

## UNUSUAL DICHOTOMOUS BRANCHING IN VERNONIA.\*

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During the summer of 1918, the writer observed a remarkable occurrence of dichotomy in the stems of the ironweed, *Vernonia baldwinii* Torr. (*Vernonia interior* Small). Large numbers of stems were found that had a perfect dichotomy occurring at various heights from the ground to near the top of the inflorescence. The writer has observed isolated, individual cases of such two-forked branching or twinning in other plants, as for example in the inflorescence of *Chatochloa viridis* (L.) Scrib. and *Lacinaria punctata* (Hook.) Ktz. But such examples have been exceedingly rare.

Since the study of abnormal developments has received a new importance in practical investigations on heredity, it was thought worth while to make a record of the facts observed. At Morganville, Clay County, Kansas, several hours of superficial search along two ravines for about a mile resulted in the discovery of 81 such stems, mostly belonging to different individual plants. This *Vernonia* is a crown-former, sending up a number of shoots each year which are usually unbranched below the inflorescence unless injured, when abundant branching occurs of the usual monopodial type from buds in the leaf axils. The shoots are usually from 1—6 feet high and the inflorescence is much branched.

The division of the bud begins by a widening of the stem which soon becomes grooved on the two sides and after some inches of this double or twin structure gives rise to two usually separate branches. It is rather difficult to observe the plants rapidly because the dichotomous shoot may be hidden by neighboring, normal ones but the abnormality is nevertheless very striking. Only one clump was found in which all the stems were dichotomous and this individual had but three shoots. Usually one or occasionally two shoots are dichotomous in a clump. Sometimes a shoot is forked a second time above either in one or both branches and it is interesting to note that in all such cases found the second dichotomy is at right angles to the first.

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FIG. 1. Pressed shoots of *Vernonia baldwinii* Torr., showing dichotomous branching. The third specimen shows each primary branch forked a second time at right angles to the first.

A very few plants were found with fasciated stems. Fasciation was exceedingly rare when compared with the dichotomous branching. One shoot was found which was both fasciated and dichotomously branched and which also had a number of twin and forked leaves. The forked leaves have dichotomous midribs.

At Emporia, Kansas, 24 plants were found with dichotomous stems in a narrow strip through a pasture about one-half mile long. Near Meriden, Kansas, north of Topeka, 55 plants with the dichotomous shoots were found, as the result of a short search in two pastures. Some of these were also twice forked.

These three stations are about 90 miles apart each way and it is evident that the dichotomous sporting is not local but probably is a characteristic of the entire species, occurring regularly in a given percentage of individuals. From the fact that more commonly only a single shoot among a half dozen or so, which develop on a fair sized individual, is dichotomous, it appears probable that in some years an individual might have forked shoots and in others not. This might easily be observed in transplanted individuals.

Dichotomous systems are extensively developed in the thallophytes, as in the red and brown algæ and also in the gametophytes of the *Bryophyta*. Among sporophytes of the higher plants the monopodial system of branching or some modification of it, namely, a true lateral branching system, is almost universal, except in the *Lepidophyta* where a remarkable dichotomous system was developed, as represented in *Lycopods* and *Selaginellas*. In the great tree forms of *Lepidodendron* and *Sigillaria* the repeated dichotomy of the crown and of the root system forms a truly remarkable type of tree when compared with our present trees with monopodial or sympodial systems.

Now it appears exceedingly interesting to the writer that such a dichotomous system should be developed in the ironweed which we may assume has had its monopodial character for millions of years and must have had a purely monopodial ancestry from the beginning of a branching system in the sporophyte. It is a dichotomous factor added in the presence of a monopodial factor of stem development. In the case of the *Lepidophyta*, the dichotomy was probably originated in a plant without any branching ability whatever in the stem. The *Lepidophyta* are far isolated in many characters from all other vascular plants.

It is possible that a dichotomous system might become normally hereditary in *Vernonia* but the present freak seems to be a case of ever-sporting or recurrent variation of the same nature as the fasciated cock's-comb and many other examples mentioned by De Vries. But from its wide distribution and abundant occurrence the writer is inclined to believe that this variation is a tendency of the whole species. There is a "bent" at least for the factor to be evolved if it is not universally present in a suppressed state. Whether the individuals that have dichotomous shoots would repeat the character more abundantly than those which are normal, as seems probable, can be determined by experiment. Of course, there may have been a primitive mutation which survived and became generally hybridized with the normal form. It may also be a case of double expression, something like the expression of lobed and unlobed leaves on a white mulberry tree.

Seed was not available at the time when the writer left Kansas for the east, but since one can find the dichotomous individuals so readily, seed can easily be obtained by any one at the proper season, because the character shows in the mature or dead shoots as well as in the younger stage of growth.