

**The Wild Legumes of
Maryland.**



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AGRICULTURAL EXPERIMENT STATION,
College Park, Maryland.

THE MARYLAND AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 100.

MARCH, 1905.

THE WILD LEGUMES OF MARYLAND AND THEIR UTILIZATION.

By J. B. S. Norton and E. P. Walls.

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The value to the soil of the cultivated leguminous plants has long been recognized and they are now being used extensively, aside from their great feeding value, for adding to the nitrogen and humus content of the land.

The wild plants of this kind, next to the grasses and composites, form a larger part of our native flora than any other family of plants, and since many of them are closely related to the kinds doing best under cultivation it is reasonable to suppose that some of the wild species are of value in the same manner as the cultivated ones. It is the design of this bulletin to furnish a list of the leguminous plants found wild in this State, showing the localities and kinds of soil and surroundings where they grow best, and indicating the ways in which they may be utilized, with suggestions as to the possible improvement of the more valuable species, experiments along this line being in progress now at this Experiment Station.

Extensive collections and observations over the State as well as all available herberia and published records have been used as the basis of this work. In addition to our own observations some of the notes on uses, etc., have been taken from various standard works.

UTILIZATION.

The most valuable use of the wild legumes is in improving soil by means of nitrogen compounds produced in them from the assimilation of free atmospheric nitrogen in the nodules on their roots. For this reason their protein content is unusually high and they also then make most useful feeding stuffs. A few are trees and have valuable wood. Some have very ornamental flowers, while a few are bad weeds or even poisonous.

RELATION OF LEGUMINOUS PLANTS TO SOIL FERTILITY.

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There seems to be an erroneous belief among those not thoroughly conversant with the subject, that a legume will increase the fertility of any soil, by taking up nitrogen from the air, regardless of prevailing conditions, and previous treatment of the soil; and that all green manuring crops are legumes. Therefore at the beginning it may be well to explain the soil conditions which are necessary in order that legumes may gather nitrogen from the air, and also make a distinction between those green manuring crops which gather atmospheric nitrogen, and those which either consume or only convert the soil nitrogen, or, strictly speaking, the leguminous and non-leguminous green manures.

In order that a legume may assimilate nitrogen from the atmosphere, the soil must primarily contain or be inoculated with certain bacteria, whose presence is manifested by the growth of nodules on the roots, through which it is believed that the atmospheric nitrogen is obtained. These germs are usually found abundantly in most well-tilled soils.

Any crop may serve as a green manure, but leguminous crops possess a greater value for this purpose, than others, because they can obtain certain of their constituents from sources not accessible to all plants. Therefore in order to show the value of legumes as green manure, it is necessary here to separate them from other green manuring crops, which, instead of increasing the supply of soil nitrogen, actually decrease it.

FERTILIZING POWER OF LEGUMINOUS AND NON-LEGUMINOUS PLANTS.

The most important legumes available for use as green manures, are crimson clover, red clover, cow peas, and soja beans. They are not only valuable on account of their nitrogen-gathering property, but their period and time of growth make them very convenient crops. The quantity of nitrogen which these crops gather from the air, depends largely on the amount of nitrogen stored in the soil, for they will gather at least a part of their nitrogen from the soil, in preference to that of the air, unless starved of soil nitrogen. Therefore the exact amount of nitrogen which a plant gathers from the air, cannot be determined by the content of nitrogen in the plant. But it has been determined by experiment that they do gather nitrogen from the air, and store it in their own tissues which, by decaying, allow it to be used by other crops, which can obtain this valuable element only from the soil. For this reason, they can, by judicious growing, be made a very potent factor in the economical production of crops.

The principal non-leguminous green manures are rye, buckwheat and mustard. They do not increase the supply of soil nitrogen, but by their time of growth, prevent the loss of this element by leaching, which is very liable to occur if the soil is left naked. They improve the mechanical and physical condition of soils, and conserve the soil nitrogen. But while they retain the supply of nitrogen in the soil, they convert it from the immediately available to the less available organic

form. Therefore while the practice of growing these non-leguminous crops as green manures, is desirable, if wisely followed, it should be



Fig. 1—Soy Bean—After Abel, Farmers' Bulletin 121, United States Department of Agriculture.

remembered that they do not add plant food to the soil, but only increase the organic matter.

TUBERCLE PRODUCING BACTERIA AND METHODS OF SOIL INOCULATION.

It has been stated above that in order for a legume to utilize the atmospheric nitrogen, a certain germ or bacterium must be present on the roots. This germ enters the young roots, and after locating itself, causes a multiplication of cells around it which produces the tubercles seen on such roots. This mass of cells remains soft and succulent, in comparison with the rest of the roots, and is always sufficiently porous to admit the atmospheric nitrogen, which is abundant in all well cultivated soils. The exact means by which the bacteria place the nitrogen of the atmosphere at the disposal of the plant is not thoroughly understood, but it is known that the tubercles are the dwelling places of the germs, through which the atmospheric nitrogen reaches the plant.

Because of the fact frequently observed that one kind of legume would not produce nodules in soil which abundantly supplied another legume with these growths, it has been supposed that each legume required a special and peculiar nodule organism.

Efforts have been made to distinguish between these bacteria specifically, and separate names have been assigned to the microbes from nodules of peas, beans, clover, etc. Most investigators, however,



Fig. 2—Peanut—After Abel, Farmers' Bulletin 121, United States Department of Agriculture.

have been unable to discover any constant difference in the appearance and general characteristics of the bacteria of the various legume nodules, and the results of the most recent research on this question seem to prove that there is only a difference in variety and not in species.

Dr. Geo. T. Moore, of the United States Department of Agriculture, Washington, D. C., in laboratory experiments, succeeded in producing nodules on a large number of legumes by inoculation with a single culture. As a result of a great many cross-inoculations, made in every possible combination, Dr. Moore concludes, "that it was satisfactorily demonstrated that it is possible to cause the formation of nodules upon practically all legumes no matter what the source of the original organisms." Nevertheless, it is certainly true that the bacteria seem to adapt themselves to the conditions surrounding the growth of a particular legume and, from a practical standpoint, it will be necessary, in order to obtain the best results, to use specific cultures or sources of bacteria for specific crops.

But if these bacteria are absent, how are we to supply them? This is one of the most important items to be considered in the growing of leguminous crops. This process, known as soil inoculation, may be affected by applying the material containing the germs directly to the soil, or by bringing the seed in contact with the inoculating material before planting. Soil from a field where a leguminous plant has been recently and successfully grown, is a good inoculating material for the same plant, in a soil destitute or deficient in the required form of bacterial life.

At the Kansas Experiment Station it was found that soja beans would not bear tubercles. They then proceeded to inoculate the Kansas soil with inoculated soil from the Hatch Experiment Station at Amherst, Massachusetts. Of course, only a small area was inoculated at first, and from this more extensive inoculation took place. Two methods were used; first, the finely-pulverized, Massachusetts soil was placed directly in the hill; secondly, water was added to a certain quantity of soil placed in a suitable vessel. The soil was allowed to settle to the bottom, and the water was then drawn off and applied to the plants.

From this experiment it was determined that the best time to inoculate a soil is at the time of planting a crop, and that it is better to inoculate with soil directly than to use the extract. But both methods gave very satisfactory results. This practice was carried on, on a small scale, for several years, and then the soil thus inoculated, was used in a drill, as fertilizer, after being finely powdered, and applied at the rate of six hundred pounds per acre. This drilling method is an ideal way of inoculating the soil.

There is a prevailing belief that all leguminous plants increase the fertility of the soil, but there are a few species of this family that do not gather atmospheric nitrogen; therefore, they do not increase the fertility, except by the addition of humus, and by improving the mechanical condition of the soil, which may be said of most plants. It is safe to say that only those legumes increase the fertility of the soil which bear tubercles on the roots, and those plants which do not produce tubercles are not agricultural legumes, although they are properly classed as Leguminosae. Practically all of the wild Maryland species examined have tubercles on the roots, which goes to show that their specific germ, if any, is widely distributed in the soils, making inoculation in most cases unnecessary, unless with an improved strain of bacteria to increase the yield.

COMPARATIVE VALUE OF WILD AND CULTIVATED LEGUMINOUS PLANTS.

In considering the use of a leguminous crop on cultivated land one would naturally turn to such cultivated kinds as are already well known and adapted to our farms; for example, red clover, crimson clover, alfalfa, cow peas, vetch, etc. Some of the wild kinds, however, might prove as valuable under cultivation, at least when the better strains have been selected and improved.

But when we consider the large areas of uncultivated land in Maryland, where no crop is or will be grown under present conditions, the value of the wild legume in building up such land by adding humus and nitrogen becomes much more worthy of consideration, especially if we remember the fact that the most of our waste woodland and fields are covered with a natural growth of leguminous plants, doing their work without a particle of labor on the part of the owner. On many thousand acres of waste land over one-half of the weed growth is composed of nitrogen gathering leguminous plants. If by any means these



Fig. 3—Cow-pea—After Abel, Farmers' Bulletin 121, United States Department of Agriculture.

plants can be encouraged to grow on uncultivated land their value will be increased. The rank growing forms and those most rich in nitrogen or which seed themselves most rapidly could be introduced on places where they do not now occur, and might soon take the place of useless weeds. A great many of these species grow with the greatest ease on

dry, sandy or sterile land where other plants would not succeed until the legumes had opened the way. Some like the partridge-pea, rabbit-clover, and hop-clover, often cover the stubble fields with a spontaneous growth in summer and thus add to their fertility.

OTHER USES.

Bush-clovers, the wild true clovers, beggar-ticks, etc., form the most valuable part of the wild pasture of the woodlands, and the occurrence of leguminous weeds in cultivated fields is not to be regretted as much as that of many other plants of less value to the soil. The seeds of many leguminous plants, for example, beans and peas, are good food materials; others contain valuable coloring matters and the bark of many is exceptionally rich in tannin; some are cultivated for ornament.

Other minor uses will be mentioned under the individual species in the list to follow.

FUTURE POSSIBILITIES.

Many things remain to be determined regarding the useful qualities of the wild leguminous plants. The herbage, roots and seed of the different kinds should be subjected to chemical analysis to determine their varied nitrogen content. They should be examined with reference to the presence of a greater or less amount of nodules on the roots. The most promising should be cultivated and improved from year to year by selection of the best for different purposes—hay, pasture, green manuring, seed, etc. Experiments along some of the more important of these lines are in progress at the Maryland Experiment Station. Several kinds are being grown and seed of the most promising kinds, like some of the beggar-ticks, bush-clovers, and partridge peas, have been planted.

MARYLAND LEGUMINOSAE.

Our wild leguminous plants are distinguished from other plants, first by their irregular flowers (usually with ten stamens) which more or less resemble those of the pea and bean, although they may be much smaller, and often clustered in heads, which may be mistaken for a single flower, as in the clover. Exceptions are the cassias, honey locust, and albizzia, which have regular flowers; the last two being trees and the cassias being recognized by the finely divided, pinnate leaves and flat bean-like pods.

A second characteristic of legumes is the compound leaves, with three or more leaflets, to each leaf, as in clover, or with many small leaflets arranged like the parts of a feather (pinnate) as in the partridge-pea (see Figure 9). Sometimes the leaf ends in a tendril (as the vetches) and in the lupine the leaves are arranged as in the clover but five or more leaflets together on the end of the leaf stalk. A peculiar swollen joint is seen at the base of each leaf or leaflet by which they

fold up at night, etc. Exceptions in leaf form are the red-bud tree, which has a large heart-shaped leaf, and the rattle-box with entire leaves having arrow-shaped wings on the stems below each.

As a third distinguishing mark, nearly all leguminous plants have more or less pea-like pods which, however, may be short and only one-seeded as in the case of clover or alfalfa.

DISTRIBUTION IN THE STATE.

The maps prepared from our notes and specimens show that while several species of Leguminosae are found in all parts of the State which

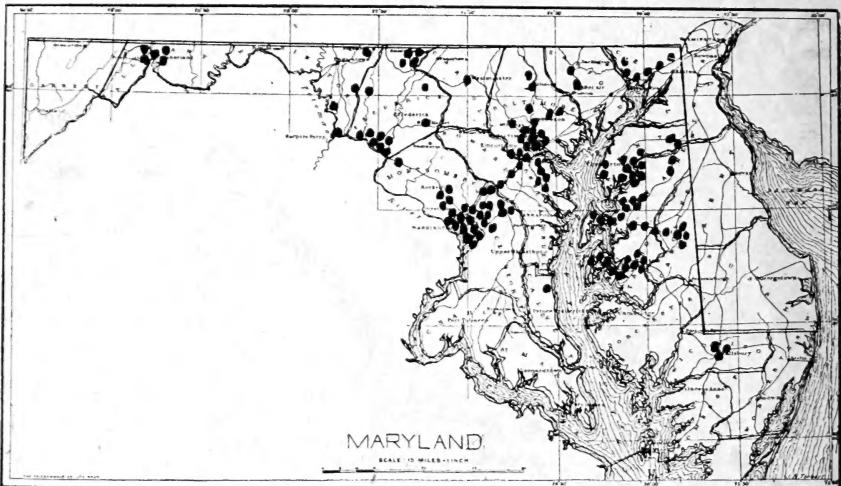


Fig. 4—The dots show where introduced legumes have been found wild in Maryland.

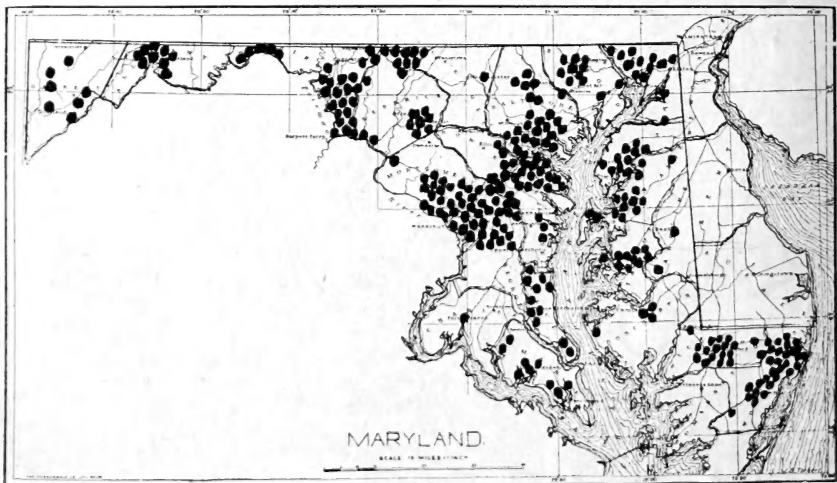


Fig. 5—The dots show where native legumes have been found in Maryland.

have been examined, many more of both species and individuals occur in the sandy lands of Prince George and Anne Arundel Counties, and the southeast and central parts of the Peninsula than elsewhere. Very few species are abundant in wet lands; consequently marshy regions, like those of Dorchester and Somerset Counties, are not abundantly



Fig. 6—The dots show parts of Maryland which have been explored botanically.

provided with them; the salt water is destructive to most legumes, especially some of the clovers. Neither do the mountainous sections

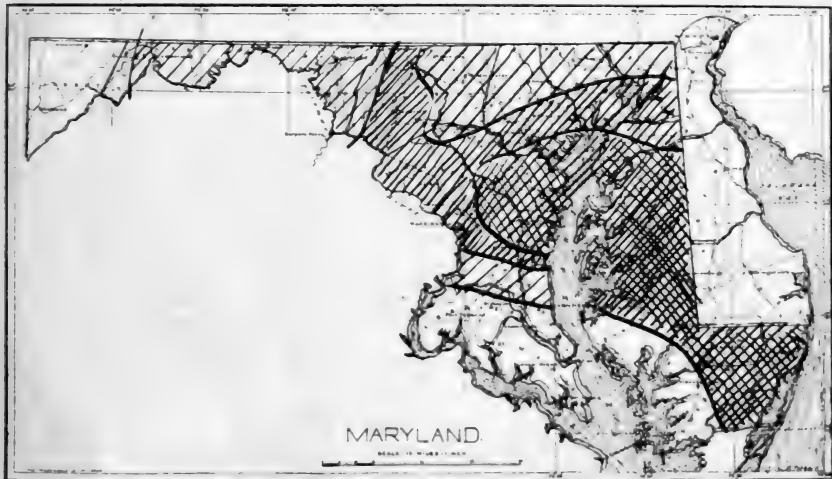


Fig. 7—Showing the proportion of leguminous plants in different parts of Maryland to the whole number of plants observed. The heavier shading denotes the greater abundance of legumes. This is based on our notes and collections from various parts of the State, which are not sufficient for more than a rough approximation.

with rich soil seem so favorable to their growth, although these parts of the State have their peculiar species which do well, and legumes of some kind are found in every climate and soil. In many parts of Maryland legumes form from one-quarter to three-quarters of the wild plants. Nearly all our clovers and related plants and several other leguminous species are natives of Europe and have been introduced by man, and run wild here. Figure 4 shows that most of these occur, as would be expected, in the parts of the State where there is most traffic. It must be borne in mind that several parts of the State (see Figure 6.) have not been explored and this must be considered in interpreting these maps.

HOW TO FIND OUT THE NAMES.

If one is interested in the wild legumes growing on his farm and is not familiar with the different kinds, fresh leaves, with flowers and pods, if possible, can be put in an envelope or wrapped in paper and mailed to the Experiment Station, at College Park, where the names will be supplied for him.

The following comparison of characteristics and easily-observed peculiarities of the different species has been devised as a key by which any one unfamiliar with the plants may, with any one of our wild legumes in hand, determine for himself the proper name of it. The figures (Plate I.) of the leaves, etc., will also be helpful. After looking up the plant in the key consult the catalogue of species for a more complete description.



Fig. 8—Nodules on roots of alfalfa.



Fig. 9—Partridge-pea.



Fig. 10—Wild Vetch
(*Vicia angustifolia*).

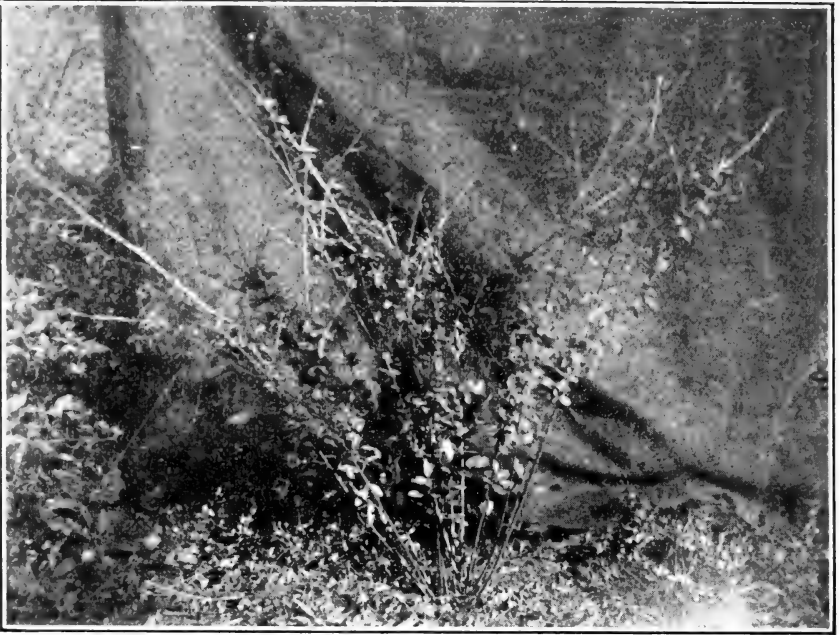


Fig. 11—Beggar-tick (*Meibomia Marylandica*).



Fig. 12 -Bush-clover (*Lespedeza repens*) covering the ground; a beggar-tick in upper left hand corner.

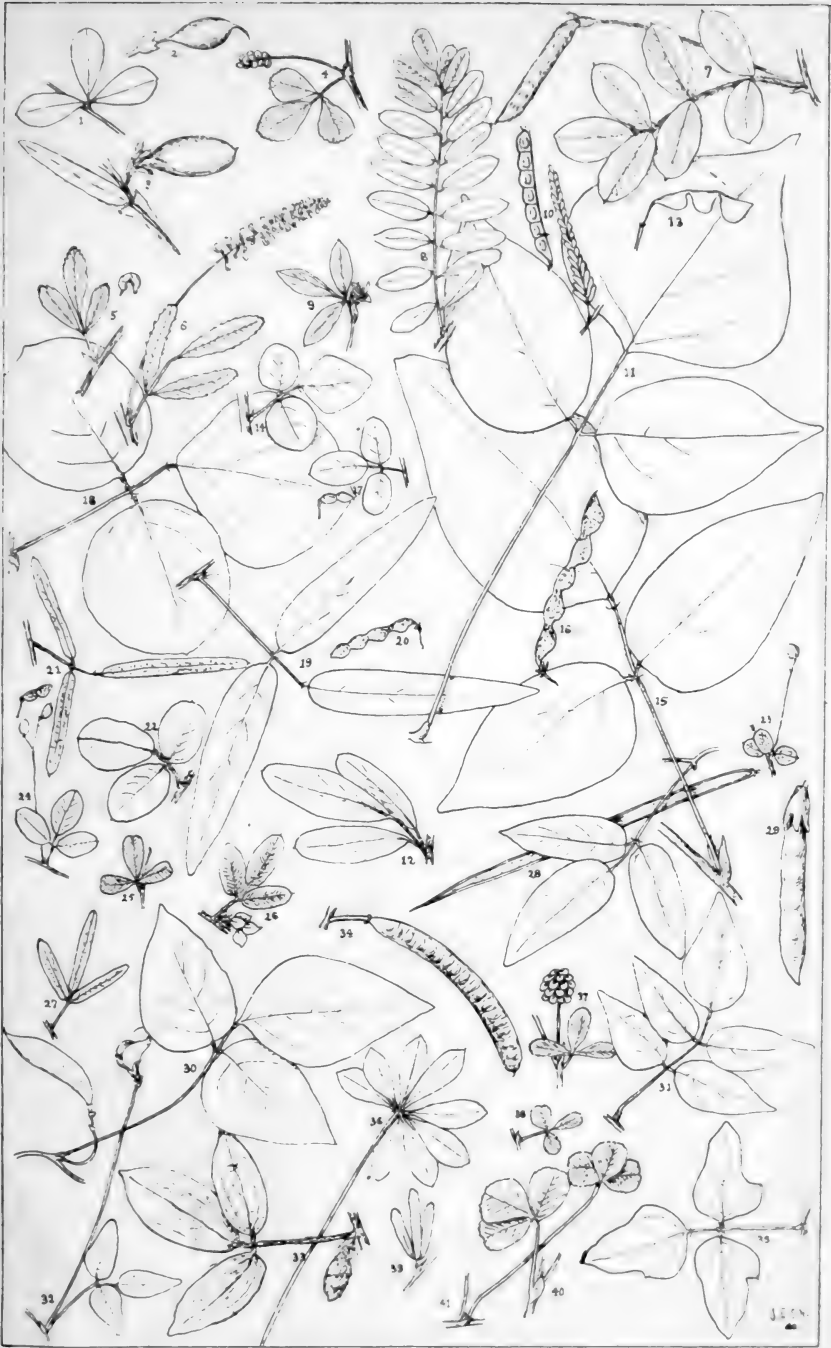


Plate I—Leaves and pods of legumes.

EXPLANATION OF PLATE I.

The figures are all one-half natural size and are nearly all drawn from herbarium specimens of Maryland plants.

- Figure- 1. Leaf of wild indigo.
" 2. Pod of same.
" 3. Leaf and pod of rattle-box.
" 4. Leaf and cluster of pods of black medic.
" 5. Leaf and pod of alfalfa.
" 6. Leaf and flower cluster of sweet clover.
" 7. Leaf and pod of cracca.
" 8. Leaf of cat-gut.
" 9. Leaf and pod of pencil flower.
" 10. Pod and partly folded leaf of joint vetch.
" 11. Leaf of beggar-tick (*Meibomia grandiflora*).
" 12. Leaf of bush-clover (*Lespedeza capitata*).
" 13. Pod of beggar-tick (*Meibomia grandiflora*).
" 14. Small leaf of beggar-tick (*Meibomia arenicola*).
" 15. Leaf of beggar-tick (*Meibomia canescens*).
" 16. Pod of same.
" 17. Leaf and pod of beggar-tick (*Meibomia obtusa*).
" 18. Leaf of beggar-tick (*Meibomia Michauxii*).
" 19. Leaf of beggar-tick (*Meibomia paniculata*).
" 20. Pod of same.
" 21. Pod and leaf of beggar-tick (*Meibomia stricta*).
" 22. Leaf of bush-clover (*Lespedeza hirta*).
" 23. Pod and small leaf of bush-clover (*Lespedeza procumbens*).
" 24. Leaf and two pods of bush-clover (*Lespedeza repens*).
" 25. Leaf of Japan clover.
" 26. Leaf and cluster of pods of bush-clover (*Lespedeza Stuevei*).
" 27. Leaf of bush-clover (*Lespedeza Virginica*).
" 28. Leaf and pod of butterfly-pea (*Bradburya*),
" 29. Pod of butterfly-pea (*Clitoria*).
" 30. Leaf and pod of hog peanut (*Falcata comosa*).
" 31. Leaf of ground-nut.
" 32. Small leaf and flower of wild bean (*Strophostyles umbellata*).
" 33. Leaf and pod of *Dolicholus*.
" 34. Pod of wild senna.
" 35. Leaf of wild bean (*Strophostyles helvola*).
" 36. Leaf of lupine.
" 37. Leaf and head of yellow clover.
" 38. Leaf of hop-clover.
" 39. Leaf of rabbit clover.
" 40. Leaf of alsike clover.
" 41. Leaf of white clover.

KEY.

The different kinds of leguminous plants of Maryland, may for ease in finding the names, be divided into the following classes: A, Trees; B, Climbing or trailing vines; C, Erect or spreading herbs.

A. The three trees may be distinguished as follows: 1. Leaves large and heart-shaped, the pink flowers appearing in the spring before the leaves—*red-bud*. 2. Leaves with 9 to 20 leaflets, 2 spines at the base of each leaf—*black locust*. 3. Leaves with many small leaflets, usually many large thorns on the body of the tree—*honey locust*. *Albizia*, usually seen in cultivation, has many very small leaflets and no thorns.

B. If the vine is woody it is *wistaria*. If not, and each leaf has several leaflets, the vine is one of the following three: A tendril at the apex of the leaf indicating that it is one of the 7 kinds of (1) *vetches* that we have, or one of our two species of (2) *lathyrus*; if there are no tendrils it is the (3) *ground-nut*.

Several of the vines have only three leaflets to each leaf. If the pods of these are composed of more or less triangular, flat, adhesive joints, it is a *beggar-tick*. If the pod is small, flat, and one-seeded, it is a *bush-clover*. If the pods of the vine are bean or pea-like, it is one of the following: *Butterfly pea* (with large purple flowers), one of the *hog peanuts*, the *milk pea* or one of the three *wild beans*.

Black medic and some of the *clovers* are sometimes vine-like.

C. If the herb at hand has only one leaflet to each leaf it is *rattle-box*.

If each leaf has three leaflets, and the pods are several seeded, it is one of the two *indigos* (with inflated pods), one of the many *beggar-ticks* (with flat, jointed, adhesive pods), *butterfly pea* (with large purple flowers) or the *milk pea*.

If each leaf has three leaflets and the pods are only one-seeded, it is one of the two *sweet clovers* (with small, yellow or white flowers in loose spikes), *alfalfa*, *black medic*, one of the *clovers* (with small flowers in heads) one of the many *bush-clovers*, (with flat, one-seeded pods), *Japan clover* or *pencil flower*.

If there are several leaflets radiating from the end of the leaf stalk it is *lupine*.

If the leaves are pinnate with several leaflets and have yellow or orange-colored flowers the plant is one of the *partridge peas*, *wild senna* or *joint vetch*. If the flowers are some other color the plant may be *cracca*, *milk vetch* or *crown vetch*.

After comparing the plants with the above key look them up in the following catalogue of species where the plants named in the key will be found further described.

Sixty-eight species of this family have been found wild in this State and several others probably occur rarely. Each of these is taken up in the following pages, and its distribution in the State, abundance,

habitat, uses, and possibilities discussed. The most important kinds are mentioned first in the list. The most commonly used name, so far as can be determined, is given for each plant, followed by the scientific name.

CATALOGUE OF SPECIES.

The Clovers, Trifolium. The members of this genus found wild in Maryland are nearly all natives of the Eastern hemisphere and introduced by man into America, where they have run wild. Some are well known cultivated plants, but frequently occur wild also. All are



Fig. 13—Alsike Clover—After cut in Bulletin of United States Department of Agriculture.

recognized by the trifoliate leaves, the margins of which are finely toothed, and the small flowers in close heads, bearing straight, unflattened, one-seeded pods. The following clovers are wild in Maryland:

Yellow clover, Trifolium aureum. Usually about twelve inches high, the flowers yellow; the central one of the three leaflets not stalked. Introduced into fields and waste places in Northeastern United States, but not extending as far south as extreme Southern Maryland. Often so abundant in Central Maryland as to form over half of the vegetation of some old fields, and is considered of some pasture value on sandy land. (Plate I. Figure 27).

Rabbit-foot clover, Trifolium arvense. Also called *pussy clover, rabbit clover,* etc. A narrow-leaved, annual clover, one foot high, with soft, silky, cylindrical heads of whitish flowers. Introduced in fields and waste places over the Eastern and Southern States. Common over Maryland, especially in somewhat sandy fields where it often forms the principal growth after harvest. Earlier in fields of low crops, like strawberries, where it is much in the way. It might be utilized as an early mulch, as it matures so much sooner than other clovers. (Plate I. Figure 39).

Hop clover, Trifolium dubium. This small clover may occur rarely in Maryland but has not been found yet. It is from Europe and may be recognized by the heads containing less than twelve small, yellow flowers.

Alsike clover, Trifolium hybridum. A perennial clover, fifteen inches high, resembling the common white clover, but is more erect and pink-flowered. It is native in Europe and occurs wild frequently in the Northern United States. It may frequently be seen wild in fields in Central Maryland, usually among other clovers. Does best in moist land. The flowers furnish honey for bees. (Figure 13 and Plate I. Figure 40).

Crimson clover, Trifolium incarnatum. This well-known cultivated annual clover, one to three feet high, with cylindrical heads of crimson flowers is sometimes seen wild around fields in Maryland and other parts of the Northeast United States.

Red clover, Trifolium pratense. This most common cultivated clover is often found growing wild in fertile fields and meadows of Maryland and other parts of the United States. It is not common wild in our western counties and is not recorded wild from the southern counties on either side of the Bay.

Hop clover, Trifolium procumbens. This species of low, spreading hop clover has heads of twenty to forty yellow flowers and has the central leaflet of each leaf projected beyond the other two by a little stalk. It is found naturalized frequently in all parts of Maryland and states north and south in fields and along roadsides, where it may be of some value as early summer pasture. (Plate I. Figure 38).

Buffalo clover, Trifolium reflexum, is somewhat like alsike clover, but the heads over one inch in diameter and borne on a much shorter stalk above the leaves. It is a native of meadows in many parts of the eastern United States and may occur in Maryland.

White clover, Trifolium repens. The common creeping clover of our lawns and meadows, with small heads of white flowers on slender stalks, six inches or less long, arising from the creeping stems. Native in Europe and northern United States and common wild in moist places in central Maryland as well as other parts of the State. It is an excellent honey plant and is often used in lawns and meadows. (Plate I. Figure 41).

Black medic, Medicago lupulina. A low, clover-like, annual plant, but with yellow flowers and the small, one-seeded pods curved or coiled. Introduced from the Old World where it is well thought of as a forage

plant, but native now in all temperate regions. Common in fields in central Maryland and seen on the Eastern Shore near Easton and Centreville. It is said to be a good pasture plant on wet meadows or stiff clay soils, too poor to grow clover or alfalfa. It stands drouth well. (Plate I. Figure 4).

Alfalfa, Medicago sativa. Wild plants of this well-known agricultural crop have been seen in Maryland at Washington Junction, and



Fig. 14—Alfalfa, or Lucerne (*Medicago sativa*); a, b, seed pod, side and end view; c, seeds enlarged. After Smith, Farmers' Bulletin 66, United States Department of Agriculture.

in District of Columbia. The flowers are rich in honey and the great feeding value is well known. (Figure 14 and Plate I. Figure 5).

Partridge pea, Cassia Chamaecrista. A low, branching, annual herb, one-half to three feet high, with pinnate leaves of about twenty small leaflets each and large yellow flowers which are more regular in shape than in most leguminous plants. Common in the dryer soils in fields east of the mountains of Maryland, especially on the Eastern Shore, and found all over the Eastern States. One of the most promising wild plants for nitrogenous green manuring. Often covers, naturally, the stubble fields with a dense growth. Cultivated occasionally, since very early times in Virginia, for improving land. (Figure 9).

Sensitive pea, Cassia nictitans, is like the last, but smaller and with finer leaves and much smaller flowers; the pods assume a more

erect position than in the partridge pea. Occurs in the same area but not so abundantly, and is a lover of wet, sandy land.

Wild senna, Cassia Marylandica, is an erect, little-branched, perennial herb, three feet high; with large, pinnate leaves and short spikes of yellow flowers. It occurs in rather moist soil, usually along roadsides and edges of fields in Western Maryland, but is not common. It is found in all the Eastern and Southern States. The foliage is sometimes used in medicine in place of the Old World senna. (Plate I. Figure 34).

Bush-clovers, Lespedeza. There are ten species of *Lespedeza* found in the State. They resemble some of the more slender clovers, having wiry stems with trifoliate leaves, the middle leaflets with a short stalk. The pods are small, flat and one-seeded. They form the great body of the wild leguminous covering of the ground in woods and old fields, are eaten by cattle and sheep, especially when young, and do a great deal in building up waste land.

Lespedeza capitata, is a yellow-flowered perennial, about three feet high, with leaflets twice as long as broad. In dry fields or open, sandy woods over the Eastern States. Not seen on Eastern Shore, but occasionally in Western Maryland. It is a good pasture plant. (Plate I. Figure 12).

Lespedeza frutescens. An erect perennial, two feet high, with oval leaflets and clusters of purplish flowers at the top. In dry soil over the Eastern United States. Frequent in Western Maryland but not so common in sandy lands as in the dry upland woods.

Lespedeza hirta. A tall, hairy perennial, three feet high, with oval leaflets and clusters of small, yellowish flowers above. In dry, mostly rocky loam in Eastern States. This is one of the most common legumes in the mountainous and highland counties of Maryland, but is infrequent on the Eastern Shore or in Southern Maryland. (Plate I. Figure 22).

Lespedeza Nuttallii is much like *Lespedeza frutescens* but the flower clusters are longer stalked. It is found in dry soil in most of the Eastern United States. In Maryland one specimen has been seen from Baltimore County and one from Anne Arundel.

Lespedeza procumbens is a trailing perennial, with hairy, oval leaves and very open clusters of purplish flowers. Found mostly in dry woods in the states east of the Mississippi. It has been seen in many places in central Maryland in dry, or especially sandy, woods and in the Atlantic coast counties. It is of some value in wild pastures. (Plate I. Figure 23).

Lespedeza repens is similar to the last, but the leaves are smooth. It is common in open, dry, sandy woods and old fields all over Maryland, and from New Jersey to Texas. It often covers the ground in woods. (Figure 12 and Plate I. Figure 24).

Japan clover, Lespedeza striata, differs from the other *Lespedezas* it being an annual, about ten inches high. It has small, yellow flowers, not in clusters, and the leaflets blunt at the apex and tapering to the

base. It is a native of East Asia, but now grows wild in all the Southern States, where it is esteemed as an agricultural plant, and has been seen wild in Baltimore, Carroll, Montgomery, Prince George, and Cal-



Fig. 15—Japan Clover (*Lespedeza striata*). After Tracy, Bulletin 15, Division of Agrostology, United States Department of Agriculture.

vert Counties and in District of Columbia. It is said to do well on soils deficient in lime, but not in dry, sandy land. (Figure 15 and Plate I, Figure 25).

Lespedeza Sturvei is much like *Lespedeza frutescens* but the leaves and stems are hairy. It is found in dry soil usually in open woods in the Northeastern United States. The only Maryland specimens we have seen are from Easton and Salisbury. (Plate I, Figure 26)

Lespedeza violacea is much like *Lespedeza repens* but erect, two feet high. It is found in dry soil in all the eastern half of the United States. It has been seen but rarely in Maryland near the District of Columbia, and is doubtfully reported from Cumberland.

Lespedeza Virginica is an erect perennial, one foot high, with very narrow leaflets and clusters of purplish flowers along the stem and at the top. It is found in dry soil over all the Eastern United States. This is one of the most common bush-clovers east of the mountains in Maryland in dry woods, especially in sandy places, and along roadside banks. It has not been seen, however, in the two western counties. It is one of the best early pasture plants in woods, etc., and a great soil improver; worthy of trial in cultivation. (Plate I, Figure 27).

Beggar-ticks, *Meibomia*. This genus is also known to botanists as *Desmodium* and locally by the common names of *tick-trefoil*, *beggar-weed* and *beggar-lice*, on account of the adhesive joints of the pods, which are more or less triangular in shape, flat and easily separated from one another. The leaves are usually comparatively large and each with three leaflets. The bush clovers are all perennial herbs, usually tall-growing, the flowers usually purplish like *Lespedeza*, but the more than one-seeded pods distinguish them. Some of them are worthy of trial in cultivation. Several are good forage, especially the woodland forms. The genus is well represented in Maryland by the following species:

Meibomia arenicola is a trailing plant of dry woods in the Southern States, with small, nearly round, almost smooth leaflets; seen only once in extreme Southern Maryland. (Plate I. Figure 14).

Meibomia bracteosa, four feet tall, with broad, long-pointed leaflets, probably occurs in Maryland near District of Columbia, but is seen most commonly in states west of this.

Meibomia canescens is four feet high, with rough, hairy, pale-green, broad, blunt-pointed leaflets. It is common over the eastern half of the United States and is one of the commonest large beggar-ticks of rich soil in Maryland from Frederick to Centreville and Baltimore to Washington, but none have been collected in the State outside this region. (Plate I. Figures 15 and 16).

Meibomia Dillenii is a lower, smoother plant than the last, and the somewhat hairy, thin, oval, green, blunt-pointed leaflets twice as long as broad. Common in woods and old fields north and west of Maryland and in most of our counties west of the Bay.

Meibomia glabella has a long trailing stem, sometimes eight feet long, dull-green, oval leaflets and purplish flowers. It is found in dry, sandy woods along the Atlantic coast, and occurs in Maryland at Salisbury.

Meibomia grandiflora is about two to three feet high, the large leaves with round, short-pointed leaflets clustered at the base of the slender, branched flower stem. This plant occurs in dry or rocky woods in the eastern half of the United States, mostly northward. It has been seen rarely in Maryland and District of Columbia. We have a specimen from Berlin and it is reported from Cumberland. (Plate I. Figures 11 and 14).

Meibomia laevigata. A plant about three feet high with the leaflets oval, blunt-pointed, about twice as long as broad and perfectly smooth. Found in dry woods along the Atlantic coast of the United States. In Maryland it has been seen near Baltimore and Washington and at Easton and Snow Hill.

Meibomia Marylandica. A plant two to three feet high with small, elliptical leaflets with only a few minute hairs on them. The joints of the pod only two or three, most of the other species mentioned having more than three. In old fields in the eastern United States. A com-

mon legume in our waste fields in Maryland, especially in the central part of the State. Berlin is the only place we have seen it on the Eastern Shore but it is no doubt common elsewhere. (Figure 11).

Meibomia Michauxii. Prostrate and almost vine-like, two to six feet long, with large, round, hairy leaflets. In dry, rich, usually rocky, woods over the eastern United States. In Maryland found only in the central counties, in mountainous or at least stony situations. (Plate I. Figure 18).

Meibomia nudiflora is much like *Meibomia grandiflora*, but the leaves and flowers are on separate stems arising from the same root. Common in dry woods in the eastern part of the United States and in all parts of Maryland.

Meibomia obtusa is very much like *Meibomia Marylandica*, but the stem and leaves are much more hairy. It is found in dry soil in the eastern part of the United States. It is not uncommon in Southern Maryland and perhaps occurs in other parts of the State. (Plate I. Figures 17).

Meibomia ochroleuca differs from *Meibomia glabella* in having larger, more-pointed, yellowish-green leaves and whitish flowers, the stems one to three feet long. It is found in woodlands from New Jersey to Georgia. The only plants we have seen from Maryland are from Easton and "Public Landing" on Eastern Shore. It is also reported from District of Columbia.

Meibomia paniculata is a very bushy plant about three feet high with narrow, perfectly smooth leaflets, several times as long as broad. In dry soil over the eastern half of the United States. This is the most common beggar-tick in Maryland, occurring all over the State in old fields and waste places or in open woods. (Plate I. Figures 19 and 20).

Meibomia pauciflora resembles *Meibomia grandiflora* but the leaves are scattered more along the stem and more narrowly oval in shape. In these two and *Meibomia nudiflora* the pointed pods are only constricted on one side, in the other beggar-ticks they are more or less constricted on both sides. In woods in the eastern United States. Seen in Maryland, in Washington, Frederick and Worcester counties, also in District of Columbia.

Meibomia rigida. Like *Meibomia Marylandica*, this plant has only two or three joints to the pod, but differs in having the leaflets rough, more elongated and over an inch long. It is found in dry soil in the eastern half of the United States. We have only two plants of this from Maryland, one from Calvert County and one from Berlin.

Meibomia stricta has very narrow leaflets and only one to three-jointed pods. It is found in open pine woods and from New Jersey southward along the coast. It has been found in Maryland, at Salisbury and Ocean City. (Plate I. Figure 21).

Meibomia viridiflora is a rather large plant with broadly oval, somewhat pointed leaflets, which are silky-hairy on the underside. It

is found in dry woods in the eastern United States as far north as Pennsylvania. In Maryland it has been seen at Bel Air, Prince Fredericktown and Salisbury.

White sweet clover, Melilotus alba, also known as *white melilot*, *sweet-scented clover*, *bee clover*, and *Bokhara clover*. A vigorous growing annual or biennial, three to ten feet high, differing from the true clovers in having the small white flowers in slender, open spikes instead of close heads. The foliage is fragrant in drying. This is a native of the Old World, but introduced and growing wild in various parts of the United States, especially around towns. It grows in all kinds of waste places, even on quite sterile ground, especially if rich in lime. It is very common in Maryland in counties bordering the northern part of Chesapeake Bay and east of the Blue Ridge. It is not common in the southern or extreme western counties of the State, especially away from the lines of traffic. It contains in the dry matter about seventeen or more per cent. of protein as compared with thirteen and sixteen per cent. respectively in red clover and white clover. The scent of the foliage makes it disagreeable to stock, but when used to it they eat it readily. The long roots bring up salts from the lower subsoil and it is good for green manuring. (Plate I, Figure 6).

Yellow sweet clover, Melilotus officinalis, is a smaller plant than the white sweet clover and has yellow flowers. It is also introduced from the Old World in many parts of our country, and is seen frequently in waste and wetter lands than the last around Baltimore and Washington. In Switzerland a powder from the dried leaves is used in flavoring chapziger cheese.

Wild bean, Phaseolus polystachys, is a high climbing vine, resembling very much in leaves, flowers and pods the cultivated bean vines; the flowers scattered along the flower stalk. It is an uncommon plant in moist or rocky thickets, especially along streams in the eastern United States. We have seen Maryland specimens from Ellicott City, and along the Potomac, in Montgomery County. It is said to be greedily eaten by cattle.

Wild bean, Strophostyles helvola, is a prostrate or low climbing vine, two to eight feet long, which with the next one differs from *Phaseolus polystachys* in having the flowers clustered at the end of the flower stalk. At least some of the leaflets are more or less indented on the sides, often so much as to make the leaflets three-lobed. There are several varieties. It grows in sandy soil in Eastern United States from Massachusetts south especially along streams. In Maryland found over most of the Eastern Shore and occasionally west of the Bay. It approaches the cowpea in feeding value, and has great promise. (Figure 16 and Plate I, Figure 35).

Wild bean, Strophostyles umbellata, is a smaller trailing vine, one to five feet long, perennial and the margin of the narrower leaves entire. In sandy soil, mostly in the Atlantic coast states. Very common in old fields and in sand, in Maryland east of Frederick County

and south of Baltimore. It is no doubt useful in pastures, and is worthy of encouragement in fields. (Plate I. Figure 32).



Fig. 16—Wild Bean (*Strophostyles helvola*). After Bentley, Bulletin 10, Division of Agrostology, United States Department of Agriculture.

The following *Wild Vetches* occur in this region:

Vicia angustifolia is an annual vine about eighteen inches long with pinnate leaves ending in a tendril as do the other vetches, narrow leaflets and with one or two purple flowers close in the axils of the leaves. Naturalized from Europe in the Atlantic coast states and occurring frequently in old fields in many parts of Maryland. Most of the vetches are good for forage. (Figure 10).

Vicia Americana. A perennial vine two to three feet long; the bluish flowers about three-quarters of an inch long and about seven in each cluster. Occurs in moist ground in the northern states and probably occasionally in Maryland.

Vicia Caroliniana differs from the last in the white flowers, less than half an inch long and about twelve in each cluster. It is found along river banks mostly west and south of this, and is seen rarely along the Potomac above Washington.

Vicia Cracca, a perennial with dense, one-sided spikes of purplish flowers, found in the northern states and Europe in dry soil. May be seen rarely in Maryland.

Tare, *Vicia hirsuta*, somewhat like the last, but annual, few flowered and hairy, may occur rarely in Maryland. It is a native of Europe.

Vicia tetrasperma, like the last, but smooth, may also occur in Maryland. Also from Europe and sparingly introduced in the northern states; found in District of Columbia.

Hairy vetch, *Vicia villosa*, a cultivated annual vetch with long spikes of purplish flowers like *Vicia Cracca*, but quite hairy, sometimes grows spontaneously around fields where it has been cultivated. (Figure 17).



Fig. 17.—Hairy Vetch (*Vicia villosa*). After Tracy, Bulletin 15, Division of Agronomy, United States Department of Agriculture.

Wild pea, *Lathyrus venosus*. A short perennial vine with pinnate leaves ending in a tendril and pea-like pods and flowers, growing on moist banks north and west of Maryland is rare here along the Potomac. It is very valuable in wild pastures.

Hog-peanut, Falcata comosa. A slender, climbing vine with trifoliolate, bean-like leaves and thin, flat pods with small seeds above, but much larger seeds borne underground on the lower branches. In moist open woods, especially on the rocky banks of streams; common west of the Bay, and in most of the Eastern States, not common on the Eastern Shore. It adds some to woodland pastures, the underground seeds being eaten by hogs and the vines by other stock. (Plate I. Figure 30).

Hog-peanut, Falcata Pitcheri. Similar to the other hog-peanut but larger and rougher; the vine covered with stiff hairs. Common west and north. One specimen found at Greenmount, Maryland.

Ground-nut, Apios tuberosa. A climbing vine with large clusters of large, handsome, brownish, fragrant flowers and tuberous roots, found in moist ground in old fields and edges of woods all over the eastern United States. It is seen frequently in the counties of Maryland bordering the Bay and in a few other places. The fleshy roots were used for food by the Indians and others. The vine is valuable for ornamental purposes; it is eaten by stock and the tubers by hogs. (Plate I. Figure 31).

Butterfly-pea, Bradburya Virginiana. A perennial vine with trifoliolate leaves and very large purplish flowers. Found frequently in the sandy lands of the lower part of the Peninsula in Maryland and more commonly in the south. Very ornamental, and adds to wild pasture. (Plate I. Figure 28).

Butterfly-pea, Clitoria Mariana. A vine-like herb, one to three feet high, differing from Bradburya mainly in less twining stem and shorter pods not thickened at the edges. In dry soil in the Southern States and north to New Jersey and extending inland in Maryland to Frederick County. It is said to be nutritious to stock. (Plate I. Figure 29).

Black locust, Robinia Pseudacacia, is a well-known tree with a maximum height of eighty feet, with pinnate leaves, a pair of stout spines at the base of each, and having clusters of large, white, fragrant flowers. It is a native of the Mississippi Valley, but extensively naturalized along our fence-rows and in waste lands, often in quite moist places, but then not bearing tubercles so abundantly. Found especially in central Maryland, but is not so common in the southern part of the Eastern Shore. The wood is strong and durable, and is commonly used for posts, but also for finer woodwork. Perfume has been made from the very fragrant flowers, which are also rich in honey.

Honey locust, Gleditsia triacanthos. A large tree with much divided leaves, and long, flat pods; usually with branched thorns, but often thornless. Native of the eastern Mississippi Valley, but naturalized in many places in cultivated lands in Maryland and other States eastward. The hard wood is of value. The pulp of the pods is sweet when fresh, hence the name. The thornless kind is best for ornament. Stock eat the pods and young growth.

Red bud, Cercis Canadensis. A small tree with large, heart-shaped leaves and clusters of pink flowers appearing along the branches before the leaves in the spring. Usually seen on rocky, rich hillsides throughout Western Maryland and the eastern states generally, occasionally on the Eastern Shore, but is not a common tree. The hard, finely-colored wood is of some value for working, and has been used as dye-wood. The sweet-tasting flower buds have been used in salads.

Wild lupine, Lupinus perennis. A low perennial with long spikes of large blue flowers rising above the plant and producing flat, hairy, bean-like pods. The leaves are peculiar in having about eight wedge-shaped leaflets radiating from the end of each leaf stalk. In very dry, sandy soil in all the Eastern United States, but unlike many legumes does not do well in calcareous soils. In Maryland it has been seen in several places between Washington and Baltimore and in northern Baltimore County, but it is not common. The seeds are said to be poisonous. (Plate I. Figure 36).

Rattle-box Crotalaria sagittalis. A small annual herb about four to eight inches high, with entire leaves, the stem having a pointed wing below each leaf; flowers yellow; pod inflated, so that seed rattle in it when dry. Frequent in dry clay or sandy upland, all over the eastern and southern states. Poisonous to stock, and causing serious disease in horses when eaten by them. (Plate I. Figure 3).

Dolicholus, Dolicholus erectus. A perennial herb, erect and stout, about one foot high, with leaves of three leaflets, velvety and heavily veined; clusters of yellow flowers and short, few-seeded pods. Sandy land, southern Maryland, and southern part of Eastern Shore and States southward; not common. (Plate I. Figure 33).

Milk-pea, Galactia volubilis. A slender, smooth, climbing vine, with trifoliolate leaves, rounded at the apex, and bean-like pods. In dry soil over the eastern United States; not common in Maryland.

Crown vetch, Coronilla varia. A vetch-like perennial, one to two feet high, with pinnate leaves and clusters of whitish flowers in long-stalked heads. Occasionally seen around Baltimore and in States northward; introduced from Europe.

Joint vetch, Aeschynomene Virginica. An annual, three feet high, with leaves resembling those of the partridge-pea, and jointed pods. Grows along river banks in the Eastern and Southern States near the coast; seen only occasionally in Maryland. (Plate I. Figure 10).

Milk vetch, Astragalus Carolinianus. A perennial herb about three feet tall, with pinnate leaves and spikes of white flowers. Common along streams west, but rare in Maryland, along the Potomac. Cattle are said to fond of it.

False indigo, Baptisia australis. A small slightly-branched perennial herb with spikes of large blue flowers. Very rare in Maryland, along the Potomac and possibly elsewhere in rich soil, but common west of us.

Wild indigo, Baptisia tinctoria. A much-branched perennial herb with trifoliolate leaves and medium size yellow flowers. Very common in dry woods of eastern Maryland, and in adjoining States. The herbage, rich in blue dye stuff was formerly used for making indigo; the young shoots have been used as asparagus, and the plant is now sometimes utilized by teamsters in the country for keeping flies from the horses's heads. (Plate I. Figures 1 and 2).

Cracca, Cracca spicata. A small, straggling perennial herb with pinnate leaves and covered with brown hairs; the few flowers purplish. This is a plant of the southern States, seen rarely on Eastern Shore. (Plate I. Figure 7).

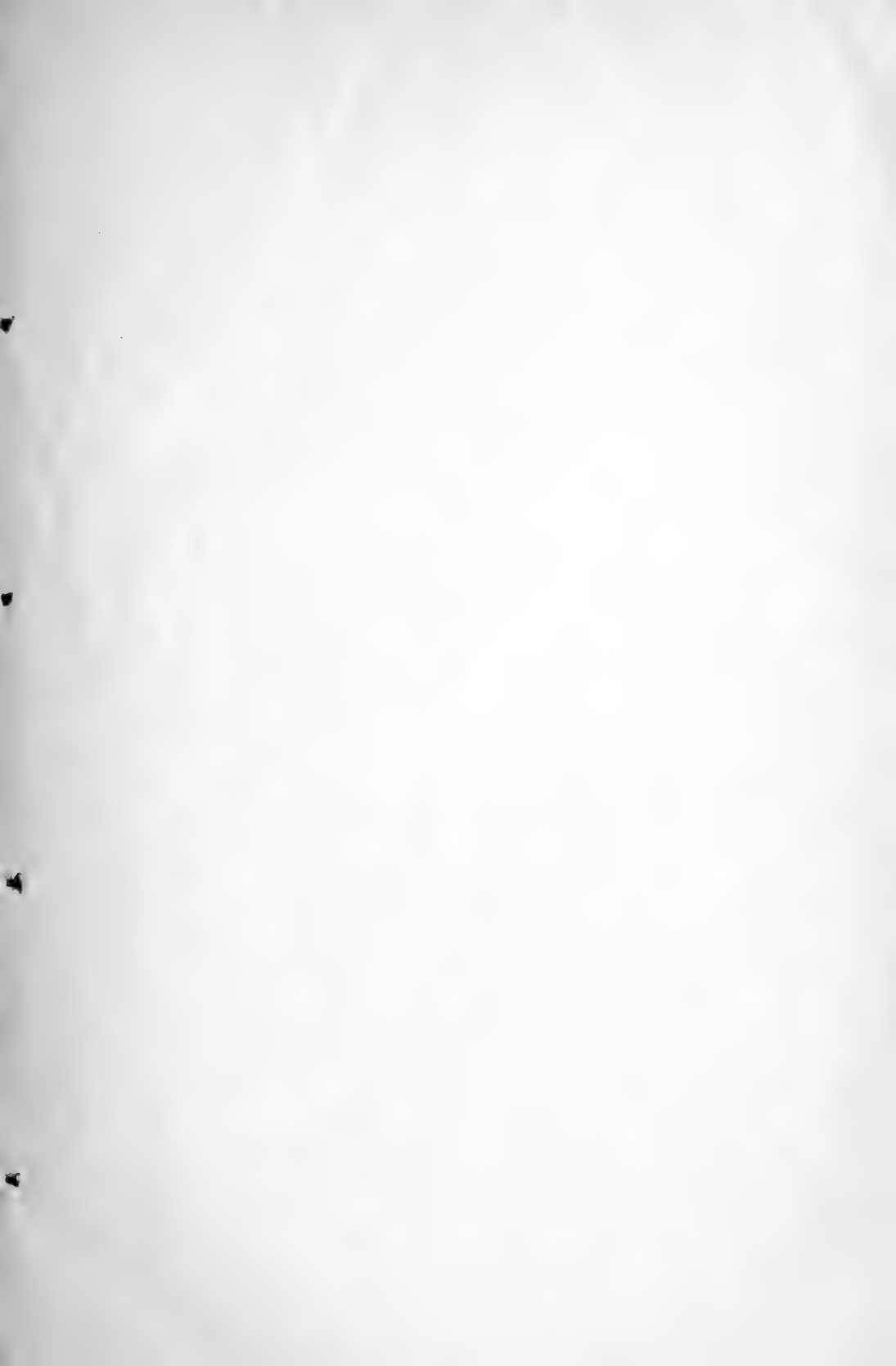
Cat-gut, Cracca Virginiana. A stiff, somewhat shrub-like perennial plant, one to two feet high, with grayish, pinnate leaves and a cluster of yellowish-purple flowers. One of the most common plants in our dry upland woods, especially in sandy lands and occurs all over the Eastern United States; probably not so common on the Eastern Shore, as it is not represented in our collections from that section. (Plate I. Figure 8).

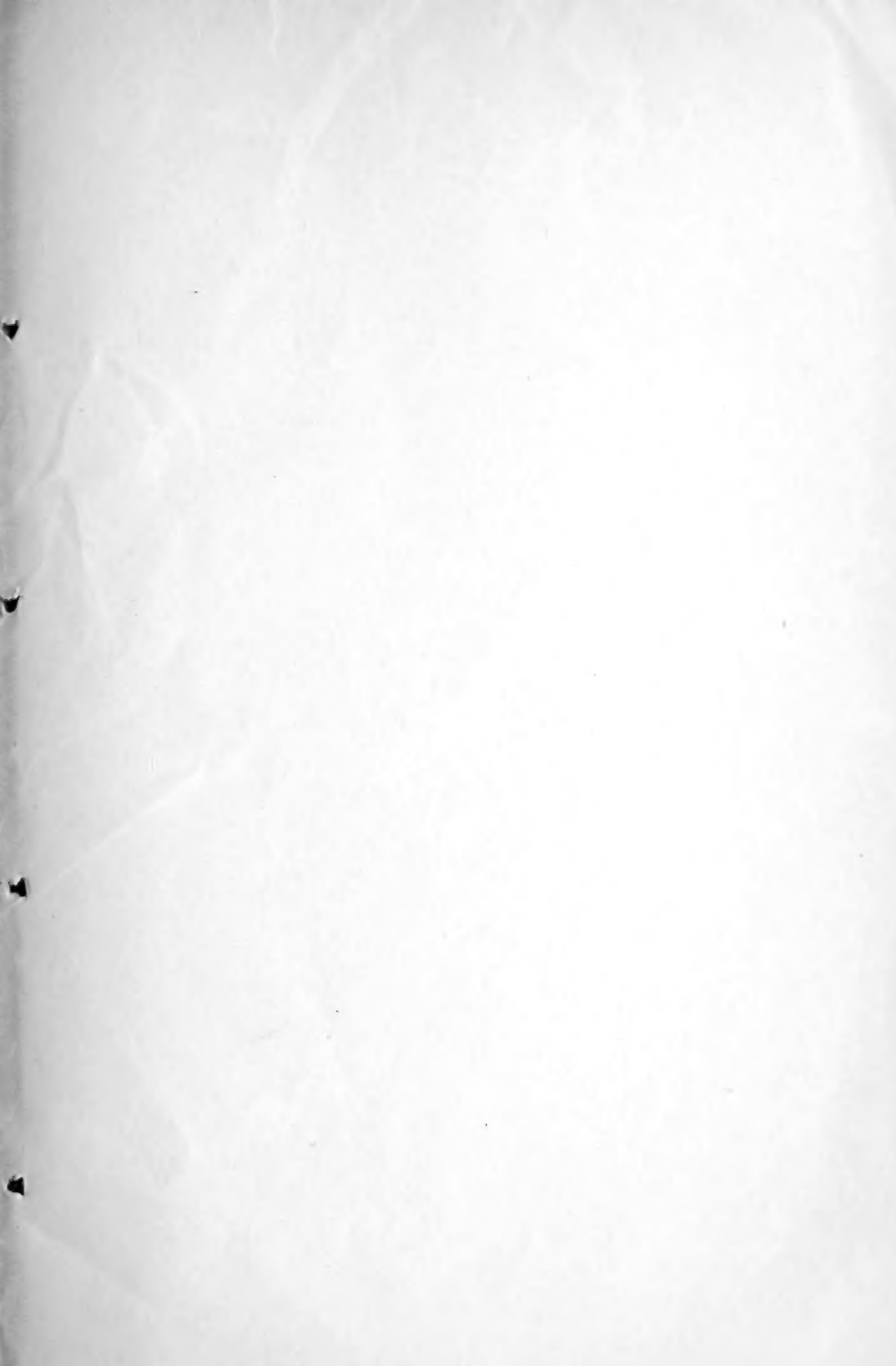
Pencil-flower, Stylosanthes biflora. A low, wiry-stemmed plant resembling Japan clover but with yellow bristles on the foliage which surrounds the flowers. Eastern United States south of New York, in dry soil. Frequent in the dry, open woods of central and southern Maryland, not seen on the Eastern Shore nor in the mountains. (Plate I. Figure 9).

American wistaria, Bradleya frutescens. A large woody vine with clusters of large purple flowers. Low ground in the Southern States, reported from Cumberland, Md.

Albizzia Julibrissan. A tropical tree, sometimes called *mimosa* here, which is grown in Southern Maryland for ornament and occasionally seeds itself in warm, sandy Eastern Shore lands. The wood is useful and the aromatic leaves have been used for tea.

The following legumes have not been found in Maryland but occur in adjoining states: *Trifolium Carolinianum*, *Meibomia Canadensis*, *Lespedeza angustifolia*, *Lathyrus myrtifolius*, *Galactia regularis*, *Ulex Europeanus*, *Cytisus scoparius*.







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