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ARCTIC AEROMEDICAL Laboratory

VITAMIN CONTENT OF ARCTIC PLANTS AND THEIR SIGNIFICANCE IN HUMAN NUTRITION

PROJECT NUMBER 22-1101-0002
PART 1

LADD AIR FORCE BASE
A L A S K A

THIS REPORT CONCERNS . . . .

the value of arctic plants as a source of food for man.

IT IS FOR THE USE OF . . . .

physiologists, nutritionists, and personnel concerned with arctic survival and arctic living.

ITS APPLICATION FOR THE AIR FORCE IS . . . .

to know the availability of local vitamin resources in the case of arctic survival.

VITAMIN CONTENT OF ARCTIC PLANTS AND THEIR SIGNIFICANCE IN HUMAN NUTRITION

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PROJECT NUMBER 22-1101-0002
PART 1

ARCTIC AEROMEDICAL LABORATORY
LADD AIR FORCE BASE, ALASKA
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PRECIS

OBJECT:

It is well known that plants have been used by man for food in northern countries from times immemorial. Very little exact information is available, however, regarding the actual nutritional value of arctic plants. The purpose of the present study is therefore briefly to evaluate the significance of arctic plants in human nutrition.

SUMMARY AND CONCLUSIONS:

On the basis of the available information, the nutritional value of arctic plants has been discussed, and the vitamin C contents of 69 species of arctic plants from Greenland and Alaska have been reported. On the basis of the reported findings it may be concluded that vitamin C is well distributed through the more common artic flora. When the natural resources of this vitamin are properly utilized there should be no reason to suffer from vitamin C deficiency in arctic regions, even without supplies of special antiscorbutic substances from more temperate zones. As a source of calories for man, the arctic flora is of little importance.

VITAMIN CONTENT OF ARCTIC PLANTS AND THEIR SIGNIFICANCE IN HUMAN NUTRITION

It is well known that plants have been used by man for food in northern countries from time immemorial. Certain plants and the stomach contents of herbivorous animals formed an important part of the diet of the Stone-Age man. In Norway, angelica, scurvy grass, mountain sorrel, and roseroot were eaten as invigorating foods from the earliest times, and have been used as a cure for scurvy (Reichborn-Kjennerud, 1936). According to Ehrström (1933), the Lapps eat berries, sorrel, angelica, and scurvy grass. A great variety of plants as well as seaweeds played an important part in the original Eskimo diet, although the use of plants as food has steadily declined in the Eskimo communities since the contact with the White man. Thus, as early as in 1770, only half a century after the arrival of the first missionary, the use of plant food was markedly reduced in West Greenland (Bertelsen, 1911).

According to Höygaard (1941) nearly all land plants and berries are still eaten by the Angmagssalik Eskimo, but only a few species which grow abundantly are eaten in sufficient quantities to be important as a source of food, such as crowberries, roseroot, willow, mountain sorrel, thyme, saxifrage, harebell, dandelion, scurvy grass, and angelica. These plants may be eaten when collected in the field, or they are brought to the house or tent where they are eaten with blubber or dried meat, or stored in blubber bags ("Imigarmit") together with dried meat, boiled seal flippers, boiled narwhale skin, fat, and dried marine algae.

Marine algae are consumed in quite large quantities by the East Greenland Eskimos, who most often eat them raw after rinsing them in fresh water. Sometimes they are dipped in boiling meat stock until they take a greenish color, or they are eaten with blubber oil. Alaria pylaii and Rhodymenia palmata are the more important species. The use of Rhodymenia palmata as human food is well known in Iceland, and this alga is repeatedly mentioned in the sagas. It is also known that marine algae have been used as food in Japan, China, and Hawaii (Höygaard, 1941).

The Eskimos on the North West Coast of Greenland no longer consume berries and plants to any extent of nutritional importance. Small quantities of Empetrum nigrum are eaten on rare occasions in the fall. The same applies to the Oxyria digyna and the bark from the willow roots. Cochlearia is no longer eaten, nor is the stomach content of herbivorous animals.

In the Disco Island district large quantities of Empetrum nigrum and Vaccinium uliginosum are still consumed raw. The same applies to the Julianehaab district, where the kajak hunters also occasionally consume marine algae mixed with blubber during the hunting in the summer.

According to Porsild (1945) the Canadian Eskimo today obtains a very insignificant part of his food from the vegetable kingdom, although some plants are normally consumed, such as the liquorice-root (Hedysarum boreale) which they sometimes obtain by robbing the winter caches of the mice and lemming.

In Alaska close to one hundred various plants have been used as food by Eskimos and Indians through the ages. Since the contact with the White man the use of native plant food has rapidly been reduced also in Alaska. However, some land plants and berries are still being used today in most settlements along the Arctic Coast. Of greatest importance are the different berries, such as the blueberries, cranberries, crowberries, and salmonberries. At Gambell, St. Lawrence Island, the willows are gathered for the edible root bark and occasionally for the tender leaves, as well as the Sedum roseum ("Nonavook"), Petasites frigida ("Kongwak"), and Saxifraga punctata ("Amslokruk"). The roots of various other plants are also gathered for food, particularly when found in the underground cache of field mice, where according to Geist (1936) more than half a bushel of choice roots sometimes may be found in a single cache. At Gambell the plants to be prepared for winter use are usually gathered by the women in the month of July. The plants including stem and leaves are usually washed prior to being placed in wooden barrels. Fresh water is added, and heavy weights are placed on the top. The barrel is left standing until the plants become slightly sour, and when the frost appears in the fall, most of the water is discarded. The plants are then stored frozen to be consumed in the winter together with meat and blubber.

Of other plants still being consumed at various settlements by the natives in Alaska, the following may be mentioned: Hedysarum alpinum (Eskimo potato), Epilobium latifolium (broadleaf willowherb), Oxyria digyna (mountain sorrel), Angelica lucida (seacoast Angelica), Cochlearia officinalis (Scurvy grass), Rumex arcticus (Arctic sorrel), and Ledum palustre (Labrador tea). Of particular interest is the "Eskimo icecream" prepared in the following way on the west coast of Alaska: Leaves of a mixture of plants including Arenaria peploides (seabeach sandwort) are ground and thoroughly mixed with seal oil, walrus oil, or caribou fat, whipped, and left in a cold place to freeze. Sometimes berries are added. The "icecream" is eaten by itself as a dessert.

As pointed out by Porsild (1951), the wild plant life in the arctic regions is generally too sparse, dwarfed, and poorly developed to make any major contribution to the food supply of man under the present climatic conditions. Only a few of the arctic plants produce edible and nourishing roots, stems, or edible fruits. It is thus obvious that plants should not be depended upon as a major source of food supply in arctic survival. Nevertheless, arctic plants have been used as food supplements by arctic travellers and are mentioned in their reports.

This is also true in the case of lichens, which produced the Biblical "rains of manna" of the Israelites (which appear to have been the lichen Lecanora esculenta, which according to Llano (1951) is still eaten by desert tribes), and which were used as emergency food for many weeks by the marooned party of Sir John Franklin in the region northwest of Hudson Bay. They lived on the dry, black, tough lichen of the genus Gycophora (Tripe de Roche), which grows on precambrian rock. (Fernald and Kinsey, 1943). When dry it is hard and brittle, but in damp weather it becomes soft and cartilaginous and is then easily collected. It contains an acid (lichen acid) which is bitter and which may cause intestinal irritation. According to Porsild (1945), this acid is materially reduced by adding small amounts of alkali to the water in which the lichens are soaked. Following the soaking, the lichens are dried until brittle, after which they are made into a powder by rubbing or pounding. The powdered lichen is then soaked in water overnight, and when boiled, a jelly is formed which is rich in starch.

In his diary Sir John Franklin describes how this lichen saved his party from starvation until the lichen became so frozen that it could no longer be collected, when he wrote in his journal: "The tripe de roche had hitherto afforded us our chief support, and we naturally felt great uneasiness at the prospect of being deprived of it, by its being so frozen as to render it impossible for us to gather it."

According to Llano (1951) lichen has not only been used as a last resort in the face of starvation, but also as a delicacy, such as the use of Cetraria islandica (Iceland moss) in Iceland, Norway and Sweden.

Very little exact information is available regarding the actual nutritional value of arctic plants. Höygaard (1941) reports that the marine algae (Fucus sp., Alaria pylaii, Rhodymenia palmata and Ascophyllum nodosum) contained on an average 81-85% water, 1.6-2.4% protein, 0.1-0.4% fat, 9.6-14.9% carbohydrate, 117-189 mg calcium, 26-60 mg phosphorus, and 1330-1580 mg sodium chloride per 100 g. Sedum roseum contained 93.9% water, 2.1% protein, 0.4% fat, 2.5% carbohydrate, 70 mg calcium, 22 mg phosphorus, and 131 mg sodium chloride per 100 g. The figures for crowberries (Empetrum hermaphroditum) were: 89.2% water, 0.2% protein, 0.1% fat, 10.0% carbohydrate, 8 mg calcium, 7 mg phosphorus per 100 g and very small amounts of sodium chloride. Vegetables stored in blubber bags for winter food contained 63.9% water, 1.1% protein, 23.7% fat, 10.5% carbohydrate, 98 mg calcium, 32 mg phosphorus, and 162 mg sodium chloride per 100 g.

According to Llano (1951) the nutritional value of lichens lies in their high content of lichenin (lichen starch). Some of the lichens contain 3 times more sugar than potatoes. The lichen Cladonia rangiferina contains 1-5% proteins.

From these figures it is obvious that plants, in the quantities they are eaten by the Eskimos, are quite unimportant as a source of calories, since it would be necessary to consume approximately 10,000 g of fresh plant material to supply 2000 calories. It would take 4,000 g of seaweed or berries or 700 g of plants stored in blubber bags to supply the same amount of calories. Höygaard (1941) reports that in Angmagssalik, Southeast Greenland, the native vegetable food supplied only 2% of the total caloric intake of the Eskimo.

Compared with the animal sources of vitamin A available to the Eskimo, the plants are of little importance as a source of this vitamin. The vitamin B_1 content of the common arctic plants is also insignificant (Rodahl, 1945).

On the other hand, determinations of the vitamin C content of arctic plants by a modification of Tillmans' method (Rodahl, 1944) have shown that several of the plants common in the Arctic, as well as the marine algae collected from arctic waters, are extremely rich in vitamin C (Höygaard, 1941, Rodahl, 1944) as is evident from table 1. More recent studies have supported these findings (tables 2,3).

This is not surprising in view of the fact that it has long been known that many arctic plants have been used as a remedy against scurvy in the northern countries (Bartholin 1671-72). In Southeast Greenland the Eskimos obtain 50% of their total vitamin C intake from plants and seaweeds during the summer months (Höygaard, 1941), and in many cases it is observed that the plants which are preferred by the Eskimo have the highest vitamin C content. Furthermore, plants stored in blubber bags in the Eskimo manner have been found to contain

TABLE 1. VITAMIN C CONTENT OF COMMON GREENLAND PLANTS EXAMINED IN NORTHEAST GREENLAND, LAT. 74° N.

Plant	Part of Plant Analyzed	Date of Analysis	Mg Ascorbic Acid Per 100 g.	
			Mean	Variations
Alaria sp. (edible kelp)	Whole plant	7-16 Sept.	5	4-7
Alaria sp. (edible kelp)	Roots and stems	16 Sept.	16	12-21
Armeria vulgaris (thrift)	Leaves	22 July	165	128-195
Armeria vulgaris (thrift)	Stems	22 July	120	105-135
Alopecurus alpinus (alpine foxtail)	Whole plant	13 Sept.	40	37-44
Alopecurus alpinus (alpine foxtail)	Leaves	29 July	84	62-105
Alopecurus alpinus (alpine foxtail)	Stems	29 July	39	32-46
Arnica alpina (mountain tobacco)	Leaves	11 July	5	-
Arnica alpina (mountain tobacco)	Stems	11 July	4	-
Betula nana (dwarf alpine birch)	Buds	1 May - 4 June	30	9-50
Betula nana (dwarf alpine birch)	Leaves	2 July- 1 Aug.	209	198-232
Betula nana (dwarf alpine birch)	Stems	1 May - 1 Aug.	10	8-14
Cassiope tetragona (four-angled mountain heather)	Whole plant	8 July	148	120-150
Cerastium alpinum (alpine chickweed)	Whole plant	13 Sept.	42	42-42
Cerastium alpinum (alpine chickweed)	Leaves	27 July	60	58-62
Cerastium alpinum (alpine chickweed)	Stems	27 July	32	31-34
Dryas octopetala (white mountainavens)	Whole plant	24 June	243	-
Dryas octopetala (white mountainavens)	Stems	24 June	200	-
Dryas octopetala (white mountainavens)	Flowers	24 June	180	-
Empetrum nigrum (crowberry)	Branches	1 Sept.	47	-
Epilobium latifolium (broadleaf willowherb)	Leaves	17 July	132	132-132
Eriophorum callitrix (cotton grass)	Whole plant	30 Aug.-15 Sept.	3	2-4
Fucus sp. (seaweed)	Whole plant	16 Sept.-16 Nov.	9	3-17
Honckenya peploides (seabeach sandwort)	Flowers	30 July	74	-
Honckenya peploides (seabeach sandwort)	Leaves	30 July	55	50-60
Honckenya peploides (seabeach sandwort)	Stems	30 July	15	-
Honckenya peploides (seabeach sandwort)	Whole plant	30 Apr.- 31 Dec.	14	1-27
Honckenya peploides (seabeach sandwort)	Buds	25 May - 30 Jul	40	1-80
Koenigia islandica (koenigia)	Whole plant	27 July	180	-
Lychnis triflora (lychnis)	Leaves	20 July	94	80-108
Melandrium affine (arctic lychnis)	Whole plant	27 July	105	-
Oxyria digyna (mountain sorrel)	Whole plant	27 July	95	-

TABLE 1. (Cont.)

Plant	Part of Plant Analyzed	Date of Analysis	Mg Ascorbic Acid per 100 g.	
			Mean	Variations
Papaver radicatum (arctic poppy)	Whole plant	26-30 Aug.	3	1-5
Papaver radicatum (arctic poppy)	Leaves	6 July	6	4-9
Papaver radicatum (arctic poppy)	Stems	6 July	3	-
Papaver radicatum (arctic poppy)	Flowers	7 July	7	6-7
Pedicularis hirsuta (lousewort)	Leaves	22 July	22	-
Poa glauca (glaucous spear-grass)	Whole plant	13 Sept.	12	11-12
Potentilla nivea (snowy cinquefoil)	Leaves	12 July	314	295-330
Russula sp. (common woodland mushroom)	Whole plant	27 July	4	-
Rumex acetosella (sheep sorrel)	Whole plant	30 Aug.	12	-
Saxifraga cernua (nodding saxifrage)	Leaves	2 Aug.	86	80-92
Saxifraga cernua (nodding saxifrage)	Stems	2 Aug.	60	-
Saxifraga oppositifolia (purple saxifrage)	Whole plant	10 June	54	-
Stellaria humifusa (low chickweed)	Whole plant	26 Aug.	60	50-70
Stellaria longipes (longstalked starwort)	Whole plant	27 July	59	-
Salix sp. (arctic willow)	Buds	31 Jan.-3 June	25	16-30
Salix sp. (arctic willow)	Stems	29 Mar.-31 July	46	22-63
Salix sp. (arctic willow)	Leaves	25 Jun.-31 July	160	90-230
Mushrooms (3 various kinds)	Whole fungus	1 Nov.-25 Sept.	1	0-2

TABLE 2. VITAMIN C CONTENT OF SOME COMMON GREENLAND PLANTS EXAMINED AT PEARYLAND, LAT. 82° N.

Plant	Part of Plant Analyzed	Date of Analysis	Mg Ascorbic Acid Per 100 g *
Alopecurus alpinus (alpine foxtail)	Whole plant	3 August	170
Cerastium alpinum (alpine chickweed)	Whole plant	5 August	85
Cerastium regelii (chickweed)	Whole plant	5 August	77
Chamaenerion latifolium (broadleaf willowherb)	Whole plant	4 August	305
Cochlearia officinalis (scurvy grass)	Whole plant	3 August	149
Cochlearia officinalis (scurvy grass)	Fruit	3 August	170
Cochlearia officinalis (scurvy grass)	Stem	3 August	136
Cochlearia officinalis (scurvy grass)	Root	3 August	68
Cystopteris fragilis (brittle fern)	Whole plant	5 August	100
Draba sp. (whitlow-grass)	Whole plant	4 August	100
Draba alp. (alpine whitlow-grass)	Whole plant	7 August	50
Dryas octopetala (white mountainavens)	Whole plant	5 August	135
Erigeron compositus (fleabane)	Whole plant	5 August	34
Eriophorum callitrix (cotton grass)	Whole plant	4 August	35
Equisetum arvense (horsetail)	Whole plant	5 August	68
Glyceria sp. (floating meadow grass)	Whole plant	3 August	60
Melandrium apetalum (nodding lychnis)	Whole plant	4 August	119
Melandrium apetalum (nodding lychnis)	Root	4 August	34
Minuartia rubella	Whole plant	5 August	100
Oxyria digyna (mountain sorrel)	Whole plant	3 August	119
Oxyria digyna (mountain sorrel)	Fruit	3 August	205
Oxyria digyna (mountain sorrel)	Leaves	3 August	102
Oxyria digyna (mountain sorrel)	Stem	3 August	85
Papaver radicatum (arctic poppy)	Whole plant	3 August	50
Pedicularis hirsula (lousewort)	Whole plant	5 August	50
Poa glauca (glaucous speargrass)	Whole plant	3 August	50
Polygonum viviparum (serpent grass)	Whole plant	4 August	100
Potentilla rubricaule (red-stemmed cinquefcil)	Whole plant	5 August	145
Potentilla nivea (snowy cinquefoil)	Whole plant	5 August	270
Salix sp. (arctic willow)	Whole plant	4 August	160
Saxifraga oppositifolia (purple saxifrage)	Whole plant	4 August	50
Saxifraga flagellaris (flagellate saxifrage)	Whole plant	4 August	65
Saxifraga cernua (nodding saxifrage)	Whole plant	5 August	119
Stellaria longipes (long-stalked starwort)	Whole plant	5 August	135
Taraxacum pumilum (dandelion)	Whole plant	4 August	34

* Average of 10 plants or more.

TABLE 3. VITAMIN C CONTENT OF SOME COMMON ALASKAN PLANTS.

Plant	Part of Plant Analyzed	Location	Date of Analysis	Mg. Ascorbic Acid Per 100 g.
Acilllea borealis (northern yarrow)	Whole plant	Ladd Field •	25 Sept.	9
Alnus oregona (red alder)	Buds	Rainbow Pass	16 Sept.	2
Alnus oregona (red alder)	Leaves, stalks, catkins	Rainbow Pass	16 Sept.	20
Alnus crispa (green alder)	Catkins, leaves, stalks	Ladd Field	25 Sept.	27
Aster sibirica (siberian aster)	Leaves, stems, flowers	Rainbow Pass	16 Sept.	14
Betula sp. (dwarf hybrid)	Leaves, stems	Rainbow Pass	16 Sept.	58
Brassica arvensis (wild mustard)	Whole plant	Rainbow Pass	16 Sept.	145
Capsella bursa pastoris (shepherds purse)	Whole plant	Rainbow Pass	16 Sept.	72
Carex atratiformis (black sedge)	Whole plant	Rainbow Pass	16 Sept.	51
Cassiope tetragona (four angled mountain heather)	Whole plant	Rainbow Pass	16 Sept.	225
Chamaenerion latifolium (broadleaf willowherb)	Whole plant	Rainbow Pass	16 Sept.	18
Chenopodium capitatum (strawberry spinach)	Whole plant	Rainbow Pass	16 Sept.	129
Chenopodium album (lambs quarters)	Whole plant	Ladd Field	26 Sept.	80
Chondius crispus (Irish moss)	Whole plant	Rainbow Pass	16 Sept.	9
Cladonia amaurocraea celote (reindeer moss)	Whole plant	Ladd Field	25 Sept.	25
Cladonia rangiferina (reindeer moss)	Whole plant	Ladd Field	25 Sept.	0
Cladonia timbriata (reindeer moss)	Whole plant	Ladd Field	25 Sept.	0
Diapensia laponica abovata (diapensia)	Whole plant	Ladd Field	25 Sept.	54
Duforea arctica	Leaves	Rainbow Pass	16 Sept.	18
Empetrum nigrum (crowberry)	Berries	Rainbow Pass	16 Sept.	81
Empetrum nigrum (crowberry)	Leaves	Rainbow Pass	16 Sept.	37
Elephantella groenlandica (little red elephant)	Roots	Rainbow Pass	16 Sept.	2
Elephantella groenlandica (little red elephant)	Stems, pods	Rainbow Pass	16 Sept.	16
Eriophorum ocreatum (cotton grass)	Stalks, flowers	Rainbow Pass	16 Sept.	13
Hylocomium splendens	Whole plant	Rainbow Pass	16 Sept.	14
Ledum groenlandicum (labrador tea)	Whole plant	Rainbow Pass	16 Sept.	174
Ledum groenlandicum (labrador tea)	Leaves	Rainbow Pass	16 Sept.	278
Lupinus parviflorus (mountain lupine)	Leaves, pods, stalks	Rainbow Pass	16 Sept.	42
Lycopodium annotinum (stiff club moss)	Whole plant	Rainbow Pass	16 Sept.	18
Nostocaceae (algae)	Whole plant	Ladd Field	25 Sept.	0
Oxyria digyna (mountain sorrel)	Leaves, roots	Rainbow Pass	16 Sept.	20
Pedicularis labradorica (lousewort)	Fruits, stems	Rainbow Pass	16 Sept.	0
Potentilla fruticosa (shrubby cinquefoil)	Whole plant	Rainbow Pass	16 Sept.	27
Pyrola grandiflora (large flowered wintergreen)	Leaves, buds, roots	Rainbow Pass	16 Sept.	110
Ribes triste (wild red currant)	Berries	Rainbow Pass	16 Sept.	79

TABLE 3. (Cont.)

Plant	Part of Plant Analyzed	Location	Date of Analysis	Mg.Ascorbic Acid Per 100 g.
Rosa nutkana (wild rose)	Hips	Rainbow Pass	16 Sept.	1400
Rosa nutkana (wild rose)	Leaves,stalks,roots	Rainbow Pass	16 Sept.	36
Salix anglorum (green-scaled willow)	Catkins,stalks,leaves	Rainbow Pass	16 Sept.	72
Salix sp. (arctic willow)	Leaves	Rainbow Pass	16 Sept.	72
Salix sp. (arctic willow)	Buds	Rainbow Pass	16 Sept.	72
Salix sp. (arctic willow)	Catkins	Rainbow Pass	16 Sept.	36
Salix sp. (arctic willow)	Stems	Rainbow Pass	16 Sept.	26
Sedum roseum (roseroot)	Whole plant	Rainbow Pass	16 Sept.	99
Silene acaulis (moss campion)	Whole plant	Rainbow Pass	16 Sept.	160
Stetocaulontomen tibsum	Whole plant	Ladd Field	16 Sept.	0
Vaccinium ovalifolium (blueberry)	Berries	Rainbow Pass	16 Sept.	63
Vaccinium vitis idea (lowbush cranberry)	Berries	Rainbow Pass	16 Sept.	108
Vaccinium vitis idea (lowbush cranberry)	Leaves, roots	Rainbow Pass	16 Sept.	23
Viburnum pauciflorum (highbush cranberry)	Berries	Rainbow Pass	16 Sept.	63
Viburnum pauciflorum (highbush cranberry)	Berries	Ladd Field	25 Sept.	20
Viburnum pauciflorum (highbush cranberry)	Buds, flowers	Ladd Field	25 Sept.	108
Picea sp. (black spruce)	Needles	Ladd Field	25 Sept.	185
Picea sp. (black spruce)	Stalks	Ladd Field	25 Sept.	2
Picea sp. (black spruce)	Cone seeds	Ladd Field	25 Sept.	0

considerable quantities of vitamin C even after having been kept in this way for months.

There are considerable seasonal variations in the vitamin C content of the plants examined (fig. 1), the highest values being found in the middle of the summer, at the time when the Eskimos normally collect the plants for winter storage. It is interesting to note that the Arctic willow, which constitutes an important part of the food supply for the musk-ox and the ptarmigan, is comparatively rich in vitamin C even during the winter. It may be added that the stomach content of a musk-ox killed in Pearyland, Northeast Greenland, lat. 82° N, in August 1947 (mostly consisting of Salix sp.) contained 14 mg vitamin C per 100 g.

Three various kinds of moss examined in Pearyland in August 1947 contained no vitamin C. Höygaard (1941) found that frozen crowberries contained no discernible vitamin C, and concluded that berries picked up later than November are of no importance as a source of vitamin C.

In a previous publication (Rodahl, 1944) it was pointed out that the vitamin C content in plants from Northeast Greenland (lat. 74° N) was generally higher than in the same plants from Angmagsslik, Southeast Greenland (lat. 66° N) examined by the same technique. This finding was verified in 1947 when the vitamin C content in plants from Northeast Greenland (lat. 74° N) was compared with the vitamin C content in the same plants examined in Pearyland, North Greenland (lat. 82° N), by the same technique, as is evident from table 4.

On the basis of the reported findings, it may be concluded that vitamin C is well distributed through the more common arctic flora. When the natural sources of this vitamin are properly utilized there

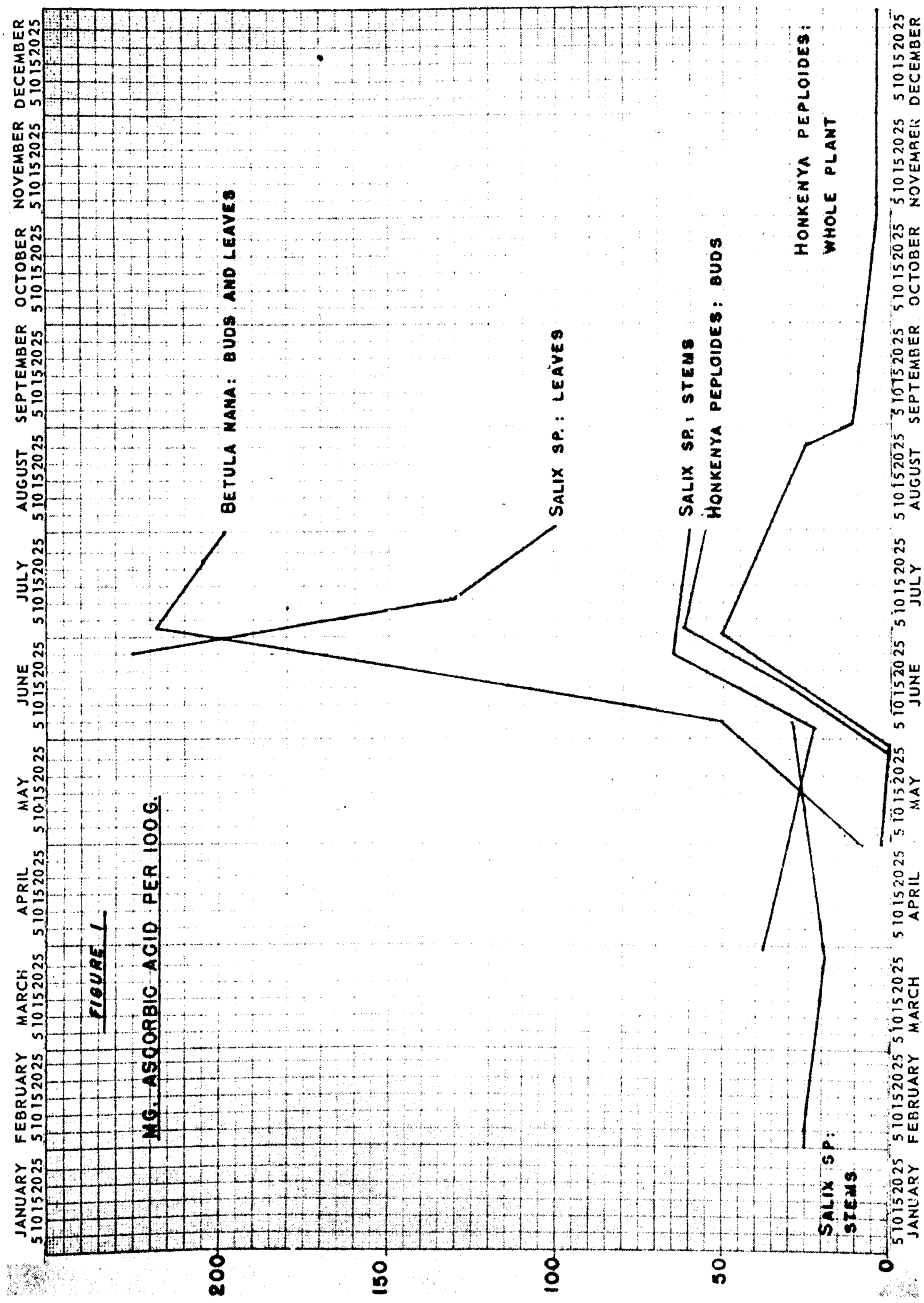
FIGURE I
MG. ASCORBIC ACID PER 100G.
BETULA NANA: BUDS AND LEAVES
SALIX SP.: LEAVES
SALIX SP.: STEMS
HONKENYA PEPLOIDES: BUDS
HONKENYA PEPLOIDES: WHOLE PLANT
SALIX SP.: STEMS
0
50
100
150
200
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER
NOVEMBER
DECEMBER
5 10 15 20 25

TABLE 4. SHOWING THE VITAMIN C CONTENTS OF THE SAME SPECIES EXAMINED AT TWO DIFFERENT LOCATIONS IN GREENLAND *

Species	Mg Ascorbic Acid per 100 g *	
	Clavering Isl. N.E.Greenland Lat. 74° N.	Pearyland, N. Greenla Lat. 82° N.
Alopecurus alpinus	40	170
Cerastium alpinum	42	85
Eriophorum callitrix	17	35
Oxyriá digyna	95	119
Papaver radicatum	1	50
Poa glauca	12	50
Saxifraga cernua	50	119
Stellaria longipes	59	135

* The plants were examined at the same time of the year, and the figures repre the average of 10 plants or more.

should be no reason to suffer from vitamin C deficiency in arctic regions, even without supplies of special antiscorbutic substances from more temperate zones. As a source of calories for man, the arctic flora is of little importance.

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