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## A LIST OF OHIO PLANTS WITH COMPOUND LEAVES.

WALTER FISCHER.

In making out a list of plants having compound leaves, a few words on this subject and on the light relation of plants in general may not be out of place.

From what is known of the function of leaves it is evident that with the exception of plants in xerophytic conditions, the greater the surface exposed and provided this is done in such a way as not to handicap the plant in other ways, the better will that plant be enabled to survive in its struggle for existence.

Plants may secure a better exposure to light and air in any of the following ways:

1. By motile leaves and stems.

2. By increase in height or length, thus providing room for a greater number of leaves, as in trees, vines and ivies.

3. By leaf arrangement in which the plant secures the best possible light relation by arranging the material on hand to its best advantage. Here we have rosettes, mosaics, etc.

4. By an increase in the size of the leaf blade or the lengthening of its petiole. When the petiole is lengthened it is only to place the leaf in a better position, so this phase of leaf enlargement would more properly come under No. 3. When an enlargement of the blade takes place it must be in such a manner that nothing will be sacrificed to light or strength and it is evidently for this reason that we get the great variety of forms which gradually lead up to the compound leaf.

In our common Monocotyls leaf enlargement takes the form of increase in length only; this being necessary on account of the parallel system of venation which could not prevent the leaves from becoming shredded when exposed to wind and rain, something which does take place in a great many palms. Some of the palms which have pinnately compound leaves and the aroids present quite an exception to this statement however, as their leaves are usually quite large and expanded. Our common *Arisaemas* are very distinctly palmately compound.

Among Ferns and Dicotyls we have the greatest variety of forms ranging from those that are but slightly toothed or lobed to those which are deeply lobed, cleft or divided, until finally the division is so marked that we have a compound leaf apparently made up of separate leaves on a common axis and petiole. That these compound leaves are a gradual development from simple ones may be readily observed by comparing the leaves of different species in the same families or genera; those of different individuals in the same species and finally the older and later leaves on a single individual. Leaves that are pinnately veined will give rise to pinnately compound ones, while those which are palmately veined will give rise to leaves that are palmately compound. Of the ferns, *Botrychium* affords the best example of compound leaf development from the simpler forms like *B. lunaria* to the highly complex leaf of *B. virginianum*. In different species of *Ranunculus* all transition forms are also easily observed. Often another feature is added here. In some forms the plants have the rosette habit while young and when leaves are few; later the leaves become compound and thus avoid shading the older ones. The writer has before him a seedling of *Robinia*, in which the first true leaf is a simple one; the second and third are each composed of three leaflets; the fourth, fifth and sixth each of five; and the seventh and eighth each of seven leaflets.

Thus in the history of species as well as in the history of individuals, the simple leaf is the first to appear and may usually be regarded as the more primitive form. Although the acquirement of compound leaf forms is a higher development it is not necessarily restricted to the higher groups. Some of the best types of such forms are found in the lowest leaf bearing plants like ferns, cycads and buttercups and are nearly absent in the Compositae. They seem to have been acquired independently as a parallel development as is shown by their presence in widely separated groups and in isolated genera and species. In some families as in Leguminosae, Juglandaceae and Umbelliferae, the character is already fixed; in others as in Ranunculus, Geum, and Potentilla, it seems to be a more recent development; while others again show no indications whatever of a tendency to develop higher types of leaves.

Before concluding a few words might be said on the advantage accruing to plants which possess a higher type of foliage. Plants which grow in the shade and where vegetation is dense could present a greater surface without additional shading. It would obviate the necessity of lengthening the petioles of the lower leaves or of decreasing the size of upper leaves and would thus be a distinct gain to the plant. This arrangement is especially marked in some of the climbers. In ferns which are plants usually growing in the shade, a compound leaf seems almost a necessity as the stems are as a rule underground and they must **depend entirely** upon their leaves for exposure to air and light. Plants which grow in exposed situations would be greatly benefited as they could increase their foliage surface enormously without exposing themselves to injury by wind, rain or hail. This would be most likely to occur in trees. In our common Kentucky coffee tree the leaf stalk has taken the place of the smaller twigs and its branches present a very naked condition in winter, causing them to expose but a small surface to winter storms. This would certainly be of great advantage to the tree.

It seems as though no definite conclusion could be drawn as to when, where and why plants develop a more complex leaf system, especially as so many plants develop it in connection with some of the other features that enable it to reach the light. A closer study of the question seems to present more problems than solutions. This is undoubtedly because plants are continually shifting from place to place and from one condition into another. So that if certain characters are developed and become fixed when the plant lives in one condition they need not be lost if the plant is forced to migrate or if this condition is changed, as they might not necessarily be a disadvantage to it. Until then, the entire geological history of the different groups is known it would be impossible to tell why plants with similar habits and

growing under similar conditions should develop such a great variety of leaf forms.

The following is a list principally by families and genera of Ohio plants possessing leaves that are compound or nearly so. Since it is often difficult however, to distinguish between leaves that are truly compound and those deeply divided, the more typical forms have been put under separate heads with a large list of unclassified ones by themselves. The finely segmented immersed forms are not included in the list.

With pinnate leaves:

Osmunda, Woodsia, Dicksonia, Cystopteris, Dryopteris, Phegopteris, Woodwardia, Asplenium, Pteris, Juglans, Hickoria, Potentilla (3 species), Comarum, Agrimonia, Sanguisorba, Rosa, Sorbus, Cassia, Amorpha, Kuhnistera, Cracca, Robinia, Astragalus, Phaca, Vicia, Lathyrus, Apios, Xanthoxylum, Ailanthus, Floerkea, Rhus (all but one species), Acer negundo, Aralia, Fraxinus, Cuscuta indecora, Polemonium, Tecoma, Sambucus, Valeriana sylvatica.

With bipinnate leaves:

Osmunda regalis, Gymnocladus dioica, Gleditsia triacanthos, Acuan illinoensis.

With trifoliolate leaves:

Arisaema triphyllum, Coptis, Polanisia, Proteranthus, Rubus, Fragaria, Waldsteinia, Baptisia, Stylosanthes, Meibomia, Lespedeza, Falcata, Phaseolus, Strophostyles, Oxalis, Ptelia, Rhus radicans, Staphylea, Cuscuta epithimum, Valeriana pauciflora.

With palmately compound leaves:

Arisaema dracontium, Cannabis sativa, Potentilla (2 species), Lupinus perennis, Medicago, Melilotus, Trifolium, Lotus Psoralea, Aesculus, Parthenocysus, Panox.

With dichotomously decompound leaves:

Adiantum pedatum.

With ternately compound or decompound leaves:

Isopyrum, Cimicifuga, Aquilegia, Anemone, Syndesmon, Clematis, Thalictrum, Caulophyllum, Bicuculla, Adlumia, Capnoides, Dentaria, Cardiospermum.

With leaves more or less cleft, divided, compound or decompound and not otherwise classified.

Onoclea, Pellaea, Helleborus, Trollius, Actaea, Delphinium, Aconitum, Ranunculus, Jeffersonia, Papaver, Stylophorum, Argemone, Chelidonium, Fumaria, Lepidium, Sinapis, Brassica, Rhabanus, Barbarea, Iodanthus, Roripa, Cardamine, Sophia, Arabis, Reseda, Aruncus, Potentilla, Geum, Ulmaria, Agrimonia, Geranium, Erodium, Malva, Hibiscus, Umbelliferae (all but 4 genera), Hydrophyllum, Ambrosia, Silphium, Rudbeckia, Ratibida, Coreopsis, Bidens, Dysodia, Achillea, Anthemis, Matricaria, Tanacetum, Artemesia, Carduus.