *Taraxacum palustre var. vulgare.*

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