NATIVE FLOWERS FOR BEES.

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Numerous requests from residents in various parts of the Province for assistance in the identification of "honey-yielding" plants, and for information regarding the native flora of regions where settlers proposed to establish apiaries, prompted me to select "Native Flowers for Bees" as a subject for discussion before this Society, in response to the request of the Secretary.

As the bee-keeping industry is a comparatively new one in this Province, bee-keepers here have to depend largely on the experience of apiarists in other Provinces or in the United States, and British Columbia apiarists are finding many interesting problems, due largely to the fact that our climatic conditions and native flora are quite different from those of the Eastern Provinces and for most of the States in America. Further, in British Columbia we have such a variety of habitats, from the moist Coast area with luxuriant vegetation to the arid Interior with an almost desert flora, and again to the moist regions of the Interior and the foot-hills of the Rockies, in all of which the soil, the rainfall, the growing season, the extremes of temperature, and the resultant effect of these on the flora show corresponding differences which make it necessary for the prospective apiarist to study local conditions and be guided by his observations.

The relationship between the local flora and the success or failure of apiarist cannot be disputed. You can have no more bees than the flora will support; apart from insect parasites, the flora is the limiting factor. Bees, being the only insects which feed their offspring with pollen, are wholly dependent upon flowers for their own food and that of their offspring.

One need not here enter into the discussion of the relationship between the habits of bees and the structure of flowers, further than to mention that without our native bees this Province would be minus many of our showy wild flowers, for as pollinating agents the bees far surpass all other insects in importance. So dependent are many flowers on the visits of bees that in their absence they fail to produce seed, as is well known in the case of red clover, salvia, larkspur, and some orchids. You probably know that when the farmers of New Zealand first grew red clover it failed to produce seed because there were no bumble-bees in New Zealand, and it was not until several species of these were introduced from Great Britain that the raising of clover-seed became commercially profitable. The bee-keeper is similarly indebted to many species of wild or native bees for the abundance of flowers which he depends upon to replenish his apiary from year to year.

About fifteen years ago Lord Avebury advanced a theory that blue flowers were mostly favoured by bees, and numerous examples given made the theory seem very plausible. It has since been shown that structure, and perhaps odour, is of greater importance than colour, because different coloured varieties of asters, zinnias, and centaureas are visited indiscrimi-

nately, whereas many of the best bee-flowers are not blue. For example, we find amongst the best native bee-plants of this Province, **Salix** (willows), **Solidago** (goldenrod), **Cleome** (Rocky Mountain bee-flower), **Taraxacum** (dandelion), **Helianthus** (Sunflowers), and **Monarda** (horsemint), none of which have blue flowers.

Regarding the structure of flowers best suited for bees, one has to take into account the different species of bees in each region, as we find a great variation in the length of their tongues according to species and sex, varying from 6 or 7 mm. in the case of honey-bees to about 20 mm. in some species of bumble-bees. Flowers, therefore, with the nectar at a greater depth than 6 or 7 mm. are of little value to the apiarist, and very shallow flowers may be classed in the same category, because flies and other insects with very short tongues may reach the nectar and thus limit the supply available for bees.

It has been calculated that about 37,000 loads of nectar are required for the production of 1 lb. of honey; it is therefore necessary for the bee to get as much as possible from each flower, and the flowers most favoured by honey-bees are those with a short narrow tube which will prevent smaller insects from reaching the nectar.

We do occasionally find honey-bees visiting flowers with long spurs and obtaining nectar through holes made in the spurs by bumble-bees. This dishonest method of obtaining the nectar seems very prevalent not only on this continent, but also in Europe. In the north of Scotland I have examined hundreds of wild dog-violets and every one had its spur perforated; in other years on the same area I have scarcely found a damaged spur. In British Columbia one frequently finds the Columbine spurs similarly pierced, and it has been reported that about 300 different species of flowers are thus robbed.

Though I have never seen a bumble-bee in the act of burglary, I learn from other observers that the punctures are made by laciniæ, or lance-shaped ends of the maxillæ. I am not aware of any authentic case of a honey-bee thus robbing the flower of its nectar where the flower has not previously been perforated by bumble-bees.

ALL BEE-FLOWERS DO NOT YIELD NECTAR.

There are other native plants, however, which yield no nectar, yet are valuable to bees as sources of pollen to feed the young larvæ. Apiarists generally distinguish between the pollen-yielding and the nectar-yielding flowers, but many novices overlook the importance of this distinction, and one cannot always rely on what novices write in prose or poetry. For example, the wild roses, of which we have so many in British Columbia, are nectarless, but useful in providing an abundance of pollen which bees make free use of. A poet, observing the frequent visits of honey-bees to roses, bursts into song in the following words:—

He harries the ports of the hollyhocks
And levies on poor sweetbrier;
And drinks the whitest wine of phlox,
And the rose is his desire.

"*He*" must refer to drones, and not to the undeveloped females or workers which visit the flowers. The tube of the phlox is too long for the tongues of honey-bees; the poet may have seen a long-tongued bumble-bee without knowing the difference, and phlox is generally regarded as a butterfly-flower; had the poet known the rose was nectarless we would have lost this gem of ignorance.

In dealing with the different kinds of native plants for bees, it may be useful to indicate whether they yield nectar or pollen, or both.

Willows.—Probably the most valuable plants to the apiarist are the willows; they furnish the first nectar of the season, and honey-bees have been reported as storing from 8 to 15 lb. of honey per hive from this source alone. The honey has a pleasant aromatic taste, not unlike that obtained from fruit-blossoms. Further, no other early blooming flowers yield so much pollen as the willows, as any one can prove by watching the myriads of bees returning with heavily laden pollen-baskets from almost any clump of willows in the early spring.

The willows are well distributed over the Province, different species in different districts, but in the Coast region (i.e., west of the Coast Range) we have in succession Nuttall's, Scouler's, Sitka, Hooker's, and the cracked-bark willow, the four former probably being the most productive.

As willows are readily grown from twigs stuck into moist soil, they can be easily multiplied, or introduced into districts where they are scarce. It should be borne in mind, however, that in areas infested with tent-caterpillars willows are favourite food-plants of this pest.

Dandelion (**Taraxacum officinale**).—Though one cannot consider this a native plant, it is so closely associated with man that in practically every little community it is found as an introduced weed which has come to stay and cause us endless trouble trying to eradicate it from our lawns and gardens. "It's an ill wind that blaws naebody guid," and the wind that blows the dandelion fruits in the direction of an apiary should be appreciated by bee-keepers. The dandelion's chief value lies in providing pollen and nectar for building up colonies in early spring just after the willows have passed their best. It is not relied on to provide a surplus of honey, though in occasional years bees will store a surplus from this source. The honey is of an amber colour.

Cleome serrulata, sometimes known as spider-flower, is known to bee-keepers in Colorado as the Rocky Mountain bee-flower on account of the abundance of nectar which it furnishes. This plant is found in the Okanagan and Chilcotin Districts, though not perhaps in such quantities as to make its presence noticeable to bee-keepers. It should not be difficult, however, to encourage, and as it is one of our showy species it will prove an acquisition to the flora of any district. Under favourable conditions it is reported a heavy yielder, two or three flowers giving a full load of nectar for honey-bees.

Goldenrod (**Solidago,** various species) is a widely distributed plant in British Columbia, some species being more common in the Coast area and

others more common in the Interior; the different species are so like each other that amateurs overlook their differences and regard them merely as goldenrods. It has been found, however, that bees prefer certain species, and will fly over several plants of one species to visit another one. I shall be glad at any time to receive specimens of the goldenrods most favoured by honey-bees, so that we can ascertain the species of most value to British Columbia apiarists.

The honey from this source is described as of a golden-yellow, with heavy body, not of the finest flavour, and the fall honey when freshly gathered is said to have such a pronounced odour that it can be detected a little distance from the hive.

Asters (many species), like the goldenrods, are well distributed over the Province, and it is possible that much of the value credited to goldenrod belongs to the asters, because the former are most conspicuous. The later flowering species are considered of most value.

Blooming, as they do, in the fall until frost cuts them down, asters are valuable in providing winter stores; though aster-honey is not considered good for this purpose it is in most localities mixed with dark fall honey, so that it is rarely stored separately. The honey is pale amber, with a mild flavour, is rather thin, and by itself does not thicken up readily.

Horse-mint (**Monarda fistulosa**) is a plant which, like red-clover, varies in value according to the locality in which it grows. Of the ten species of **Monarda,** three are recommended to United States apiarists, the best of which is our native species common in some parts of the Okanagan Valley, but somewhat limited in its distribution. The corolla-tubes are sometimes very deep and one would scarcely think honey-bees could reach the nectar; nevertheless, in hot dry regions it is considered of major importance and it is widely reported as a source of honey.

Milkweed (**Asclepias**) is to the botanist a plant of unusual interest on account of the peculiar adaptation it has for insect pollination. The stamens are so placed and constructed that when an insect visits the flower the pollinia, or masses of pollen, adhere to its body and sometimes its feet, and lurid word pictures have been printed of bees becoming so entangled as to be unable to find their way home again, but these are probably exaggerated.

In "Gleanings in Bee-culture" for July, 1912, an apiarist reports a yield of 1,320 lb. of honey from eleven colonies in eleven days from milkweed. Any plant that will yield from 10 to 11 lb. of honey per colony per day deserves encouragement. The honey is light in colour and of good quality.

Dogbane (**Apocynum**) is often erroneously called milkweed because, like many other plants, it exudes a milky juice when injured. This plant is found at the Coast and in the Interior, where it more abundant. (It was formerly of great value to the Indians for the production of fibre for lines.) It is very common in the Kootenay, Okanagan, and Thompson Valleys, but appears in many unexpected places in the Coast area and on the islands along the Coast, including Vancouver Island. Although not usually listed amongst honey-yielding plants, I was glad to learn from Mr.

W. Sheppard, Provincial Apiarist for the Kootenay region, that this plant was considered a valuable bee-plant in his district.

In addition to the foregoing useful bee-plants, we have in some parts of the Province, particularly in the Lower Fraser Valley and on some parts of Vancouver Island, a plant which is considered an agricultural undesirable —namely, the bitterweed, or sneezeweed (**Helenium**). Though I have not heard of our native species affecting the quality of honey, I draw attention to it in the hope of eliciting information as to whether or not it is as harmful as its closely related species found in the United States.

Regarding **Helenium tenuifolium** in Texas, it is reported that the "honey yield is good in favourable seasons; honey golden-yellow, heavy body, but very bitter, as if 50 per cent. quinine and some pepper were added." Our native species flowers from June to August, and I have seen it in abundance around Langley Prairie and on Vancouver Island in the vicinity of Colwood.

If apiarists have had experience with bitter honey, we would like to know in order to ascertain if other plants may be responsible for similar results. Good crops of white-clover honey are frequently spoiled in the United States by mixing with bitter honey.

Pammel, in his huge work on poisonous plants, reports that the honey from rhododendron and **Kalmia latifolia** is poisonous, and mentions our native species, **Kalmia polifolia**, as possessing similar properties. This is of interest to us, because in some districts we have large areas covered with these plants. There are probably no apiarists within reach of our evergreen rhododendron region in the Skagit River basin, but we may have in the regions of white rhododendrons, and there must be some within reach of the bogs which are ablaze in spring with millions of our beautiful kalmia flowers.

Conclusive evidence seems to be lacking as to the poisonous properties in the nectar of these plants, and it is hoped that by mentioning it here it may lead to our being able to corroborate or contradict the statement with definite proof.

As previously mentioned, this work in British Columbia is comparatively new; there is much to be done in testing the value of our native flowers for bees. With keen and intelligent observers in various parts of the Province co-operating in this work, we should be able to accumulate much valuable information for the benefit of the present and future generations. Entomologists can assist, if they will, by observing flowers that are visited by honey-bees, and having the flowers correctly identified so that definite records can be made.

It is impossible here to deal in detail with all the native plants known to yield nectar and pollen for bees. I have drawn up a list of over 100 botanical and common names of the best known species, indicating their use for nectar or pollen, or both, and the periods of flowering.

The list is not by any means to be regarded as complete, but is submitted as a nucleus to be revised or added to according to the experience of apiarists working under British Columbia conditions.

It is quite likely that some species will be of value to apiarists at the Coast, though the same species may be unimportant in the Interior, and vice versa.

I have referred chiefly to native plants; the value of fruit-trees, clover, alfalfa, and other introduced plants is well enough known, and the abundance of these depends on the number of farms and orchards in the district.

The main point of economic importance is that this Province uses more honey than it produces; whereas, with the assistance of our native bee-flowers, we should be able to produce more than we use and have a surplus to export. If the study of our native flowers can assist the apiarists to attain this end, the Department of Botany of the University is ready to co-operate by assisting in the identification of likely bee-plants, so that our present information may be verified or added to, and the results made known to apiarists in other parts of the Province, and thus contribute to the future prosperity of British Columbia.

(This address was illustrated by herbarium specimens of the plants mentioned.)

LIST OF PLANTS.

Name.	USE.		PERIOD OF FLOWERING.								Remarks.
	Nectar.	Pollen.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	
1. Acer	X	X	....	X	X	X	....	....	....	....	
2. Alder (*see* No. 3)	....	X	....	X	X	X	....	....	....	....	
3. Alnus	....	X	....	X	X	X	....	....	....	....	
4. Amelanchier	X	....	....	....	....	X	X	....	....	....	
5. Apocynum	X	....	....	....	....	....	X	X	....	....	
6. Arctostaphylos Uva-ursi	X	....	....	....	....	X	....	....	....	....	
7. Arctostaphylos tomentosa	X	....	....	....	X	X	....	....	....	....	Honey, amber; excellent flavour.
8. Arbutus	....	....	....	....	....	....	X	....	....	....	
9. Asclepias	X	....	....	....	....	....	....	X	....	....	Very valuable in some localities.
10. Aster	X	....	....	....	....	....	....	X	X	X	
11. Barberry (*see* No. 14)	X	....	....	X	X	X	....	....	....	....	
12. Bearberry (*see* No. 6)	X	....	....	....	....	X	....	....	....	....	
13. Beggarticks (*see* No. 16)	X	....	....	....	....	....	....	....	X	X	Honey, amber; heavy body; granulates slowly.
14. Berberis	X	....	....	....	X	X	X	....	....	....	
15. Betula	....	X	....	....	X	X	....	....	....	....	
16. Bidens	X	....	....	....	....	....	....	....	X	X	Honey, amber; heavy body; granulates slowly.
17. Birch (*see* No. 15)	....	X	....	....	X	X	....	....	....	....	
18. Bird-cherry (*see* No. 81)	....	....	....	....	....	X	X	....	....	....	
19. Blackberry (*see* No. 90)	X	....	....	....	X	X	....	....	....	....	Honey similar to that from raspberry.
20. Blueberry (*see* No. 107)	X	X	....	....	X	X	X	....	....	....	
21. Buckbush (*see* No. 27)	X	X	....	....	....	X	X	X	....	....	
22. Buckthorn (*see* No. 85)	X	....	....	....	....	X	....	....	....	....	Honey, dark; does not granulate.
23. Cactus (*see* No 76)	....	....	....	....	....	....	X	X	....	....	
24. Canada thistle (*see* No. 31)	X	....	....	....	....	....	X	X	....	....	Gives good honey.
25. Cascara (*see* No. 85)	X	....	....	....	....	X	....	....	....	....	Honey, dark; does not granulate.
26. Catnip (*see* No. 74)	X	....	....	....	....	....	X	X	....	....	Not important.
27. Ceanothus spp	X	X	....	....	....	X	X	X	....	....	
28. Choke-cherry (*see* 81)	X	....	....	....	....	X	....	....	....	....	
29. Chicory (*see* No. 30)	....	....	....	....	....	....	....	X	X	X	
30. Cichorium	X	....	....	....	....	....	....	X	X	X	
31. Cirsium spp	X	....	....	....	....	....	X	X	....	....	
32. Cleome	X	....	....	....	....	....	....	X	....	....	Heavy yielder.
33. Clematis	....	X	....	....	....	....	....	X	....	....	
34. Cockle-bur (*see* No. 113)	....	X	....	....	....	....	X	X	X	....	
35. Cornus	....	....	....	....	X	X	X	....	....	....	
36. Crab-apple (*see* No. 82)	X	....	....	....	X	X	....	....	....	....	
37. Cratægus	X	X	....	....	....	X	X	....	....	....	
38. Dandelion (*see* No. 106)	X	X	....	....	X	X	....	....	....	....	Honey, amber.
39. Dogbane (*see* No. 5)	X	....	....	....	....	....	X	X	....	....	
40. Dogwood (*see* No. 35)	....	....	....	....	....	X	X	X	....	....	
41. Epilobium	X	....	....	....	....	....	X	X	X	....	A heavy, reliable yielder.
42. Figwort (*see* No. 95)	....	....	....	....	....	....	X	....	....	....	Nectar abundant.
43. Firewood (*see* No. 41)	X	....	....	....	....	....	X	X	X	....	
44. Gaultheria	X	....	....	....	....	....	X	X	....	....	
45. Goldenrod (*see* No. 98)	X	....	....	....	....	....	....	....	X	X	
46. Gooseberry (*see* No. 88)	X	X	....	....	X	X	....	....	....	....	
47. Hawthorn (*see* No. 37)	X	X	....	....	....	X	X	....	....	....	
48. Helianthus	X	....	....	....	....	....	....	X	X	....	Nectar often abundant.
49. Honeysuckle (*see* No. 57)	X	....	....	....	X	X	X	....	....	....	Short-tubed species locally important.
50. Horehound (*see* No. 63)	X	....	....	....	....	....	X	X	....	....	Honey, dark amber; strong flavour.
51. Horse-mint (*see* No. 70)	X	....	....	....	....	....	X	....	....	....	Honey, amber; flavour somewhat strong.
52. Huckleberry (*see* No. 109)	X	....	....	....	X	X	X	....	....	....	
53. June-berry (*see* No. 4)	X	....	....	....	X	X	....	....	....	....	
54. Kalmia	X	....	....	X	X	X	....	....	....	....	
55. Kinnikinnik (*see* No. 6)	X	....	....	....	....	X	....	....	....	....	
56. Locust (*see* No. 91)	X	....	....	....	....	X	X	....	....	....	Honey, white; fine flavour.
57. Lonicera	X	....	....	....	X	X	X	....	....	....	Short-tubed species locally important.
58. Lupine (*see* No. 59)	....	X	....	....	X	X	X	....	....	....	
59. Lupinus	....	X	....	....	X	X	X	....	....	....	
60. Madrona (*see* No. 8)	....	....	....	....	....	....	X	....	....	....	
61. Manzanita (*see* No. 7)	X	....	....	....	X	X	....	....	....	....	Honey, amber; excellent flavour.
62. Maples (*see* No. 1)	X	X	....	X	X	X	....	....	....	....	

LIST OF PLANTS—*Continued.*

Name.	Use.		Period of Flowering.								Remarks.
	Nectar.	Pollen.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	
63. Marrubium	X						X	X			Honey, dark amber; strong flavour.
64. Meadow-rue (*see* No. 107)		X				X	X				
65. Mellilotus alba	X						X	X	X	X	Honey, slightly green; cinnamon flavour.
66. Mentha	X							X	X		Honey, amber.
67. Michaelmas daisy (*see* No. 10)	X							X	X	X	
68. Milkweed (*see* No. 9)	X						X				Very valuable in some districts.
69. Mint (*see* No. 66)	X							X	X		Honey, amber.
70. Monarda	X							X			Honey, amber; flavour somewhat strong.
71. Mountain-laurel (*see* No. 54)	X			X	X	X					
72. Mullein (*see* No. 110)		X						X	X		
73. Myrica		X		X	X						
74. Nepeta Cataria	X							X	X		Not important.
75. Oak (*see* No. 83)		X			X	X					
76. Opuntia							X	X			
77. Oregon grape (*see No.* 14)	X					X					
78. Polygonum	X							X	X	X	
79. Poplar (*see* No. 80)		X			X						
80. Populus		X			X						
81. Prunus spp	X					X	X				
82. Pyrus	X					X	X				
83. Quercus		X			X	X					
84. Raspberry (*see* No. 90)	X					X	X	X			Flavour unsurpassed.
85. Rhamnus	X					X					Honey, dark; does not granulate.
86. Rhodendron	X							X			
87. Rhus glabra	X						X	X			
88. Ribes spp	X	X			X	X					
89. Rocky Mountain Bee-plant (*see* No. 32)	X						X				
90. Rubus spp	X					X	X				Reliable when abundant.
91. Robinia	X					X	X				Honey, white; fine flavour.
92. Rosa spp	X	X					X				
93. Salal							X	X			
94. Salix spp	X	X	X	X	X						Nectar abundant.
95. Scrophularia	X						X				
96. Smartweed (*see* Nos. 7, 8)								X	X	X	
97. Snowberry (*see* No. 105)	X						X	X			
98. Solidago spp	X							X	X		Honey, golden-yellow; not finest flavour.
99. Sonchus	X						X	X			
100. Sow-thistle (*see* No. 99)	X						X	X			
101. Sumac (*see* No. 87)	X						X	X			Honey, amber; fine flavour.
102. Sunflower (*see* No. 48)								X	X		Nectar often abundant.
103. Sweet clover (*see* No. 65)	X						X	X	X	X	Honey, slightly green; cinnamon flavour.
104. Sweet gale (*see* No. 73)		X		X	X						
105. Symphoricarpus	X						X	X			
106. Taraxacum	X	X			X	X					
107. Thalictrum		X				X	X				
108. Thistles (*see* No. 31)	X						X	X			
109. Vaccinium spp	X				X	X	X				
110. Verbascum		X						X	X		
111. Willow-herb (*see* No. 41)	X						X	X	X		
112. Willows (*see* No. 94)	X	X	X	X	X						
113. Xanthium		X					X	X	X		