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Notes on the Distribution of Midsummer Bee Plants in the Mississippi Zone of Clayton County

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NOTES ON THE DISTRIBUTION OF MIDSUMMER BEE PLANTS IN THE MISSISSIPPI ZONE OF CLAYTON COUNTY

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With intent to determine (1) what plants were available to bees in late summer, (2) how these plants were located with reference to water reservoirs and (3) which of these plants were most valuable to the bee, some observations were made in Clayton county, Iowa, August 20 to September 9, 1919. The vicinity of McGregor, Beulah, Garnavillo, Guttenberg, Clayton, Prairie-du-Chien, and some of the adjacent islands of the Mississippi about McGregor were visited. Since the water supply is related to the topography and the distribution of plants is relative to both these factors, the geology and topography should be kept in mind.

Topography.— This county has a variant topography and includes many geologic formations. The highest elevation is 1,185 feet on the divide between Turkey and Yellow rivers, tributaries of the Mississippi, which bounds this county on the east. According to Norton, in the southeast section of the county lies an area of Iowan drift where old valleys have been filled and the surface has assumed an aspect of gradual sags and swells. The older drift is said to contribute little to topographic influence. The topography of the county outside of the Iowan drift plain is that of the driftless area. It has been subject to long continued and deep erosion. The northern tier of townships and a belt about eight miles wide along Mississippi river lie within this driftless area. The ancient base plain of erosion to which this area has been reduced has been elevated to about 1000 feet above sea level. Subsequent erosion by numerous streams and their tributaries has deeply carved this region, forming a network of narrow valleys.

Geology.— The Pleistocene deposits include the loess, the Iowan drift, the Kansan drift and the Nebraskan drift. Along the high precipitous escarpments of the Mississippi where the older rock strata are exposed may be seen the St. Croix sandstone, one of the oldest rocks of Paleozoic times, (Figs. 13 and 14) and next to it the Prairie-du-Chien limestone followed by the St. Peter sandstone and the Galena-Platteville limestone and dolomite. In these rocks the numerous springs of Clayton county have their

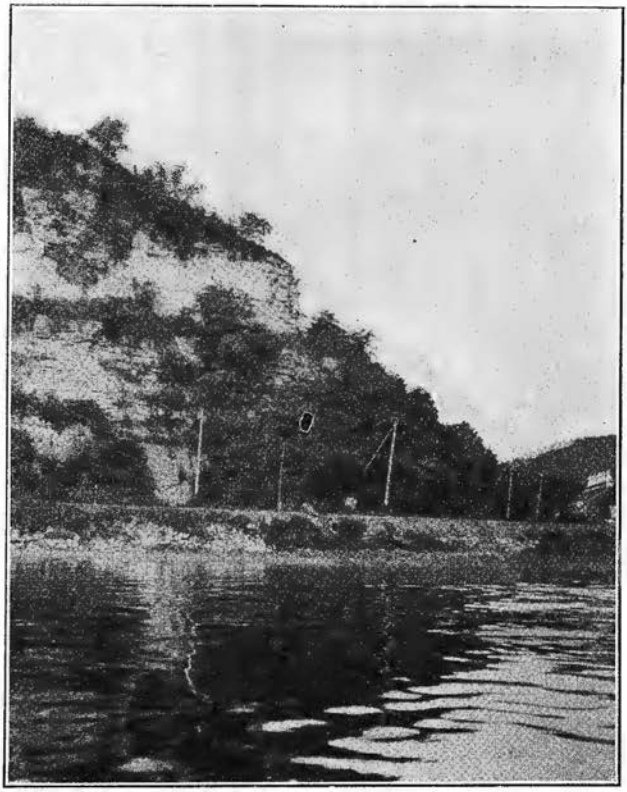

Fig. 13. Point Ann. West shore of Mississippi River near McGregor.

Fig. 14. The Heights. McGregor. Islands to the right.

source. The St. Peter sandstone gives rise to small springs while the larger ones have their source in the Prairie-du-Chien and the Galena-Platteville limestones (Fig. 15).

Edaphic and Floral Features.— Where these alternatingly pervious strata of limestone and sandstone and less pervious strata

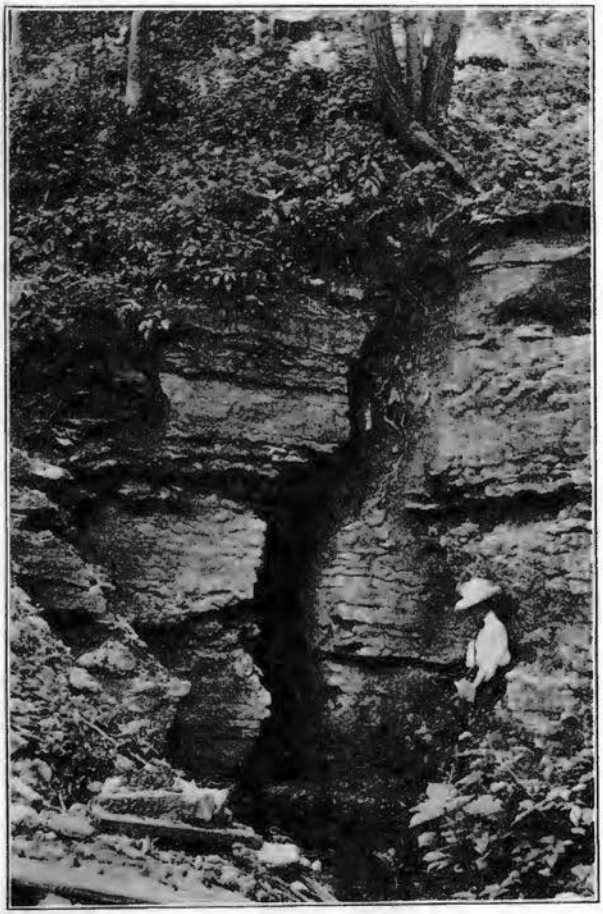

Fig. 15. One of a group of seven springs. Bluffs near Clayton, Iowa.

of shale lie parallel are ideal conditions for the formation of springs, which are numerous on every hand, some being the sources of vigorous little streams. The soil includes both pulverized limestone and sandstone in quantities and is abundantly supplied with moisture. Sandstone derivatives include small quantities of compounds of silicon, aluminum, iron, magnesium, calcium, sodium and potassium while limestones include principally com-

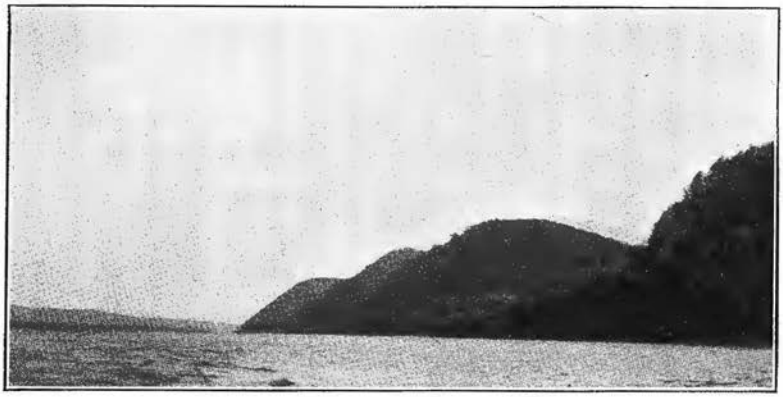

Fig. 16. Bluffs along west shore of Mississippi river. Abounds in asters and goldenrods. West slope.

pounds of calcium and magnesium. All of these elements are essential for plant foods. It is generally recognized that the flora of limestone and sandstone regions differ, but this region in which both limestone and sandstone occur abundantly, shows a richer flora with reference to number of species of plants than is generally seen in a region in which either sandstone or limestone is the dominant constituent.

While the west side of the river bears a luxuriant mesophytic forest, (Fig. 16) with only an occasional dry ridge or exposed peak bearing the prairie verdure, the weathered and exposed Wisconsin shore of the river in this vicinity bears a sparse and

Fig. 17. Weathered aspect of Wisconsin shore near Prairie du Chien. East slope. Silky aster, Fragrant Goldenrod and Blazing Star.

Fig. 18. Prairie verdure of Wisconsin shore near Prairie du Chien. Blazing stars, Large flowered goldenrods and Pasque flower.

more xerophytic forest with a broad expanse of treeless prairie. (Figs. 17, 18, 19.)

TYPICAL FLORA OF THE WEST SHORE OF MISSISSIPPI RIVER

Acer nigrum, A. saccharum, A. saccharinum, Fraxinus alba, F. viridis, F. nigra, F. americana, Ulmus americana, U. fulva, Celtis occidentalis, Carya alba, Quercus alba, Q. acuminata, Q. rubra, Q. macrocarpa, Juglans cinerea, J. nigra, Tilia americana, Mitella diphylla, Asperella hystrix, Lobelia siphilitica, Campanula americana, Osmorrhiza brevistylis, Podo-

Fig. 19. *Quercus velntina, Betula papyrifera, Rhus glabra,* Xerophytic aspect of Wisconsin shore near Prairie du Chien.

STATISTICS RELATING TO VISITATION

Date	Hour	Locality	Name of Plant	Wind	Light
8/26/19	11-11:30 a.m.	McGregor, Ia., West side Mississippi River	Polymnia canadensis (Leaf cup)	S. E.	Clear
8/28/19	1:00 p.m.	McGregor, Ia., West side Mississippi River	Polymnia canadensis (Leaf cup)	S. E.	Clear
8/28/19	3:00 p.m.	McGregor, Ia., West side Mississippi River foot of dry cliff	Sicyos angulatus (Wild cucumber)	S. E.	Clear
9/1/19	3:30-4 p.m.	Prairie du Chien, Wis., East side of Mississippi River	Sicyos angulatus (Wild cucumber)	S. E.	Clear
8/28/19	4-4:30 p.m.	McGregor, Ia., West side Mississippi River base of rocky cliff	Cirsium lanceolatus (Bull thistle)	S. E.	Clear
8/28/19	4-4:30 p.m.	McGregor, Ia., West side Mississippi River	Clematis paniculata (white clematis)	S. E.	Clear
8/28/19	4:00 p.m.	McGregor, Ia., West side Mississippi River foot of cliff	Nepeta cataria (catnip)	S. E.	Clear
8/28/19	11:00 a.m.	Beulah, near Bloody run	Linaria vulgaris (toadflax)	S. E.	Cloudy showers
9/1/19	1:25 p.m.	Prairie du Chien, Wis., East side of Mississippi Riv., flood plain	Physostegia lanceolata (False turtle's head)	S. E.	Clear
9/1/19	1:25 p.m.	Prairie du Chien, Wis., East side of Mississippi Riv., flood plain	Physostegia lanceolata (False turtle's head)	S. E.	Clear
9/1/19	2:30 p.m.	Prairie du Chien, Wis., East side of Mississippi Riv., flood plain	Helenium autumnale (Sneeze weed)	S. E.	Clear
9/3/19	2:00 p.m.	Island in Mississippi River near McGregor	Helenium autumnale (Sneeze weed)	N. W.	Clear
9/2/19	4:00 p.m.	Prairie du Chien, Wis., flood plain	Grindelia gum weed, tarweed	S. E.	Cloudy
9/2/19	3:00 p.m.	Prairie du Chien, Wis.,	Aster salicifolius (Swamp aster)	S. E.	Cloudy
9/3/19	2:36 p.m.	Near Prairie du Chien, Wis., Bergman's Island in Miss. River	Mentha canadensis	S. E.	Cloudy showers
9/4/19	12:30 p.m.	Bergman's Island, E. of McGregor in Mississippi River	Polygonum pennsylvanicum (Knot weed)	S.	Clear
9/5/19	3:00 p.m.	Mouth of Yellow Riv.	Solidago Missouriensis	N. W.	Clear
9/9/19	1:00 p.m.	Oneida, Sand	Solidago Missouriensis	S. E.	Clear

OF MIDSUMMER PLANTS BY BEES

Habitat		Insect	Ave. No. Visits Per 20 Min.	Range in 20 Min.	No. Insects Per Min. in 2 Square Meters
Soil	Exposure				
Rocky gravelly soil	Shady slope	Small bumble bee	17	14-21	6-5-7
Gravelly soil	Foot of dry rocky cliff, East Exp.	Small bumble bee	18	15-22	16-18 small bumble bees
Gravelly soil	Foot of dry cliff, dense vegetation, shady East slope	Honey bee	15	15-18	1 wasp, 10 insects, yellow jacket, honey bee
Rich loam alluvial	Flood plain, moist open all sides	Small bumble bee	14	11-17	6-8, wasp, yellow jacket, honey bee
Gravelly loam	Foot of dry rocky cliff, East Exp.	Honey bee	21	15-25	5-7 small bumble bees
Gravelly loam	Foot of dry rocky cliff, dense vegetation, East Exp.	Honey bee	15	15-18	Honey bee, yellow jacket
Gravelly loam	Foot of dry rocky cliff, East Exp.	Large bumble bee	36	30-32	10 honey bees
Loam alluvial	Flood plain, rocky limestone	Small bumble bee		Bees hung up under flower during shower	
Loam alluvial	Flood plain exposed all sides	Honey bee	36	31-47	Wasps, small bumble bee, honey bee
Loam alluvial	Flood plain exposed all sides	Honey bee	20	14-26	Wasps, small bumble bee, honey bee
Loam alluvial	Flood plain exposed all sides	Honey bee	24	20-33	Large bumble bees, small bumble bees, 10-15
Loam alluvial	Flood plain exposed all sides	Honey bee	35	35-46	Honey bees 1, 10-50 honey bees, 10-30 bumble bees
Loam	Dry bank near river	Small bumble bee	57	50-64	
Alluvial	Swamp flood plain	Honey bee	41	39-50	Small bumble bee, yellow jacket, honey bee
Alluvial	Swamp, edge of lakes on island	Honey bee	38	25-50	
Alluvial	Edge of lakes on island	Honey bee	39	35-40	
Alluvial	North bank of river	Honey bee	45	37-50	
Sandy loam	Railroad track	Honey bee	51	50-55	Wasp, fly, beetle

phyllum peltatum, Hepatica acutiloba, Cystopteris fragilis, C. bulbifera. Camptosorus rhizophyllus, Asplenium Filix-femina, Pellea atropurpurea, Botrychium virginianum, Adiantum pedatum, Struthiopteris Germanica, Hydrastis canadensis, Actaea rubra, Panax quinquefolium, Arabis racemosa, Cypripedium pubescens, Caulophyllum thalictroides, Rhus typhina, Clematis virginiana, Hamamelis virginiana, Physocarpus opulifolius, Sicyos angulatus, Polymnia canadensis, Impatiens pallida, Impatiens biflora.

FLORA OF THE BLUFFS ON THE EAST SHORE OF MISSISSIPPI RIVER NEAR PRAIRIE du CHIEN

Quercus velutina, Populus tremuloides, Betula papyrifera, Carya alba, Ulmus fulva, Rhus glabra, Rhus toxicodendron, Corylus americana, Vitis vulpina, Andropogon furcatus, A. scoparius, Sorghastrum nutans, Sporobolus longifolius, Bouteloua curtipendula, B. hirsuta, Panicum scribnerianum, Elymus robustus, Muhlenbergia mexicana.

PLANTS FREQUENTED BY HONEY BEES

(Figures 20, 21, 22)

Compositæ
- Aster salicifolius
- Grindelia squarrosa
- Helenium autumnale
- Polymnia canadensis
- Solidago canadensis
- Solidago missouriensis
- Solidago rigida

Cucurbitaceae
- Sicyos angulata

Labiatae
- Lycopus americana
- Mentha canadensis
- Nepeta cataria

Leguminosae
- Apios tuberosa

Polygonaceae
- Polygonum muhlenbergii
- Polygonum pennsylvanicum

Ranunculaceae
- Clematis virginiana

Scrophulariaceae
- Scrophularia marilandica

No accurate data were taken on the distribution of flowers per unit area. Plants with loose paniculate inflorescence such as *Clematis* and *Sicyos* or racemes such as those of *Polygonum* or the looser clusters of *Apios* involved much more of the time as well as the energy of the bee in covering space and making visits. The Compositæ such as Golden Rod or Helenium produce obviously manyfold more flowers per unit area than the plants of the former groups. All of the plants listed have the colonial habit with the exception of the rare *Apios* or *Scrophularia*. The Compositæ along the streams or the shaded west river banks were much more sparsely distributed than on the islands (Fig. 23) or on the flood plains (Fig. 24) where acres of white *Aster, Cardinal, Lobelia* or *Golden Helenium* emblazoned the earth. The *Asters* and *Heleniums* of the flood plain and islands were giants compared with the dwarfs of the meadow country inland.

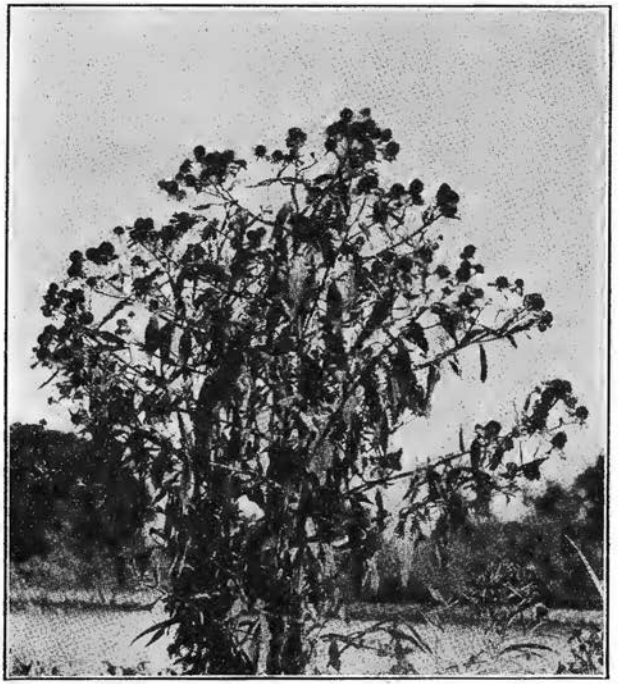

Fig. 20. *Helenium autumnale*

Fig. 21. *Polygonum pennsylvanicum*

Fig. 22. *Grindelia squarrosa*

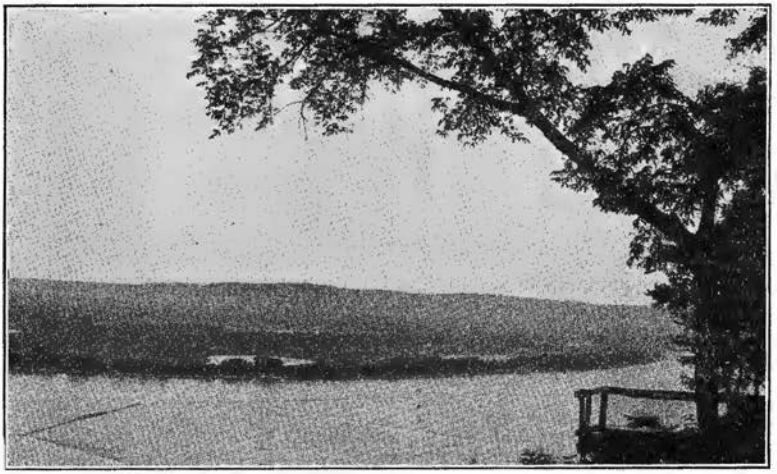

Fig. 23. Lakes in islands of the Mississippi

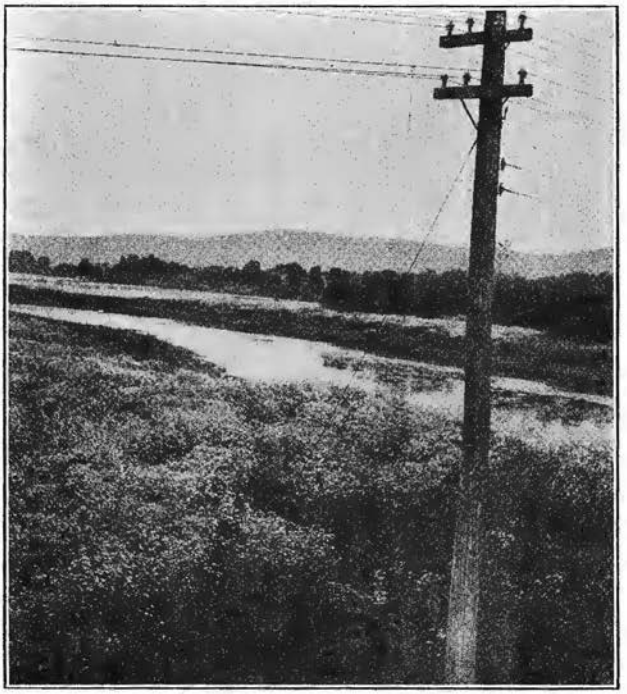

Fig. 24. *Aster salicifolius*, a flood plain plant

The Bee Pastures.— The Mississippi hills of the Iowa shore during the later part of August and early September showed only foliage traces of the profuse spring flora, as here and there the scarlet berried Ginseng or the blue berried Cohosh, with now and then along a rivulet or hedged about a spring the Jewel weed, spangled with orange or pale yellow cornucopias and encircled by bumble bees buzzing in and out. The only flowering plants were on the surfaces of the slopes exposed to the sun. *Clematis* or *Sicyos* vines lay on the bushes like great white blankets, here and at the damp base of the cliff or in the open spaces about the springs. Polymnia clumps stood out against the green tangle in cream colored patches and along the railway banks ran the low white catnip colonies. Here small bumble bees and honey bees worked briskly in the morning and continuously on through the lengthening shadows of the afternoon, dipping their proboscides into the many flowered heads, then moving with a whirr to the next cluster, or, having filled their baskets with the pollen or their sacs with nectar, straight up from the flowers they circled and flew toward the distant hive. Not seldom the heavy laden worker

beaten low from its high line of flight by treacherous currents met its death in the river.

The honey bee seems less efficient in its movement than the small bumble bee, which usually visits only fresh flowers and inserts its proboscis without experiment in the right grove, while the honey bee visits old dilapidated flowers as well as fresh ones, hovers sometimes before it makes a decision as to which flower to visit and occasionally finds difficulty in making entrance.

Again when a dull, warm, blue-haze-wrapt day blended the vivid colors in a soft mosaic scheme, a sudden shower drove the large bumble bee to shelter. Heels upward it clung to the under surface of a flower cluster, its back fur coat protected from the drops; yet its small velvet coated collaborator diligently and even more vigorously beseiged the trembling rain-pelted flowers. The honey bee laboriously persisted for nearly half an hour then somewhat reluctantly disappeared, as finally, but more slowly did the small bumble bee, leaving the soundly sleeping big bumble bee swinging in the steady drip under the rain-buffeted flowers.

SUMMARY

The abundance of limestone and sandstone products as constituents of the soil and the abundant water supply affords a desirable environment for a wide range of flora.

The light of the forest is sparse in the height of summer and though water is abundant in the deep interior, the flowering plants appeared in the greater light period of early spring and summer, hence the deep forest in midsummer affords few nectar producing plants.

The open borders of the forest slopes and margins of open springs are the only habitats occupied by flowering plants. These plants are principally deep throated *Lobelia siphilitica, L. cardinalis, Impatiens bi-flora* and *I. pallida,* bumble bee pollinated plants.

The evenly watered, amply lighted, broad expanse of flood plain and island are the flower gardens of midsummer. The flowering plants are largely composites whose many flowered heads, closely arranged in flat, corymbose panicles, afford an easily accessible surface and copious pollen as well as nectar. The conservation of space in the arrangement of the composite flowers per unit area allows a valuable economizing of time by an insect.

The large bumble bee, the small bumble bee and the honey bee were the only insects whose activities were observed. The small bumble bee seemed to be a more efficient worker than either the

honey bee or the large bumble bee. The greater length of its proboscis permits the small bumble bee to visit corollas having a wide range of tube lengths and to effect an entrance to flowers more readily than can the honey bee, while it has the advantage of more rapid movements than the large, slow moving bumble bee, thus enabling it to visit more flowers in period of time than the large bumble bee.

A uniform water supply is essential to copious flower production, on which nectar flow is dependent. Since most midsummer flowers are found in the open forest or prairie, the factor light may be regarded as quite as important as water.

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LITERATURE

Kemp, J. F., A Handbook of Rocks, 1911.
Norton, W. H., Underground Water Resources of Iowa, Ia. Geol. Survey, 21: 342-358, 1910.
Schimper, A. F. W., Plant Geography Upon a Physiological Basis, 1903.
Warming, Eugenius, Oecology of Plants, 1909.