# A PHARMACOGNOSTICAL STUDY

# OF

# ACHILLEA MILLEFOLIUM L.

BY

Robert Laughlin McMurray.



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## HISTORY.

In 1753 Linne[1] described a plant that he designated as Achillea Millefolium. Since that time it has been customary to consider this as a foundation whereupon to base the characteristics of this plant. Previous to that date the history of the plant is more or less uncertain, the farther back an attempt is made to trace this history the greater becomes the uncertainty of the identity of the plants considered.

The earliest reference to the plant is claimed by Linne[2] to have been made by Theophrastus.[3] Theophrastus lived about 350 B.C., in Greece, and his works[4] are now available for reference, but so far attempts to confirm this allusion have failed.

About 70 A.D. Dioscorides[5] wrote about a plant "achilleos" (ἀχίλλειος) in his "Materia Medica" (περὶ ὕλης). The description is not specific enough to eliminate plants other than Achillea Millefolium Linne', but so comprehensive as to possibly include other related species than this plant. Furthermore, the illuminated edition of Dioscorides, "Codex Constantinopolitanus"[6] contains an illustration for this "achilleos" (myriophyllum) that cannot be Achillea Millefolium Linne', for the plant illustrated is of the umbelliferous, marsh type (see photostat in this thesis). However, the illuminations in the Codex are known to be the work of various operators nearly 500 years

after Dioscorides wrote his "Materia Medica" (περι υλης), and more than this the various illustrations were in many cases subsequently altered, so that they are not now considered reliable.[7] Because of this condition Tschirch prefers the original non-illuminated work of Dioscorides in which he finds nothing contrary to believing that the plant there described could be Achillea Millefolium Linne'.

Pliny[8] in his "Historia Naturalis" discusses the Millefolium and its legendary use by Achilles to heal Telephus.[9] Linne[10] refers to this work of Pliny, as also do Bauhin[11], Bock, Gerarde[12], and others. But the description by Pliny leaves much to be desired so that specific identification is impossible.

About the years 1000-1066 A.D. the plant Yarrow was considered in certain old English manuscripts.[13] Cockayne has included these items in his compilation of the manuscripts.

The "Hortus Sanitatus"[14] (1485) gives an illustration of Millefolium, Garba, and references to Dioscorides and Pliny. About the same time "Le Livre d'Heures, de la reine Anne de Bretagne", by Delaunay,[15] (1476-1517), described and gave a colored illustration of Milles feuilles. A little later the "Arbolaire"[16], (1495) included an illustration and uses of De Millefolio. The plants, above mentioned, in these 15th century works are probably the Achillea Millefolium of Linne'.

Brunfels[17] in 1530 considered and gave synonyms for the plant Millefolium album, with refefence to Dioscoride's work. Bauhin[18] in his "Pinax" stated that the Millefolium album of Brunfels was the same as his Millefolium vulgare album

for which he gave synonyms and references. Linne'[19] in his "Materia Medica" considers Achillea foliis bipinnatis nudis the same as the Millefolium vulgare album of Bauhin. Then in the first edition of his "Species Plantarum"[20] he states the Achillea Millefolium is the same as the Achillea foliis bipinnatis nudis of the "Materia Medica".

This brief survey of the history of the plant, or the supposed plant, is intended merely to show the confusion and uncertainty concerning the history of the plant. But very few references have been used. The complete list of references, chronologically arranged, are given in the Bibliography.

1) Linne, C., Species Plantarum, (1753), p.899.

2) Linne, C., Philosophia Botanica, (1751), p.187.

3) Tschirch, A., Handbuch der Pharmakognosie, (1910), ed.1, v.1, pt.2, p.545.

4) Wimmer, F., Theophrasti Eresii Opera, (1866).

5) Dioscorides, P., Materia Medica, (ca.70 A.D.), lib. 4, cap.36.

6) Tschirch, A., Handbuch der Pharmakognosie, (1917), ed.1, v.2, pts.2, p.995.

7) ibid.

8) Pliny, C. Jr., Historia Naturalis, (ca. 70 A.D.), lib.25, cap. 8.

9) Linne, C., Philosophia Botanica, (1751), p.187.

10) Bauhin, C., Pinax, (1596), p.140.

11) Bock, H., De Stirpium Maximo, (1552), p.477.

12) Gerarde, J., The Herbal, (1597), p.913; ed.2, (1633), p.1072.

13) Cockayne, T.O., Leechdoms, Wortcunning and Starcraft, (1864), v.1, pp.195-199.

14) Cube, J.W., Hortus Sanitatus, (1485), p. ---.

15) Delaunay, L.Abbe, Le Livre d'Heures, de la reine Anne de Bretagne, (1476-1517), v.1, p.32; v.2, p.295.

16) (-----), Arbolaire, (1493 ?), p.---.

17)Brunfels, O., Herbarium vivae eicones, (1530), pt.2, p.171.

18) Bauhin, C., Pinax, (1596), p.140.

19) Linne, C., Materia Medica, (1749), ed.1, p.397.

20) Linne, C., Species Plantarum, (1753), p.899.

## BOTANICAL CLASSIFICATION OF ACHILLEA MILLEFOLIUM LINNE'.

A number of different systems have been devised for classifying the thousands of individual species occurring in the plant kingdom, all but one of which belong to the socalled natural method. Achillea Millefolium Linne' is located in each of 8 of these systems, chronologically arranged, primarily as a means of comparison of the several systems.

I.

Linne, C., Species Plantarum, (1753), v.2, p.899.

Classification:

Classis I. Monandria.
" --- 
" X. Decandria.
" XI. Dodecandria.
" XII. Icosandria.
" XIII. Polyandria.
" XIV. Didynamia.
" XV. Tetradynamia.
" XVI. Monadelphia.
" XVII. Diadelphia.
" XVIII. Polyadelphia.
" XIX. Syngenesia.

Polygamia Superflua

Achillea

Achillea Millefolium.

" XX. Gynandria.
etc.

II.

Jussieu, A.L., General Plantarum, (1791), p.207.

Classification:

Dicotyledones.

Monopetalae

Corolla epigyna

Antheris connatae

Corymbiferae

Receptaculum paleaceum

Achillea

Achillea Millefolium.

III.

De Candolle, A.P., Prodromus Systematis Universalis, (1837), v.6, p.24.

Classification:

I. Cotyledoneae

Class: Dicotyledoneae

Subclass: Calyciflorae

Order: Compositae

Tribe: Senecioniderae

Subtribe: Anthemideae

Division: Euanthemideae

Genus: Achillea

Species: Millefolium L.

IV.

Engler, A., Syllabus der Pflanzenfamilien, (1898), p.194.

Classification:

Embryophyta Siphonogama:

Angiospermae

Dicotyledoneae

Metachlamydeae

Campanulatae

Compositae

Anthemideae

Achillea Millefolium.

V.

Gray, A., New Manual of Botany, (1908), p.845.

Classification:

| | |
|---|---|
| Division II. | Spermatophyta |
| Subdivision II. | Angiospermae |
| Class II. | Dicotyledoneae |
| Subclass II. | Metachlamydeae |
| Order XLIV. | Campanulales |
| Family 157. | Compositae |
| Series I. | Tubuliflorae |
| Tribe VII. | Anthemideae |
| # 67. | Achillea |
| 8. | * Millefolium L. |

## NOMENCLATURE.

The following scientific names have been obtained from the Index Kewensis. Part A is a list of genus names synonymous with Achillea of Vaillant; part B. is a list of genus and specie names, arranged alphabetically, synonymous with Achillea Millefolium Linne'[1], as determined by the editors of the Index Kewensis. The original reference in the literature of each name is given, and to which the date has been appended, followed by the Index Kewensis reference thereto in brackets.

### PART A.

Achillea — Linne', C., Systema Naturae, (1735), ed.1, p.-
(Index Kew., 1 ed., v.1, p.22).

Achillea — Bentham, G., & Hooker, J.D., Genera Plantarum, (1876), v.2, p.419.
(Ind. Kew., 1 ed., v.1, p.22).

Ageratoides — Linne', C., Classes Plantarum, (1747), p.527.
(Ind. Kew., 1 ed., v.1, pp.22, 58).

Alitubus — Dulac, J., Flore du department des Hautes Pyrenees, (1867), p.500.
(Ind. Kew., 1 ed., v.1, pp.22,76).

Arthrobepis — Boissier, E., & Reuter, G.F., Diagnoses Plantarum, (1849), s.1, v.11, p.14.
(Ind. Kew., 1 ed., v.1, pp.22,200).

Conforata — Fourreau, J., Annales de la Societe Linneenne de Lyon, (1869), n.s. 17, p.91.
(Ind. Kew., 1 ed., v.1, pp.22, 595).

Millefolium — Adanson, M., Familles des Plantes, (1763), v.2, p.128.
(Ind. Kew., 1 ed., v.1, p.22; v.3, p.238).

Ptarmica — Ruppius, H.B., Flora Jenensis, (1745), p.174.
(Ind. Kew., 1 ed., v.1, p.22; v.4, p.651).

1) Achillea Millefolium, Linne, C., Species Plantarum, (1753), 1 ed., v.2, p.899. (Index Kewensis, 1 ed., v.1, p.23).

PART B .

Achillea ambigua — Boissier, E., Flora Orientalis, (1875), v.3, p.255. (Ind. Kew., 1 ed., v.1, p.22)

Achillea anethifolia — Herder, F., Bulletin de la Societe Imperial des Naturalistes Moscov, (1865), 38, pp.403-04. (Ind. Kew., 1 ed., v.1, p.22).

Achillea borealis — Bongard, H.G., Memoires de L'Academie Imperiale des Sciences de St.Petersbourg, (1832), s.6, v.2, pt.2, p.149. (Ind. Kew., 1 ed., v.1, p.22).

Achillea ceretanica — Sennen, Boletin Soc. Arag., (1916), 15, p.235. (Ind. Kew., Supplement 6, p.3).

Achillea collina — Reichenbach, H.G.L., Flora Germanica Excursoria, (1830), p.850. (Ind. Kew., 1 ed., v.1, p.22).

Achillea crassifolia — Steudel, E.G., Nomenclatur Botanicus, (1840), 2 ed., v.1, p.15. (Ind. Kew., 1 ed., v.1, p.23).

Achillea cuspidata — Wallich, N., Catalogue arte lithographica exsusus 7683 specierum e collectione Wallichiana, quas societas Mercatorum Indiae orientalis celebrioribus Europae botanicis don dedit, (1832), n.3230. (Ind. Kew., 1 ed., v.1, p.22).

Achillea dentifera — Reichenback, L., Flora Germanica Excursoria, (1832), p.230. (Ind. Kew., 1 ed., v.1, p.22).

Achillea gracilis — Rafinesque, S., & Constantino, S., Atlantic Journal, (1833), p.177. (Ind. Kew., 1 ed., v.1, p.23).

Achillea Haenkeana — Tausch, J.F., Flora, (1821), 4, p.567. (Ind. Kew., 1 ed., v.1, p.23).

Achillea intermedia — Schleicher, J.C., Catalogus hucusque absolutus omnium Plantarum in Helvetia, (1821), 4 ed., p.5.

Achillea lanata — Lamarck, C., Flora Francoise, (1778), v.3, p.640. (Ind. Kew., 1 ed., v.1, p.23).

Achillea lanulosa — Nuttall, T., Journal of the Philadelphia Academy of Science, (1834), v.7, p.36. (Ind. Kew., 1 ed., v.1, p.23).

Achillea magna — Haenke, T., Botanische Beobachtungen im Riesengebirge exstant in Jirasek, (1791), p.103. (Ind. Kew., 1 ed., v.1, p.23).

Achillea marginata — Ledebour, K., Flora rossica, (1846), v.2, pt.2, p.532. (Ind. Kew., 1 ed., v.1, p.23).

Achillea montigola — Martrin-Donos, V., Plantes critiques dub Department du Tarn, (1862), p.31. (Ind. Kew., 1 ed., v.1, p. 23).

Achillea nigrescens — Rydberg, A., North American Flora, (1916), v.34, p.281 (Ind. Kew. Supplement 6, p.3).

Achillea occidentalis — Candolle, A.P., Prodromus, (1837), v.6, p.24. (Ind. Kew., 1 ed., v.1, p.23).

Achillea ochroleuca — Eichwald, E., Naturhistorische Skizze von Litthauen, (1830), p.149. (Ind. Kew., 1 ed., v.1, p.23).

Achillea ossica — Koch, K., Linnaea, (1851), 24, p.523. (Ind. Kew., 1 ed., v.1, p.23).

Achillea pannonica — Scheele, A., Linnaea, (1844), 18, pp. 471-72. (Ind. Kew., 1 ed., v.1, p.23).

Achillea scabra — Host, N.T., Flora austriaca, (1831), v.2, p.512. (Ind.Kew., 1 ed., v.1, p.23).

Achillea Seidlii — Presl, J.S. & K.B., Flora sechica indicalis medicinalibus, oeconomicis technologicisque plantis, (1819), p.173. (Ind. Kew., 1 ed., v.1, p.23).

Achillea setacea — Schweintz, L.D. von, A Catalogue of Plants collected in the North Western territory by Mr.Thomas Say, in the year 1823. Narrative of an expedition to the source of St.Peter's River, Lake Winnepeek, lake of the woods, performed in the year 1823, by the order of the hon. J.C.Calhoun, under the command of Stephen H.Long. Compiled from the notes of Major Long, Messers.Say, Keating et Calhoun, by Wm.Keating, (1825), v.2, p.119. (Ind. Kew., 1 ed., v.1, p.24).

Achillea sordida — Dalla Torre, K.W., & Sarntheim, L.G., Flora der Gefürsteten Grafschaft Tirol, (1912), v.6, pt.3, p.529. (Ind. Kew., Supplement 5, p.3).

Achillea subhirsuta — Gilibert, J.E., Flora Lithuanica in Chosta, (1781), v.1, p.217. (Ind. Kew., 1 ed., v.1, p.24).

Achillea sudetica — Opiz, P.M., Hesperus, (1813), p.625. (Ind. Kew., 1 ed., v.1, p.24).

Achillea sylvatica — Becker, J., Flora der Gegend um Frankfurt a/M, (1823), pt.1, p.295. (Ind. Kew., 1 ed., v.1, p.24).

Achillea tanacetifolia — Miller, P., The Gardener's Dictionary, (1768), 8 ed., p.7. (Ind. Kew., 1 ed., v.1, p.24).

Achillea tenuifolia — Salisbury, R.A., Prodromus stirpium in horto, (1796), p.204. (Ind. Kew., 1 ed., v.1, p.24).

Achillea tenuis — Schur, P.J.F., Enumeratio Plantarum Transsilvaniae, (1885), p.329. (Ind. Kew., 1 ed., v.1, p.24).

Achillea tomentosa — Purah, F.T., Flora Americae Septentrionalis, (1814), v.2, p.563. (Ind.Kew., 1 ed., v.1, p.24).

Achillios millefoliatus — Saint Lager, — Annales de la soc. bot. de Lyon, (1880), 8, p.118. (Ind. Kew., 1 ed., v.1, p.240

Alitubus Millefolium — Rulac, J., Flore du department des Hautes-Pyrenees, (1867), p.500. (Ind. Kew., 1 ed., v.1, p.76.

Millefolium officinale — Ledebour, K.F., Flora rossica, (1844), v.2, p.532. (Ind. Kew., 1 ed., v.3, p.238).

Millefolium vulgare — Ledebour, K.F., Flora rossica, (1844) v.2, p.532. (Ind. Kew., 1 ed., v.3, p.238.

## TAXONOMIC NOMENCLATURE CONFUSION.

Achillea Millefolium Linne' is a member of the Compositae family. This group of plants is noted in general for its hardy growth and prolific reproduction. Moreover, being a relatively new group of plants, the individuals show tendencies to vary among themselves. They tend to become adapted to their environment, and may show apparent morphological changes in a new environment. Thus, due to its variability it is difficult to definitely limit the characteristics of the Species Achillea Millefolium Linne'.

Taxonomists have encountered these conditions and have attempted to present a satisfactory description and classification of the individuals examined. Some have created new species names; some have created variety names when the members of a species varied in a recognised manner, but such that the author considered them all within the species, and still others have taken cognizance of the variability of the group and have adopted the simpler plan of giving a wider scope to the limits of fewer species.

The editors of the Index Kewensis have taken the latter viewpoint and have considered Achillea Millefolium Linne' as a group of variable individuals maintaining certain constant characteristics. They have made certain species of various authors synonymous with Achillea Millefolium Linne'. The list is given under the title of Nomenclature.

The present condition of the classification of the genus Achillea and the species Achillea Millefolium Linne' is unsatisfactory. But the scope of this work does not now include a revision of a genus that has so long troubled and left taxonomists in confusion and disagreement among themselves.

## ETYMOLOGY.

The genus Achillea was established by Vaillant[1] in 1720. He defined the genus, listed 29 species with references by which each could be identified with previous authors, and among these he included Achillea vulgaris, flore albo, which Linne'[2][3] considers the same as Achillea Millefolium Linne'. Vaillant[1] states this to be the Millefolium vulgare album of Bauhin[4] and Tournefort[5]. Vaillant, in his etymology of the word Achillea, states that it comes from Achilles who is reputed to have used a species of Millefeuille to heal Telephus, but Vaillant cites no reference for mention of Achilles.

The name Achillea Millefolium was introduced into scientific literature by Linne'[2], in 1753, as the binomial designation of a particular plant of ancient acquaintanceship to mankind. Its possible identity exists back to the time of Theophrastus. Linne'[6] states that the genus Achillea Vaillant is the same as the plant Achillea of Pliny and as the of Theophrastus. Theophrastus[7] is believed to have written about the year 350 B.C. (374-286 B.C.). Pliny[8] included in his "Naturalis Historiae" an Achilleos which he briefly described and related the legend of its vulnerary properties having been discovered by Achilles. Linne'[6] also referred to the plant αχιλλειος included by Dioscorides.[9] Tschirch[10] also considers that the word referred to Achilles.

The word Millefolium ( La Mille= a thousand; folium, leaf) indicates the many divisioned leaf, according to Tschirch.[10]

The etymological meaning for the common names of this plant are obscure.[10]

Herba aux charpentiers refers to its use by carpenters to heal cuts and bruises.[10] Feldgarbe refers to its extensive growth as a field-monopolizing weed.[11] The English synonym Yarrow is considered by Krayser[12] to be of uncertain origin, but may have come from the Teutonic languages. Murray[13] also states it to be of uncertain origin, but related to gearwe, gerw, garwe, garawe, garbe, Yaerow, gearwe, garwe, garrow, etc., and for which he gives references. Muret-Sanders[14] indicate that garbe is related to the obd high German word garba, meaning "sheaf", or "covering", but do not consider Schafgarbe etymologically. SKeat[15] also considers the English word Yarrow closely related to the Anglo-Saxon word gearuwe, as "that which prepares or sets in order", and from gearwian, "to prepare" and from gerwan," to dress", indicating "the curative properties of the yarrow, which was supposed to be a great remedy for wounds? He also gives other possible roots for Yarrow.

The word Schafgarbe is of uncertain meaning.[16] Grimm states that it designates alsb the garbe or garwe, and that "the sheep readily eat it."

These words thus seem to be of ancient origin. In the course of time and by various tribal and national changes they would undoubtedly become so altered that the unraveling of the present mystery of their early meaning will require their extended study by an expert etymologist. No author has been found who has yet solved the problem.

1) Vaillant, S., Histoire de L'Academie Royale des Sciences, avec les Memoires de Mathematique & de Physique, (1720), pp. 320-323.

2) Linne, C., Species Plantarum, (1753), ed.1, p.899.

3) Linne, C., Hortus Cliffortianus, (1737), p.413.

4) Bauhini, C., Pinax Theatri Botanici, (1596), p.140.

5) Tournefort, P., Institutiones Rei Herbariae, (1700), v.1, p.496.

6) Linne, C., Philosophia Botanica, (1751), p.187.

7) Tschirch, A., Handbuch der Pharmakognosie, (1910), ed.1, v.1, pt.2, p.545.

8) Pliny, C., Naturalis Historiae, (ca. 79 A.D.), lib. 25, cap. 8.

9) Dioscorides, P., Materia Medica, ( ca. 70 A.D.), lib.4, cap. 36.

10) Tschirch, A., Handbuch der Pharmakognosie, (1912), ed.1, v. 2 pt.2, p.992.

11) Grimm, J. & W., Deutsches Wörterbuch, (1878), v.4, p.1338.

12) Xrayser, Chemist and Druggist, (1923), 99, p.451.

13) Murray, J.A.H., A New English Dictionary, (1923), v.10, pt.2, sect.2, p.20.

14) Muret-Sanders, Encyclopaedic Dictionary, (1905), v.1, p.795.

15) Skeat, W.W., An Etymological Dictionary of the English Language, (1888), p.723.

16) Grimm, J. & W., Deutsches Wörterbuch, (1893), v.8, p.2037.

## SYNONYMS.

The following synonyms (common names), arranged alphabetically, for Achillea Millefolium Linne' have been found. Each synonym is followed by the name of the language in parenthesis, and a number referring to its occurrence in the literature. No attempt has been made to list all the references in which each synonym occurs, but rather to have a list of all of the synonyms that have been observed in the literature.

.....

A'chaithir-thalmhain (Gaelic) [3]
Achilea (Roumania) [2]
Achilea milenrama (Spanish) [4]
Achillea Millefolium (Latin) [5]
Achillee (French) [1]
Achillee' fleurs roses (French) [1]
Achillee' millefeuille (French) [4]
Achillenkraut (German) [1]
Achilleskruid (Dutch) [1]
Achilliere millefeuille (French) [1]
Ahair talhum (Irish) [3]
An carr'-thalmhain (Gaelic) [3]
Angerblume (German) [1]
Antheebloem (Dutch) [1]
Arrowroot (English) [1]

Balsamo (Portugese) 4)

~~Barbrick (Danish)~~

Barnune (German) 2)

Bauchwehkraut (German) 2)

Beilhiebkraut (German) 1)

Bienenpfeffer (German) 1)

Bloodwort (English) 6)

Blutkraut (German) 1)

Bolick (German) 1)

Bui maderain (India) 2)

.....

Camil (English) 6)

Cammick (English) 1)

Cammock ( English) 6)

Carpenter's grass (English) 6)

Chatzenmagel (German) 1)

Cheeskruid (Dutch) 1)

Chiliophillon (Greek) 2)

Chocoladebloem (Dutch) 1)

Common Yarrow (English) 3)

.....

Dead man's daisy (English) 1)

Doezendtak (Dutch) 1)

Dog-daisy (English) 6)

Dusendblad (Dutch) 2)

Duizendblad (Dutch) 1)

Duizendglaren (Dutch) 1)

Duizend-tak (Dutch) 1)

Duizend-tandekens (Dutch) 1)

Dusentbladt (Dutch) 1)

Duysentblat (Dutch) 1)

Dusendblad (Dutch) 1)

******

Edelgarb (German) 1)

Ferie (Scotch) 1)

Egher-fark-fu (Hungary) 4)

Erba de foenj e cent foenj (Swiss) 2)

Ervel (Dutch) 1)

Ezer-levelu-fu (Hungary) 4)

Fasankraut (German) 2)

Fasanenkraut (German) 4)

Fase (German) 2)

Feld Garbe (German) 2)

Flores Achilleae (Latin) 6)

Frau halt wort (German) 1)

Furstlingsblute (German) 1)

******

Gaarf (Dutch) 1)

Gabl (German) 2)

Gachelkraut (German) 2)

Gachheil (German) 2)

Gaerbel (Dutch) 1)

Gaerwe (Dutch) 1)

Gahel (German) 1)

Gahrl (German) 2)

Gange (German) 2)

Gänsezunge (German) 1)

Gansegerf (Dutch) 1)

Garawa (German) 2)

Garb (German) 1)

Garbe (German) 2)

Garbel (Dutch, German) 1)

Garbenkraut (German) 4)

Garbewurz (Swiss) 2)

Garbkraut (German) 1)

Gare (Old Saxon) 2)

Gartee (German) 1)

Gartenkraut (German) 4)

Garve (German) 4)

Garwa (German) 2)

Garwe (Dutch, English) 1)

Gärwel (German) 2)

Gearwe (Anglo-Saxon) 2)

Gechelkraut (German) 1)

Gechheil (German) 1)

Geiref (Dutch) 1)

Gemeine Garbe (German) 1)

Gemeine Schafgarbe (German) 1)

Gemeines Achillenkraut (German) 4)

Gengegrane (German) 4)

Gerbel (German) 4)

Gerbelblume (German) 1)

Gerf (Dutch)

Gertel (German) 2)

Geruwe (Dutch) 1)

Gerve (Dutch) 1)

Gerwe (Dutch) 4)

Gerwel (German) 1)

Gherue (Dutch) 1)

Gherwe (Dutch) 1)

Gliedkraut (German) 1)

Gollenkraut (German) 2)

Gor (German) 2)

Gordolobo ( " " ) 6)

Gorow (English) 1)

Gotteshand (German) 1)

Gransing (German) 1)

Gransing (German) 4)

Graue Genge (German) 1)

Grausing (German) 2)

Graw (German) 1)

Green-arrow (English) 6)

Green yarrow (English) 1)

Grensing (German) 2)

Grenzink (Dutch) 1)

Grillenkraut (German) 2)

Grinsing (German) 4)

Grundheilkraut (German) 1)

Grünsingkraut (German) 2)

Gruttblom (German) 2)

Guer (German) 1)

Gwilffrai (Welsh) 3)

.....

Haaze-garve (Dutch) 1)

Haaze-gerf (Dutch) 1)

Haaze-gerve (Dutch) 1)

Haazegerwe (Dutch) 1)

Haazengeruwe (Dutch) 1)

Haazengerwe (Dutch) 4)

Hank-sintah (Winnebago) 7½

Harhaens (Danish) 11)

Harwe (German) 1)

Harwe Ribbe (German) 2)

Hasenschardele (Dutch) 2)

Hazen-garve (Dutch) 1)

Hazen-geil (Dutch) 1)

Hazen-gerf (Dutch) 1)

Hazen-geruwe (Dutch) 1)

Hazen-gerwe (Dutch) 1)

Hazen-gras (Dutch) 1)

Hazen-kervel (Dutch) 1)

Hazen-klaver (Dutch) 1)

Hazzegere (Dutch) 1)

Heil allen Schaden (German) 4)

Heil aller Schaden (German) 2)

Herbe a la coupure (French) 1)

Herbe a picot (French) 1)

Herbe aux charpentiers (French) 4)

Herbe aux charpentiers ou de St. Jean (French) 2)

Herbe aux coupures (French) 1)

Herbe aux militaires (French) 1)

Herbe aux voituriers (French) 1)

Herbe de mille feuilles (French) 1)

Herbe de Saint-Jean (French) 1)

Herbe du coeher (French) 1)

Herbe militaire (French) 1)

Herf (Dutch) 1)

Herft (Dutch) 1)

Herigottruckenkraut (German) 2)

Herrgottsrückenkraut (German) 1)

Herve (Dutch) 1)

Hervel (Dutch) 1)

Heseekaeen (Dutch) 1)

Het gemeene duizenblad (Dutch) 4)

Hieppe du Notrudame (French) 1)

Hinzentee (German) 1)

Honde-gerve (Dutch) 1)

Honde-gervel (Dutch) 1)

Honde-gerve (Dutch) 1)

Honde-hervel (Dutch) 1)

Honde-kemme (Dutch) 1)

Honde-kervel (Dutch) 1)
Hondeklaar (Dutch) 1)
Honde-bloem (Dutch) 1)
Honde-kervel (Dutch) 1)
Honde-kerven (Dutch) 1)
Hundred-leaved grass (English) 1)

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Jase (German) 1)
Jordhumble (Danish) 11)
Judenkraut (German) 4)
Jungferaugbraunen (German) 4)
Jungfernaugenbrauenkraut (German) 1)
Jungfernaugenbraunkraut (German) 1)
Jungfrauaugbroen (German) 1)
Jungfrauenaug (German) 1)
Jungfraukraut (German) 2)

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Kachelkraut (German) 2)
Kachl (German) 1)
Kachlkraut (German) 1)
Kalikblume (German) 1)
Kamille (Dutch) 1)
Kamillen (Dutch) 1)
Karbe (German) 1)
Karbekraut (German) 4)
Karpenkraut (German) 4)
Karvekraut (German) 1)
Karwekraut (German) 1)

Karwiek (Dutch) 1)

Katzensagel (German) 2)

Katzenschwanz (German) 1)

Katzenschwanzblüte (German) 1)

Katzen-sagel (German) 1)

Katzen-zohl (German) 1)

Kelke (German) 2)

Kelken (German) 4)

Kerbel (German) 1)

Kerfkeskraud (Dutch) 1)

Kervele (German) 2)

Kikkerbloem (Dutch) 1)

Kleines Gliedkraut (German) 1)

Knighten Milfoil (English) 1)

Koddebloem (Dutch) 1)

Kruswoartel (Dutch) 1)

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Lämmerschwanz (German) 1)

Lämmlizungen (German) 1)

Llys y gwaedlif (Welsh) 3)

Lus sh'osgadhêna fola (Gaelic) 3)

* * * * * *

Mannsleuterl (German) 1)

Margaretenkraut (German) 1)

Melefour (English) 1)

Mila figyas (French) 1)

Milefolia (Spanish) 9)

Mil em rama (Portugese) 4)

Milenrama (Spanish) 2)
Milfoil (English) 4)
Milfolha (Portugese) 2)
Milfolhada (Portugese) 4)
Milfolhe (Portugese) 1)
Milfou (French) 2)
Millefeuille (French) 1)
Millefeuilles (French) 4)
Millefeuilles commune (French) 2)
Millefoglie (Italian) 10)
Millefoglie (Italian) 1)
Millefolium (Latin) 8)
Millefolium Vulgare Album (Latin) 1)
Millefoly (English) 1)
Millfoil (English) 1)
Milofeille (French) 1)
Minfel (English) 2)
Mom'adru' ehopandiga (India) 1)
Myllefoly (English) 4)
Myriophyllon (Greek)

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No ki gi zi se (Japanese) 8)
Nosebleed (English) 6)
Nosebleet (English) 4)

Old man's mustard (English) 1)
Old man's pepper (English) 6)

Paddebloem (Dutch) 1)
Poorblöme (German) 1)

Qwacuvas a tsa (Swiss) 2)
Quer (German) 1)

Rainefase (German) 1)
Rälk (German) 1)
Reelse (German) 1)
Reilcken (German) 1)
Reinefase (German) 1)
Reinejase (French) 1)
Reine jase (German) 1)
Reinfase (German) 1)
Relek (German) 2)
Releke (German) 4)
Relich (German) 4)
Relick (German) 4)
Relicken (German) 2)
Relitz (German) 1)
Rels (German) 1)
Ribbel (German) 4)
Ribbenkruid (Dutch) 1)
Riesenbrij (Dutch) 1)

Rippel (German) 1)

Rippelkraut (German) 1)

Rijstebrij (Dutch) 1)

Rijstepapbloem (Dutch) 1)

Rohlegg (German) 1)

Rohlei (German) 1)

Röhlk (German) 2)

Röhlke (German) 4)

Röhls (German) 4)

Rojmari biranjasif (India) 2)

Rolck (German) 12)

Roleggen (German) 1)

Rolegger (German) 1)

Röleke (German) 1)

Roley (German) 4)

Rolick (German) 2)

Rolits (German) 1)

Rolken (German) 1)

Rollecke (German) 1)

Rolleka (Swedish)

Rölleka (Swedish) 2)

Röllike (Danish) 4)

Rölse (German) 2)

Rolyk (German) 2)

Rosy yarrow (English) 1)

Rötlish (German) 1)

Rulk (German) 1)

Rülkere (German) 1)

Rüppel (German) 1)

Rzebr'ik (Bohemia) 4)

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Sachfries (German) 4)

Sägkraut (German) 2)

Saigne-nez (French) 1)

Saignette (French) 1)

Sanguinary (English) 6)

Saugkraut (German) 1)

Schaafgarbe (German) 1)

Schaafgerbe (Dutch) 1)

Schaafribbe (German) 4)

Schaafrippe (German) 4)

Schabab (German) 4)

Schabeb (Swiss) 2)

Schabgrab (German) 1)

Schaepgerwe (Dutch) 1)

Schaffgarbe (German) 2)

Schafgarbe (German) 2)

Schafgrab (German) 2)

Schaf-karwe (German) 1)

Schafrippe (German) 2)

Schaf-rippengarbe (German) 1)

Schaf-schier (German) 1)

Schaf-zunge (German) 1)

Schapeklaver (Dutch) 1)

Schapfgerwe (German) 1)

Schapgarbe (German) 1)

Schapgarwer (German) 1)

Schappen-gerf (Dutch) 1)

Schappen-ribbe (Dutch) 1)

Scheere (Dutch) 1)

Schelkraut (German) 2)

Schenken (German) 1)

Schnitkraut (German) 1)

Schnitzelquack (German) 1)

Schoape-garf (Dutch) 1)

Schofgarb (German) 2)

Schofgarbe (German) 1)

Schuifkraut (German) 1)

Schweinbauch (German) 4)

Sichelkraut (German) 1)

Sjukelarjeblom (Dutch) 1)

Skieppe-gerf (Dutch) 1)

Skieppe rib (Dutch) 1)

Sourcil de Venus (French) 1)

Souris de Venus (French) 1)

Sneezewort (English) 6)

Soldiers Woundwort (English) 1)

Stanch girs (English)

Steenzweerkruid (Dutch) 1)

Stench girs (English) 1)

Stoelbloem (Dutch) 1)

Summitates Achilleae (Latin) 6)

Summitates millefolii (Latin) 6)

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Tabaksbloem (Dutch) 1)

Tandekensbloem (Dutch) 1)

Tansy (English) 6)

Tausend-augbraun (German) 1)

Tausendblatt (German) 4)

Tausend-plat (German) 1)

Tausend-spalt (German) 1)

Theebloem (Dutch) 1)

Theebloemeken (Dutch) 1)

Theeblommen (Dutch) 1)

Thousand-leaf (English) 6)

Thousandleaved clover (English) 6)

Thousand-leaved Grass (English) 3)

Tjerkhofblom (Dutch) 1)

Triessem (Dutch) 1)

Tusend-blat (German) 1)

Tusendplat (German) 2)

Tusjatschalielnik trava (Russia) 4)

Tysiacznik ziele (Polish) 4)

Veldgerwe (Dutch) 4)

Venusaugenbrauen (German) 1)

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Weiss reinfaren (German) 1)

Weiss Reinfert (German) 1)

Weisser Bienenpfeffer (German) 1)

Weisser Rainfarn (German) 4)

Weisses Achillenkraut (German) 1)

Wild Pepper (English) 1)

Wilder Bienenpfeffer (German) 2)

Wuht-Kraut (German) 2)

Wuntkrut (German) 1)

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Yallow (English) 1)

Yarrow (English) 2)

Yarroway (English) 6)

Yerba de San Juan (Spanish) 2)

Yerrow (English) 6)

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Zeeroogenbloem (Dutch) 1)

Zeiskraut (German) 1)

Zeis-Kraut (German) 2)

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## GEOGRAPHICAL DISTRIBUTION.

Achillea Millefolium Linne' is a plant of the Compositae family showing almost world-wide distribution. It has been found to inhabit a large portion of the land area around the earth from ocean to ocean in the North Temperate region. It is rare or absent on the dry plain and desert regions, and shows a preference for the more humid areas. It is also limited in its distribution by temperature. It has been found as far south towards the equator as Yucatan and Central America, and north to the more temperate parts of Alaska and of Norway, Sweden and Russia. Achillea Millefolium Linne's thus exhibits uncommon ability to adapt itself to its environment.

It presents an interesting problem by its very rare occurrence in any region south of the equator. It has been reported only from New Zealand and the Victoria province in Australia. Its occurrence in these two regions can be satisfactorily accounted for by stating that it has been carried accidentally therein clover, grass and other seeds, and therefore is an immigrant into those regions. Therefore, excluding it from these two immigrant stations, Achillea Millefolium Linne' can be stated to be absent from the southern hemisphere.

No investigator has reported any trace of Achillea Millefolium Linne' in any fossil condition. It does not seem to have had an old existence, but rather to be of a late botanical origin. Its remarkable powers of adaptability to various environments, its prolific weed-like spread in new

regions--in which it had not hithertofore occurred--and its great capacity for reproduction, all indicate that it is of a late origin. However, its youthfulness seems but a slight deterrent from now on to its ultimate conquest of the whole temperate world, for man by modern, rapid modes of transportation and desires for interchange of products has provided the means for the akenes of this plant to be carried into these regions that will furnish a fertile field for the growth of this plant.

Achillea Millefolium Linne' has been reported in Japan, Mongolia, Manchuria, Siberia, Turkestan, China, India, and various other stations in Asia; in Norway, Sweden, Denmark, Russia, Germany, Austria-Hungary, the Balkan States, the Mediterranean region, Spain, France, England, Belgium and other regions of Europe. In North America it has been reported in Yucatan, north to Alaska, and from the Atlantic seaboard of Nova Scotia south to Florida, west to California and up along the British coast to Bering Straits. It occurs throughout the intervening region, except in very unfavorable regions, such as the Great American Desert.

The following is a list of geographical references indicating where the occurrence of this plant has been reported. These have been restricted to one or two for each locality in order to show the distribution. Further references are to be found in the main bibliography at the end of this thesis.

The following is a list of references, arranged alphabetically, according to the geographical locality from which Achillea Millefolium Linne' has been reported at various times, preferences being given to those of the more recent date. The list does not include all of the references collected, but does include at least one reference to all of the geographical localities where this plant has been reported to occur.

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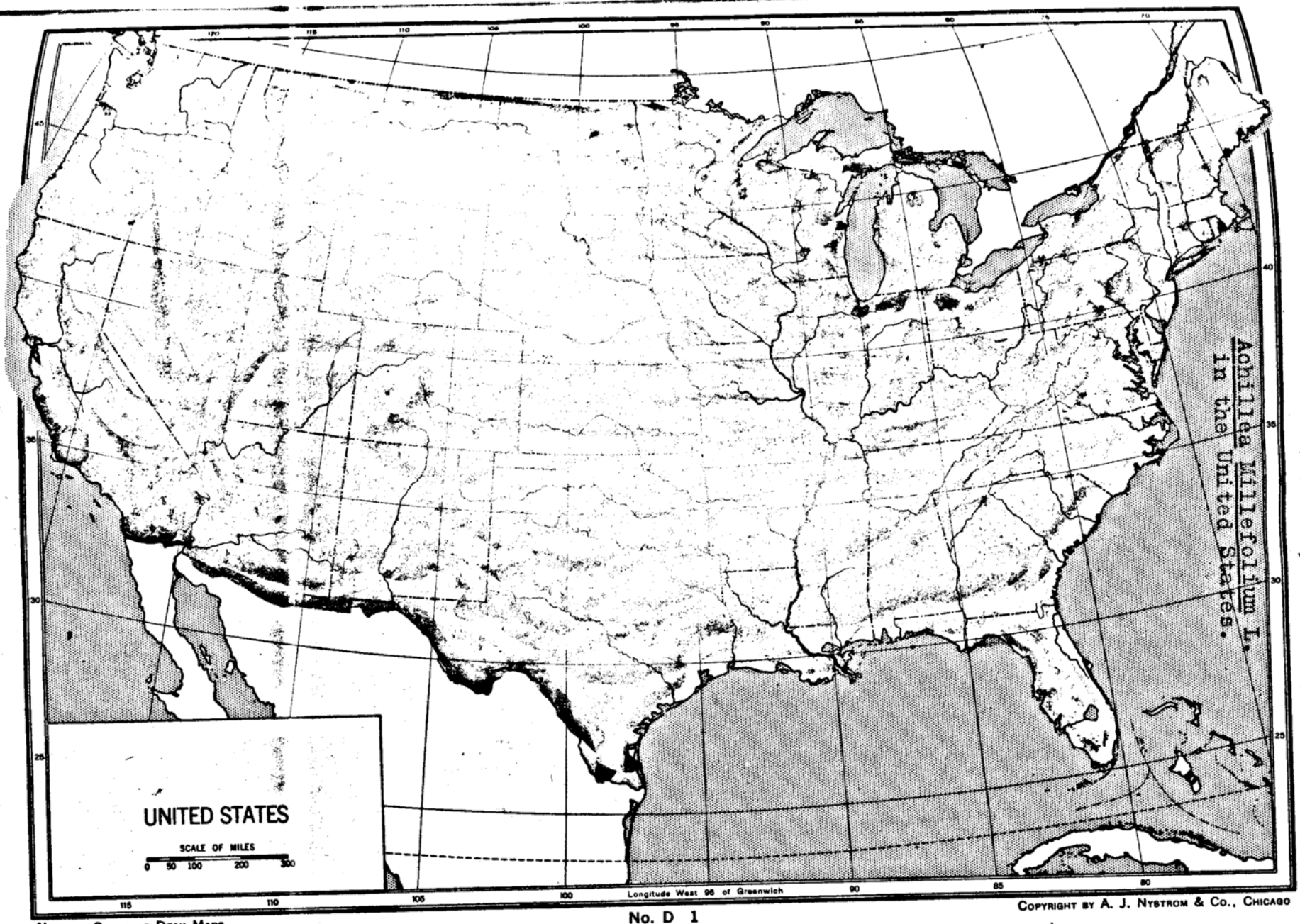




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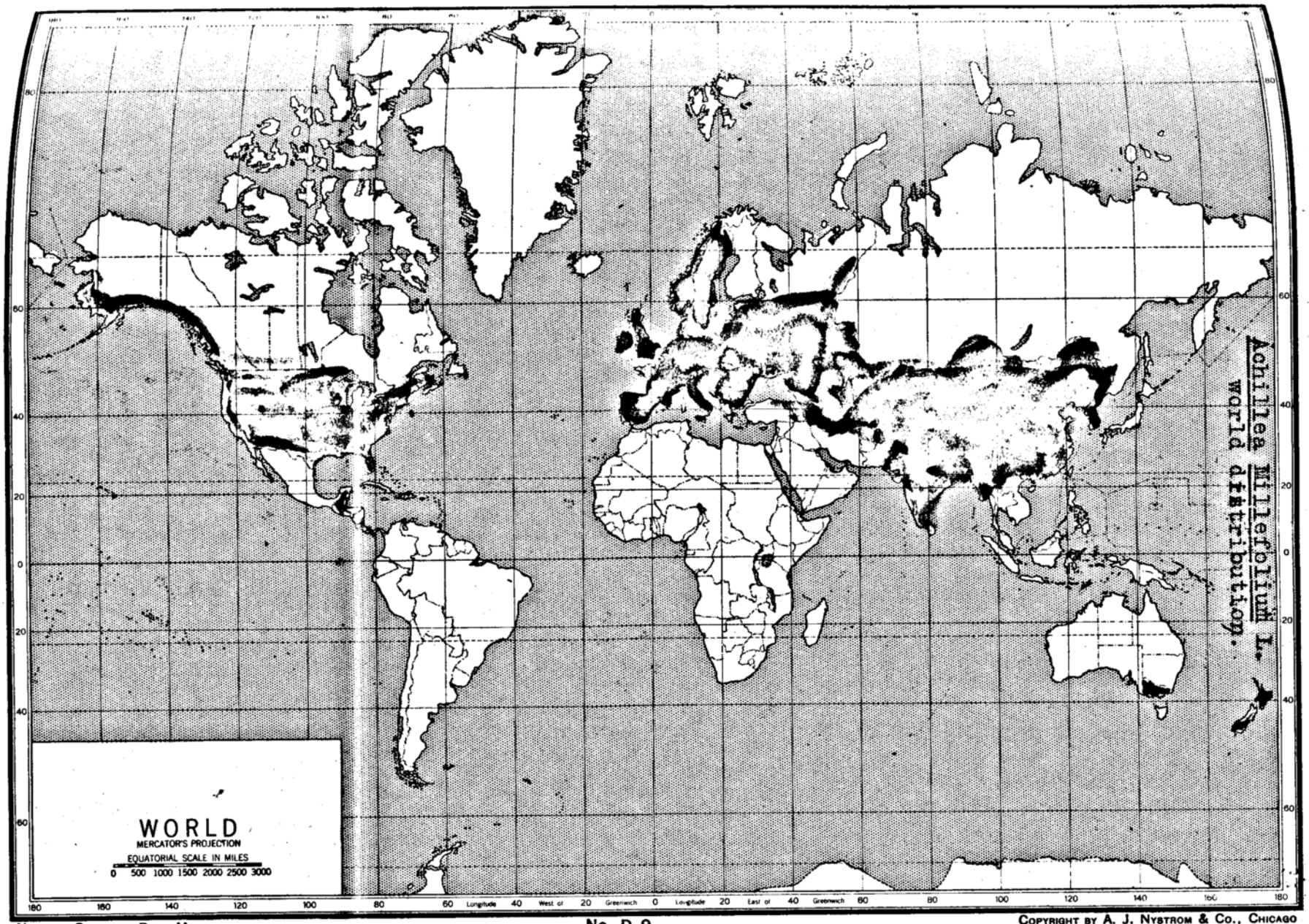


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No. D 9

## ILLUSTRATIONS.

The following is a list of illustrations of Achillea Millefolium Linne'. The list has been compiled by direct inspection of the literature and by reference to the Index Londinensis, (1929), v.1, pp.43-44. The list in the Index Londinensis begins with the year 1761, and is inclusive through the year 1920, hence it does not include references to this plant previous to 1761 and subsequent to 1920. The following list contains all references from the earliest found to 1932, and of which there are 25 previous to 1761, 8 subsequent to 1920, and 26 not listed in the Index Londinensis.

The author's name is given, the date, name of the plant illustrated, reference and page. If the original reference has not been consulted, the name of the plant is enclosed in brackets, and in which case the scientific name, Achillea Millefolium, has been chosen as the name of the plant illustrated, as done by the authors of the Index Londinensis. The index (1) occurring after the name of the plant indicates that the reference is included in the Index Londinensis. A (---) indicates that the desired information is unknown and could not be obtained, if in the literature. Colored illustrations are indicated by a # placed after the name of the plant. Certain words have been abbreviated as follows: page, p.; figure, fig.; plate, pl.; number, No.; volume, v.; edition, ed.; illustration, ill.

The list is not limited to the flowering herb, but includes the various parts of the plant, as wellas the plant in various stages of growth.

1485.

Cube, J.W.. Millefolium.

Hortus sanitatus, p.----

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(1498).

(----) De Millefolio.

Arbolaire, p.-----.

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1499.

Avicenna, A.. Millefolium.

Incipit Tractatus de virtubibus herbarium, p.85.

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1876-1517.

De Launay, L.Abbe Milles Feuilles #

Le Livre d' Heures, de la reine Anne de Bretagne, v.1, p.c32.

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1542.

Fuchsium, L. Stratiotes Millefolia.

De Historia Stirpium, p.726.

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1552.

Tragus, H. Millefolium Vulgare.

De Stirpium maximo, p.477.

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Laguna, A. Del Stratiote Milefolio.

Pedacio Dioscorides Anazarbeo Acerceade la Materia Medicinal, p.441.

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1572.

Matthiole, P.A. De la Millefeuille.

Commentaires de M. Pierre Andre Matthiole Medecin Senois sur les six livrew de Ped.Dioxcoride Anazarbeen de la Matiere Medecinale, p. ---.

Clusius, C. 1576.

De Stratiote flore luteo.

Rariorum aliquot stirpium per Hispanias observatarum p.370.

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Millefolium terrestre vulgare.

Stirpium Historia, p.430.

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Dodoens, D.R. 1578.

Of Yarrow or Common Milfoyle.

A Nieuue Herball, pp.144-145.

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Matthioli, P. 1581.

Della Stratiote Millefoglie.

Dioscorsi Di Pedacio Discoride Anazarbeo dell Materia Medicinale, p.720.

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Dodonaeus, R. 1583.

De Millefolio sive Achillea.

Stirpium Historiae, p.100.

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Stratiotes Millefolia.

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Millefolium terrestre minus Dioss.

Iconum Stirpium et Plantarum, p.130.

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Millefolium terrestre vulgare.

The Herbal, p.913.

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Millefolium rubro flore.

Rariorum Plantarum Historia, p.331

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Millefolium flore rubro.

Hortus Eystettensis, p.153.

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Millefolium flore albo.

Hortus Eystettensis, p.153.

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The Herball or Generall Historie of Plants, ed.2, p.1072.

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Van Geruwe oft Millefolium.

Herbarius oft Cruydt Boeck, p.137.

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Kreuterbuch, pp.171-72.

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Millefolium terrestre maius.

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Millefolium vulgare album.

Institutiones Rei Herbariae, v.1, p.496; v.3, p.283.

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Millefolium.

The British Herbal, p.464.

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The Vegetable System, v.2, pl.65.

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Virtue of British Herbs, pl.11.

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La Botanique, p.68.

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Auserlesene mikroskopische Entdeckungen bei den Pflanzen Blumen und Blüten, Insecten und andern Merkwurdigkeiten, pl. 11, 12.

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Choix de plantes d'Europe, pl.23.

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Medical Botany, ed.2, v.1, p.36.

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Herborisations artificielles aux environs de Paris, pl.53.

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Flore pittoresque des environs de Paris, pl.55.

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Getreue Darstellung und Beschreibung der in der Arzneikunde gebräuchlichen Gewachse, v.9, pl.45 .

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Sallent, ---- 1917.

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## CHEMISTRY OF THE PLANT.

The earliest reference found in the literature to Achillea Millefolium Linne' upon any work which might be considered chemical in nature is that of Hoffmann[1], assisted by C.H. Petzsch, in 1719 who states that he obtained a sapphire colored oil by distillation. Neumanns[2], in 1752, refers to this work by Hoffmann.

Lewis[3], in 1785, found that he obtained 1 part of volatile oil from 448 parts of the plants.

Remler[4], in 1788, found that Achyllea Millefolium[5] lost 13/16 parts by weight when dried. In 1789 he changed this to 11/16 parts loss by weight.

The first extensive chemical analysis was made by L.F. Bley[6] in 1828. He separated the plant into roots, herb, flowers and seeds. In 2000 parts of the herb he reported the following: (parts of constituents)

| | |
|---|---|
| Volatile Oil | 0.96 |
| Acetic acid | 0.48 |
| Sulfur | traces |
| Albuminous matter | 24.0 |
| Potassium salts | 44.0 |
| Hard resin | 12.0 |
| Salt, saltpeter and phosphorous extractive | 352.0 |
| Tannin extractive with $K_2SO_4$ | 55.0 |
| Gum | 71.0 |
| Chlorophyll | 137.56 |
| Resinous extractive | 40.0 |
| Artificial gum | 371.0 |
| "Kleber", (Gluten ? ) | 265.0 |
| "Phyteumakolla", (Plant glue?/) | 50.0 |
| Fiber | 360.0 |
| Moisture | 180.0 |
| Loss | 37.6 |
| | 2000.0 |

He reported the constituents for the roots, flowers and seeds in a like manner.

Bley[7] continued his work and in 1832 again reported his results. He found malic acid, chlorophyll, resin, tannin, a volatile oil, acetic acid, phosphoric acid and an oleo-resin. In 1834 he[8] reported that 24 pounds of dried blossoms yielded 3½ drams of a dark blue colored volatile oil and the herb 2 drams, 8 pounds of the air dried seed 1 scruple of green volatile oil, and 8 pounds of roots 20 grains of a colorless volatile oil. Bley subsequently reported on other species of Achillea.

Schlickum[9] in 1837 found that 1/4 of the weight of Achillea Millefolium Linne' was obtained as an aqueous extract. Zanon, in 1846, obtained achilleic acid and achilleine from the plant. He prepared the K, Na, $NH_4$, Ca, Mg and quinine salts of the achilleic acid.[10] In 1850[11] the ash analysis percentages were reported as follows: K 30.37, Na---, Ca 13.40 , Mg 3.01, Iron oxide 0.21, $MnO_2$---, $H_2SO_4$ 2.44, HCl ---, Cl ---.

Hlasweta[12] in 1857 announced that the achilleic acid socalled by Zanon was actually aconitic acid, occurring as the calcium salt, and described it and its salts.

The tannin content of the plant was found by Bowman,[13] in 1869, to be 4.15%.

In 1870 Planta-Richenau[14] reported the results of a chemical examination, noting achilleine, stearic acid and the ash contents.

The ash analysis were reported by Wolff,[15] in 1871 as follows: 100 parts of ash contain--- $K_2O$ 47.81, $Na_2O$ 2.12 CaO 14.79, MgO 3.32, $Fe_2O_3$ 0.23, $P_2O_5$ 7.84, $SO_3$ 2.69,

$SiO_2$ 10.95, Cl 13.17, crude ash 13.45, $CO_2$ 12.75,

Murrie [16], in 1887, reported a yield of 0.80 kilogram of volatile oil from 100 kilograms of the herb.

Onslow [17], in 1916, found that the anthocyanin pigments were localized in the subepidermal portions and also in the epidermal portions of the young leaves. He made the interesting observation that in the more mountainous habitats a larger amount of anthocyanin is present, producing more brightly colored flowers.

Rosenthaler [18], in 1922, examined the blooming plant for HCN and found substantial proof of its presence. He believed benzaldehydcyanhydrin $\phi-C\begin{matrix}OH\\H\\CN\end{matrix}$ to be present, probably as an intermediary product in the nitrogen assimilation.

Kroeber [19], in 1925, found that 18.6% of the plant could be extracted by a hydro-alcoholic menstruum (EtOH 3, $H_2O$ 7) and that at 19° this extract had a specific gravity of 1.056 and that it yielded 2.8% ash.

Rosenthaler [20], in 1925 again reported the presence of HCN and the occurrence of a glucoside in Achillea Millefolium Linne'. He found that in the month of May 0.006-7%of HCN was present, and 0.003% in June, a decrease as the season advanced. By polarimetric measurements he found 14.1 mg. of sugar present in 100 cc. of his solution, after treating with emulsin-( a so-called HCN liberating ferment). From these results Rosenthaler believed a glucoside of benzaldehydcyanhydrin to be present.

The next year, 1926, Mahler[21] obtained some of the glucoside from the Deutsche pharmak Institute at Prag and found that it increased the secretion of gastric juice in healthy individuals when taken by mouth.

Kylin,[22] in 1926, studied the pigments and found that time, as a function of the enzymatic action, modified the absorption spectrum of the several pigments.

Kroeber,[23] in 1927, reported the constituents of the plant and among which are inulin and a phytosterol- two new contributions to the phyto-chemistry of this plant.

A retrospection of this period of over 210 years of chemical investigations upon this plant divulges that the preponderance of work has been done upon the volatile oil and that most of this work on the oil has been done at the University of Wisconsin. To date there is no commercial demand for the oil, and therefore the work represents pure phytochemical research.

The experimental part of this thesis contains the results of an investigation of a different group of constituents of this plant, but in this case attention has been confined chiefly to the non-volatile portion, more especially the fats.

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## CHEMISTRY OF THE VOLATILE OIL.

The earliest reference found in the literature to Achillea Millefolium Linne' upon any work relating to the volatile oil is that of Hoffmann[1], in 1719, who states that a blue volatile oil was obtained by distillation.

Neumanns[2], in 1752, definitely recognizes a blue volatile oil obtained from this plant. Lewis[3], in 1753, states that an "elegant blue" (volatile) oil was obtained by distillation. Later on, 1785, Lewis[4] was so much interested in this oil that he determined the yield. He obtained 4 drams of (volatile) oil from 14 pounds of flowers,(quantities are Avoirdupois, and the work was done by Lewis himself), or 1 part of oil from 448 parts of plants.

As yet, in spite of these definite statements by at least3[1)2)3)] authors, no mention has been made of the production of this volatile oil in the various publications treating on the volatile oil of Achillea Millefolium Linne' that have been available ( see references No. 6,10,11,12,13,14,15). Thus, though much of the chemical work on Achillea Millefolium Linne' has been on the volatile oil, not a single person has given any worker previous to Bley credit for the earlier production of the oil which preceded Bley's work of 1828[12)5)] by nearly 110 years.

L.F. Bley[5], in 1828, in the course of an extensive analysis of the various parts of the plant, reported that he obtained an "aetherisches Oel" as follows:

0.751 parts from 3000 parts of the roots

1.94 parts from 2000 parts of the flowers

1.05 parts from 2000 parts of the seeds.

Bley found the volatile oil of the root to be almost colorless; that of the other parts colored (blue). Gildemeister and Hoffmann[12] have given Bley credit for being the first to have obtained the volatile oil, which has been shown above to be wrong.

In 1894 Schimmel and Co.[6] obtained by steam distillation a deep-blue colored oil, from which cineol was identified. Aubert[7] examined a milfoil oil in 1902 and obtained no new information. Sievers[8] also examined an oil from milfoil and found indications for acetic acid and borneol.

Augsyurger[9] in 1915 isolated for the first time a blue hydrocarbon from the high boiling fractions of the oil.

In this relatively unknown state the chemistry of the volatile oil of Achillea Millefolium Linne' lay until the problem was attacked by Emerson R. Miller[10] in 1916. The following compounds were found by Miller to be present in the volatile oil: l-$\alpha$-pinene, d-$\alpha$-pinene, l-limonene, l-borneol, l-camphor, cineol, salicylic acid, formic-, acetic -, butyric -, and iso-valeric acids, indications for unknown aldehydes, and a blue constituent.

The work was then continued in 1921 by Roland Kremers.[11] He confirmed Miller's results, and reported the following new compounds: formaldehyde, methyl and ethyl alcohols, acetone, furfural, eugenol, nopinene, thujone, caryophyllene, and azulene.

No further isolations or additions to the chemistry of the volatile oil of Milfoil have been reported since the

work of Roland Kremers.

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3) Lewis, W., New Dispensatory, (1753), p.161.

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# UNITED STATES PHARMACOPOEIA DEFINITIONS AND DESCRIPTIONS OF ACHILLEA MILLEFOLIUM LINNE'.

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U.S.P. IV. 1860 (1864) secondary list page 56.

Achillea Yarrow

The herb and flowers of Achillea Millefolium.

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U.S.P. V. 1870 (1873) secondary list page 56.

Achillea Yarrow

The leaves and flowering tops of Achillea Millefolium.

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# ACHILLEA MILLEFOLIUM Linné

in

## NATIONAL PHARMACOPOEIAS

## AUSTRIA.

| | | | | |
|---|---|---|---|---|
| 1 ed. | Pharmacopoea Austriaca | Vienna | 1812 | (1) |
| 2 " | " " | " | 1814 | (1) |
| 3 " | " " | " | 1820 | (1) |
| 4 " | " " | " | 1834 | (1) |
| 5 " | " " | " | 1855 | (1) |
| 6 " | " " | " | 1869 | (1) |
| 7 " | " " | " | 1890 | (1) |
| 8 " | " " | " | 1906 | (1)(4) |

## BELGIUM.

| | | | | |
|---|---|---|---|---|
| 1 ed. | Pharmacopoea Belgica | Bruxelles | 1854 | (1) |
| 2 " | " " | " | 1885 | (1) |

## DENMARK.

| | | | | |
|---|---|---|---|---|
| 1 ed. | Pharmacopoea Danica | Copenhagen | 1772 | (1) |
| 2 " | " " | " | 1805 | (1) |
| 3 ed. | " " | " | 1840 | (1) |
| 4 " | " " | " | 1850 | (1) |
| 5 " | " " | " | 1868 | (1) |

## FINLAND.

| | | | | |
|---|---|---|---|---|
| 1 ed. | Pharmacopoea Fennica | Abo | 1819 | (1) |
| 2 " | " " | Helsingfors | 1850 | (1) |
| 3 " | " " | " | 1863 | (1) |
| 4 " | " " | " | 1885 | (1) |

## FRANCE.

| | | | |
|---|---|---|---|
| 1 ed. | Codex Medicamentarius sive Pharmacopoea gallica | Paris | 1818 (1) |
| 3 " | " Pharmacopee Francaise | Paris | 1866 (1) |
| 4 " | " " " | Paris | 1884 (1) |

## GERMANY.

| | | | |
|---|---|---|---|
| 1 ed. | Pharmacopoea Germanica | Berlin | 1872 (1) |
| 4 " | Ergänsungsbuch zum Arznei buch für das Deutsche Reich | Berlin | 1916 (2) |

## GREECE.

| | | | |
|---|---|---|---|
| 1 ed. | Pharmacopee Grequa | Athens | 1837 (1) |
| 2 " | Pharmacopee de Dambergis | " | 1899 (1) |
| 3 " | " " " | " | 1909 (1) |

## MEXICO.

| | | | |
|---|---|---|---|
| 1 ed. | Farmacopoea Mexicana | Mexico | 1874 (1) |
| 2 " | " " | " | 1884 (1) |
| 3 " | " " | " | 1896 (1) |
| 4 " | " (1), Nueva Farmacopoea Mexicana (2) | " | 1904 |

## PORTUGAL.

| | | | |
|---|---|---|---|
| 1 ed. | Pharmacopeia geral. | Lisbonne | 1794 (1) |
| 2 " | Codigo Pharmaceutico lusitano | Porto-Coimbre | 1836 (1) |
| 3 " | Pharmacopea Portugueza | Lisbonne | 1876 (1) |
| | or | | |
| 3 " | " " | Lisboa | 1876 (2) |

## ROUMANIA.

| | | | | |
|---|---|---|---|---|
| 1 | ed. | Pharmacopoea Romana | Bucarest | 1862 (1) |
| 2 | " | " " | " | 1874 (1) |
| 3 | " | " " | " | 1893 (1) or (2) |
| 4 | " | " " | " | 1926 (3) |

## RUSSIA.

| | | | | |
|---|---|---|---|---|
| 1 | ed. | Rossiyskaya Farmacopeya | Petrograd | 1866 (1) |
| 2 | " | " " | " | 1871 (1) |
| 3 | " | " " | " | 1880 (1) |
| 4 | " | " " | " | 1891 (1) |
| 5 | " | " " | " | 1902 (1) |
| 6 | " | " " | " | 1910 (1)(4) |
| 7 | " | Rossivskaja Farmakopeya | St.Petersburg | 1926 (2) |

## SWEDEN.

| | | | | |
|---|---|---|---|---|
| 1 | ed. | Pharmacopoea Suecica | Stockholm | 1775 (1) |
| 2 | " | " " | " | 1779 (1) |
| 3 | " | " " | " | 1784 (1) |
| 4 | " | " " | " | 1790 (1) |
| 5 | " | " " | " | 1817 (1) |
| 6 | " | " " | " | 1846 (1) |
| 7 | " | " " | " | 1869 (1) |
| 10 | " | " " | " | 1928 (2) |

## SWITZERLAND.

| | | | | |
|---|---|---|---|---|
| 1 | ed. | Pharmacopoea Helvetica | Schaffhouse | 1865 (1) |
| 2 | " | " " | " | 1872 (1) |
| 4 | " | " " | Berne | 1904 (1) or 1907 (2)(4) |

UNITED STATES.

5 ed. The Pharmacopoeia of the United States of America, secondary list, Philadelphia, 1863 (1)

6 ed. The Pharmacopoeia of the United States of America, secondary list, Philadelphia, 1873) (1)

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Achillea Millefolium Linne' has been official in the preding national pharmacopoeias, according to the following authorities.

(1) Brunts, L., and Jaleux, M., Plantes Officinales, (1918), pp.218-19.

(2) Falck, A., Die Offizinellen Drogen und Ihre Ersatzstoffe, (1928), pp.196-97.

(3) Pissel, C., Pharmaceutische Monatshefte, (1929), 10, p.206.

(4) Gathercoal, E.N., Journal of the American Pharmaceutical Association, (1916), 5, p.288.

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## PROPERTIES AND USES.

The plant now known as Achillea Millefolium Linne' has long been recognized for its use as a medicinal herb. Achilles[1] has been credited with discovering its healing virtues, more particularly that he healed the wounded Telephus at the siege of Troy.

The American Indians[2] used the plant as a vulnerary, to cure colds and as an application to heal burns. The Winnebago Indians[3] used the infusion to bathe swellings and for earache. The Pah-Ute Indians[4] of Utah took it internally for weak and disordered stomachs. It is striking that different groups of people that were entirely without any means of communication should use this plant for the healing of wounds. The legend of the use of Achillea Millefolium Linne' as a healing agent in Greece thus gains prestige from a similar practise of the American Indians.

The plant has until of late been in vogue among the different peoples of Europe and American as a remedial agent. Until recently nearly all the Materia Medicas (which have included herbs) have given considerable recognition to this plant. It has also been recognized in the national and local pharmacopoeias. But with a few exceptions this popularity has now dwindled very considerably.

Culpepper[5] (1813) states that an ointment containing it is good for wounds, green wounds, ulcers, fistulas and inflammations; that a decoction prevents the shedding of the

hair and inwardly retains the urine. Rafinesque[6] with his customary expansiveness of expression, advised its use as a bitter tonic, vulnerary and restringent,-for dysentery hemorrhoids, wounds, menstrual affections, hypochondria and cancer- in the form of an infusion or extract.[7] Griffith, likewise, accorded Achillea Millefolium Linne' recognition as a remedial agent. Scudder[8], in the Eclectic Medical Journal of 1862, lists its uses as tonic, astringent, alterative in disease of the urinary apparatus, bronchial tubes-and it caused profuse expectoration.[9] Waring, in 1863, reported on the "Medical Properties" of this plant.[10] Allen considers fully in his "Encyclopedia of Pure Materia Medica" the action and uses of Millefolium.[11] Eastes, in 1884, reported that it is used in Norway for rheumatism, as a styptic, vulnerary anodyne, and to increase the intoxicating powers of beer.[12] Hemnells, in 1897, reported that it was a bitter aromatic, carminative and diuretic stimulant worthy for cases of gastric and urinary disturbances, and for expelling small calculi, mucus and epithelium fragments. Dragendorff,[13] in 1898, mentions the previously enumerated uses and adds that it has been used for catarrh and fever. Felter[14] (1906) stated that the hot infusion was a substitute for pilocarpine in being a stimulant to the sudoriferous glands, and antipyretic. The same year he cited case histories to show the value of the fluidextract in curing menorrhagia and similar disorders.[15] Marie-Victorien[16] found that Lake Temiscaming Indians used the fresh green plant for burns. Pearn,[17] in 1921, reviewed the uses of the plant and

stated that the infusion (1 ounce to the pint, dose 5-30 drops) was preferred, and that it would cause intense perspiration, & break up colds. [18] Sans reported that dermatitis was believed to be caused by Achillea Millefolium Linné due to long contact with the leaves either in fresh or cooked condition, but the specific substance responsible was unknown. [19] Pammel considered it to be a poisonous weed and [20] Long found it to impart a bitter taste and strong odor to dairy products.

This constitutes a brief review of the principal uses to which this plant has been put in its more popular day. No attempt will be made to cite any more of the referenced appertaining to this particular topic as the Bibliography will be found to be amply supplied with references to the Properties and Uses of the plant.

1) Pliny, C. Jr., Naturalis Historiae, ( ca. A.D. 70), xxv, 8.

2) Smith, H.I., Annual Report of the Department of Mines, Canada, (1927), p.65.

3) Gilmore, M.R., Annual Report of the American Bureau of Ethnology, (1912), 33, p.134.

4) Palmer, E., American Journal of Pharmacy, (1878), 50, p.590.

5) Culpepper, N., Herbal, (1813), p.391.

6) Rafinesque, C.S., Manual of Medical Botany, (1828), v. 2, p.185.

7) Griffith, R.E., Medical Botany, (1847), p.403.

8) Scudder, J.M., Eclectic Medical Journal, (1862), 23, p.241.

9) Waring, E.J., Pharmaceutical Journal, (1863), 23, p. 504.

10) Allen, T.F., The Encyclopedia of Pure Materia Medica, (1877), v.6, pp.366-371.

11) Eastes, E.J., Pharmaceutical Journal, (1884), 43, p.842.

12) Mennella, A., Comptes-Rendus du Congres International de Medecine, (1897), 2, sect.4, b., p.9.

13) Dragendorff, G., Die Heilpflanzen, (1898), p.674.

14) Felter, H.W., Eclectic Medical Journal, (1906), 66, p.540.

15) Ibid., p.585.

16) Marie-Victorien, Fr.des E.C., Naturaliste Canadien, (1919), 45, pp. 163-169.

17) Pearn, J., Eclectic Medical Journal, (1921), 81, p.76.

18) Gans, O., Deutsche medizinische wochenschrift, (1929), 55, p.1213.

19) Pammel, L.H., Manual of Poisonous Plants, (1911), pt. 2, pp.756, 786, 787.

20) Long, H.C., Plants Poisonous to Live Stock, (1917), p.100.

## COMMERCE.

### Sources.

Achillea Millefolium Linne, as shown in the chapter on Geographical Distribution, is more or less world wide, especially in the northern hemisphere, in its habitat. It grows very well either wild or cultivated. It thus is readily obtainable and practically all of the commercial supply is furnished by collectors who secure it from non-cultivated sources. However, it has been cultivated successfully, and should a demand develop it is likely that this means would be used to supply the market. 1)

### Collection.

The plant flowers during the period from June to October, with the maximum during early July. The whole herb is collected during the flowering period. The herb is then subjected to drying conditions where it can be turned over every day until practically all the moisture is lost. Then it is stored until desired, or cut, pressed and placed in small packages, or larger bundles. The small packages of the herb have found a retail demand as a folk medicine. The fresh herb also has been in vogue and collected as needed, but because of its perishability it has been commercially unimportant.

## Adulterations.

Achillea Millefolium Linne' is so cheap in price, so readily obtainable and so characteristic that no case of adulteration has been found. The Achillea Nobilis Linne' and the Achillea Ptarmica Linne' may be substituted occasionally but are not considered as adulterants. Other species of Achillea have been used, but preference has been given to Achillea Millefolium Linne'.

## Prices.

The herb is found in commerce to a limited extent. It is still listed on the market [2] at approximately 10¢ per pound (dried condition). The average stock found in retail stores gave indications of having been purchased some years before and unsatisfactory for use.

## Cultivation.

The Achillea Millefolium Linne' can be cultivated. In the Pharmaceutical Garden of the Wisconsin Pharmaceutical Experiment Station [1] this plant has been successfully cultivated during about 20 years. It is perennial and may be grown by splitting the crowns as well as from the akenes. The plant is hardy and it withstands drought and freezing conditions that have been destructive to other plants grown under identical conditions. It has also been used as an ornamental plant--especially the red flowered variety--

because of its pleasing color. The red variety has been successfully cultivated in the Horticultural Gardens[3] at the Ohio State University. Besides ease in cultivation the plant is resistant to pathological conditions, though galls occasionally are present.[4] During the blooming period the flowers are regularly visited by bees, so that apiculturists have also given it recognition.

1) Miller, F.R., Bulletin of the University of Wisconsin, (1916), No. 785, p.12.

2) Penick, S.B. & C., Price List and Manual of Drugs, (1932), p.40.

3) Hottes, A.C., The Book of Perennials, (1929), ed.3, p.58.

4) Thomas, F., Botanische Zeitung, (1879), 37, p.93.

# EXPERIMENTAL

## Chemistry.

## Source of Material.

The material for this study of Achillea Millefolium Linne' was obtained from the Pharmaceutical Garden of the Wisconsin Pharmaceutical Experiment Station. The plant has been commonly designated as this species, but due to uncertainty and confusion by taxonomists as to the limitation of the species no positive assertion is made in this thesis concerning the plant being identical with the original of Linne'. However, in order to maintain the identity of the material a number of specimens have been deposited in the Herbarium of the University of Wisconsin.

## Preparation of Material.

The plants were harvested in the summer of 1929 while in the blooming period. They were taken to the left of the chemistry building and spread out to dry. Frequent turning in a freely circulating dry air, with temperatures during the midday reaching 100° F., rapidly dried the plants. The dried plants were then stored during the winter and then during the summer of 1930 the flower heads were separated and a little more than 100 pounds (Avoir) of dried flower heads were obtained. Considerable physiological difficulty was experienced while separating the material, chiefly manifested by congested sinuses. Since the purpose was to obtain a large amount of flower heads no figures were kept concerning quantities involved. However, the work of 1928 showed the following ratios:

| | | |
|---|---|---|
| blossoms..... | 27.5 lbs | 48.03 % |
| leaves..... | 7.25 " | 12.66 " |
| stems..... | 22.5 " | 39.30 " |

as the proportion of parts of the air dried plant.

The flower heads were then ground in a Hamse mill to approximately a No.20 powder, suitable for percolation. One hundred pounds of this ground material were then taken to make a petroleum ether extract.

## Volatile Oil Recovered from Surplus and Blossom Free Material.

The surplus material after the removal of the flower heads was steam distilled, yielding a dark blue, aromatic oil. This oil was separated from the aqueous portion of the distillate by the aid of a separatory funnel. In this manner about 235 cc. of the volatile oil were obtained. The following constants were obtained at 25° C.:

| | |
|---|---|
| Specific Gravity..... | 0.9066 |
| Refractive Index..... | 1.4703 |
| Specific Rotation a(D)... | -14.11 |

The specific rotation was determined in the following dilutions, in 95% alcohol, of 9.3853, 4.1634 and 3.3701 grams of oil respectively per 100 grams of solution and using a 50 mm. tube. One investigator[1] stated that he used absolute alcohol. Dilution is absolutely necessary because of the interference of the blue color of the oil.

1) Haensel, H., Bericht, (1901), 4, p.25.

Heinrich Haensel[2] states that a solution of 1 part of the oil to 200 parts of absolute alcohol when measured in a 50 mm. tube rotates the plane of polarized light 1.65 degrees to the left. A duplicate of this was made, using a 100 mm. tube, but his value was not obtained. Instead an average reading of 0.055 degrees, equivalent to a(D) -11.76° was noted. Considering the extreme dilution this reading is in agreement with the readings made by using a larger percentages of oil. Further, the rotary power obtained by A.B. Aubert[3] of -14.2° is in agreement with present results. Therefore, it may be concluded that the optical rotation value of Heinrich Haensel is in error.

2) Haensel, H., Bericht, (1901), 4, p.25.

3) Aubert, A.B. Journal of the American Chemical Society, (1902), 24, p.778.

## Ash Determinations.

Samples were taken from a representative well mixed portion of the ground flower heads, kept in a sealed container. Determinations were made according to the laboratory manual, "Plant Chemistry for Pharmacy Students" by E. Kremers, p.18.

| Determination No. | I. | II. | III. | Average | Absolute |
|---|---|---|---|---|---|
| Sample (Grams) | 2.0097 | 1.9517 | 1.9021 | | |
| Ash (Grams) | 0.1383 | 0.1316 | 0.1301 | | |
| Ash(crude) % | 6.88 | 6.74 | 6.84 | 6.82 | 7.45 |
| Acid Insoluble Ash % | 1.48 | 1.31 | 1.35 | 1.38 | 1.51 |
| Acid Soluble Ash % | 5.40 | 5.43 | 5.49 | 5.44 | 5.95 |
| Water Soluble and Water Insoluble Ash. | | | | | |
| Sample (Grams) | 2.6210 | 2.6488 | 2.6902 | | |
| Water Insoluble Ash % | 4.20 | 4.23 | 4.08 | 4.17 | 4.56 |
| Water Soluble Ash % | 2.27 | 2.62 | 2.47 | 2.45 | 2.68 |
| Gross Ash % | 6.47 | 6.85 | 6.55 | 6.62 | 7.23 |

These percentages of ash have been calculated to a moisture free sample basis, as the samples contained 8.5% of moisture. This value is given in the last column, labeled "Absolute".

## Moisture Determinations.

Moisture determinations were made by several different methods. These various methods do not agree on their results. The percentage of moisture shown by the different methods follows. From these the Dean[1] method has been selected and the 8.5 percentage of moisture taken as the basis for other calculations in this work.

1) U.S. Dept. of Agriculture, Forest Service Circular, (1908), No. 134.

**Dean Method:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Series I (25 Gm. samples) | | | | | | | |
| Sample No. | I. | II. | III. | IV. | V. | VI. | Average. |
| Moisture % | 8.4 | 8.4 | 8.5 | 8.8 | 8.6 | 8.2 | 8.5 |
| Series II (10 Gm. samples) | | | | | | | |
| Moisture % | 7.0 | 7.0 | 7.5 | 7.8 | 7.0 | 7.5 | 7.25 |
| Series III (17.8 Gm. samples) | | | | | | | |
| Moisture % | 8.3 | 8.0 | 8.2 | * | * | * | 8.17 |
| Series IV. (40 Gm. samples) | | | | | | | |
| Moisture % | 8.0 | 8.0 | 8.25 | * | * | * | 8.08 |

The results were obtained on different days and with amounts of samples. A small sample (10 Gm.) does not seem to be appropriate for moisture determinations, as the results of the other 3 different amounts of samples agree among themselves better than with the 10 Gm. sample. Series I (25 Gm.), average of 8.5% moisture, has been selected for the moisture content value as the basis for calculations where this is necessary.

**Sulphuric Acidd Vacuum Desiccator Method:**

| Sample No. | I | II | III | Average. |
|---|---|---|---|---|
| Sample | 4.5800 | 6.2754 | 4.8468 | |
| Moisture % | 5.98 | 6.00 | 6.06 | 6.01 |

These samples were kept under vacuum ( 6 mm.) during 31 days, and weighed at several day intervals until losses became nil.

United States Pharmacopoeia Method (U.S.P.X p.468).

| Sample No. | I. | II. |
|---|---|---|
| Sample | 7.7614 | 7.5134 |
| Moisture % | 9.53 | 9.49 |

Decomposition tended to occur by this method.

Crude Fiber:

The crude fiber content of the flower heads was determined by the U.S.P. X (p.468) method, using a 2 Gm. sample. Sample No. I contained 24.86%, No.II 26.26% and No.III 23.39%, or an average of 25.07% of crude fiber. This amounts to 27.39% when calculated to a moisture free basis.

Preliminary Extractions.

A preliminary examination of the material was made, by subjecting two 100 Gm. samples to the action of successive different solvents, as follows:

| Sample No. | I. | II. | |
|---|---|---|---|
| Solvent | | | |
| Petroleum Ether--extract | 4.27 | 4.36 | Gm. or % |
| Ether | " 4.20 | 4.73 | " " |
| Alcohol | " 7.70 | 8.47 | " " |
| Water | " 16.8 | 15.0 | " " |
| Dilute Alkali (0.2%Naoh) | 11.0 | 12.0 | " " |
| Dilute Acid (1.0% HCl) | 9.0 | 9.0 | " " |
| Mare | 39.4 | 40.7 | " " |
| | 91.57 | 94.46 | " " |

As far as possible allowance was made for tare of non-volatile (NaOH) solvent used.

## Extraction with Petroleum Ether.

The percolator of the Lloyd Continuous Extraction Apparatus was found to hold only about 15 pounds of the ground flower heads, which thus required extracting successive 15 pound portions until all of the 100 pounds of material was treated. Each of these portions was moistened with petroleum ether, carefully packed in the percolator and then a sufficient amount of the solvent added gradually to saturate the material and also provide a sufficient excess to allow continuous extraction to proceed. Extracts were drawn off from time to time, and the petroleum ether recovered and returned to the percolator. The concentrated extracts were combined and the residual petroleum ether removed by heating at about 70°C., during exposure to a current of air produced by an electric fan. The resulting extract weighed 916 grams, and was a very dark green colored solid, of a fatty nature.

## Separation of the Volatile and Fixed Oils.

The petroleum ether extract was steam distilled to separate the volatile portion, yielding a volatile oil, an aqueous distillate, a fixed oil and an aqueous residue. The volatile oil was separated from the aqueous distillate by the aid of a separatory funnel, and the latter was cohobated to recover the volatile oil from the solution. This oil was was also separated from the aqueous distillate and added to the original oil. The total volatile oil amounted to 36.8 cc., or 33 grams, representing 6.073% of the 100 pounds of

dried flower heads.

The non-volatile portion of the petroleum ether extract remained in the distillation flask, together with water condensed from the steam during the distillation. This was allowed to cool and the solified fixed oil mechanically removed. The water was drained off, and the last traces removed by evaporation on a steam bath. The fixed oil weighed 846 grams, representing 1.86% of the blossoms.

## Character of the Volatile Oil.

The first portions of the volatile oil obtained above were clear, freely mobile and colorless. As the distillation proceeded a blue color gradually developed, becoming intensely dark blue as the last portions of the volatile oil were obtained.

## The Aqueous Distillate.

The aqueous distillate from the steam distillation of the petroleum ether extract amounted to 10 liters. This was cohobated 3 times to recover the volatile oil in solution and the volatile oil separated by means of a separatory funnel, as previously noted. The amount of oil recovered amounted to 2.8 cc., and had a specific gravity of 0.9630 at 25°C.

## The Fixed Oil.

The crude fixed oil was of a dark green color (presumably due to chlorophyll), waxlike in nature, and solid at room temperature. The acid values were 36.4, 39.4, and 34.9, or an average value of 36.9; saponfication values were

110.6, 114.1 and 109.7, or an average value of 111.5; iodine values of 56, 60 and 54, or an average value of 56.6. Much difficulty was experienced by interference of the green color. Attempts to remove the color were unsuccessful.

Aqueous Portion Left in the Retorts.

The aqueous portion, remaining in the retort after the steam distillation and separation of the fixed oil, was concentrated and yielded 10 grams of a dark reddish brown, semi-solid material. Previous to drying, but in the concentrated liquid state, it had a fruity to butterscotch odor. Due to incipient decomposition it was not reduced beyond the semi-solid state.

Saponification of the Fixed Oil.

An 800 gram portion of the fixed oil was warmed on a steam bath until liquid and then stirred into a boiling solution of 89 grams of KOH (absolute) in 1 liter of 95% alcohol. The mixture was refluxed 12 hours. The alcohol was then recovered from the reaction mixture, leaving a soapy liquid.

Extraction of the Unsaponifiable Material.

The soapy liquid, obtained after the removal of the alcohol from the saponification mixture, was diluted with water and repeatedly extracted with ether in a separatory funnel. The successive ether extracts were separated from the aqueous soapy portion, combined together and then washed with water to removed the soapy material. The ether extracts were then

dried over anhydrous sodium sulphate and filtered. The ether was then recovered, leaving a residue of non-saponifiable material which amounted to 182 grams, or 22.75% of the original 800 grams of fatty material.

### Insoluble Material.

A portion of the saponification mixture was insoluble in water and ether, and remained suspended between the ether and aqueous layers. This insoluble material was mechanically removed and dried. It amounted to 60 grams, or 7.5% of the original 800 of fatty material.

### Examination of the Saponified Portion of the Fixed Oil.

After the removal of the non-saponifiable material and the insoluble suspended material, the aqueous solution containing the potassium salts of the fatty acids and other water soluble compounds (glycerol, when present) amounted to about 30 liters. This was concentrated on a steam bath by stirring continuously while exposed to a current of air, until it amounted to about 6 liters. The fatty acids were set free by adding about half a liter of sulfuric acid, diluted with water in the ratio of 1 to 4, while the liquid was vigorously stirred. The fatty acids separated as a black tarry, odoriferous mass. Resort was had to ether to recover these acids. Between the ether and aqueous layers a dark insoluble suspended material again was in evidence. This was mechanically separated, and amounted to 42 grams, or 5.25% of the original 800 grams of fatty material.

The liberated fatty acids emitted the odors of the lower members of the fatty acid series, especially iso-valeric acid. The fatty acids amounted to 418 grams, or 52.3% of the original 800 grams of fatty material.

## Separation of the Fatty Acids by the Lead Ether Method.

The saturated and the unsaturated fatty acids were separated by the method of Varrentrap and Gusserow[1]. More or less difficulty was encountered with this method, with the result that some material was lost. There was finally obtained 62 grams of unsaturated fatty acids, or 7.75%, and 121 grams of saturated fatty acids, or 15.12%, of the original 800 grams of fatty material. These combined amount to 22.87%, or a loss of 29.63% of the original fatty material by this method of separating the two groups of acids.

## The Unsaturated Fatty Acids.

The lead salts of the unsaturated fatty acids were treated with 1:1 hydrochloric acid ( 1 part of 40% hydrochloric acid to 1 part of water) under ether, and yielded 62 grams of these acids, or 7.75% of the original 800 grams of fatty material.

Sixty grams of the unsaturated fatty acids were treated with bromine according to the method of Lewkowitsch[2] by dissolving in 2½ liters of ether containing 5% glacial acetic acid, the solution cooled to 5°C., and bromine added from a burette until a distinct bromine color was noticeable. In this way the bromine addition addition products were formed.

The ethereal solution was allowed to stand 5 hours in an ice bath, but no precipitated occurred * * nor on repetition. This indicated the absence of linolenic acid from this material.

## L i n o l i c  A c i d .

The ethereal solution was then washed with a saturated aqueous solution of sodium thiosulfate to remove excess bromine, and the ether recovered by distillation. The residue was then refluxed with petroleum ether, cooled, and the solution placed in the ice box (33-36° F.)(1-3°C.) for 5 hours. The precipitate thrown down in the cold was filtered off, the filtrate reduced to half of its initial volume, and again placed in the ice box for 5 hours. The second precipitate was removed. This was repeated until no more precipitate was obtained. The precipitates were then combined and amounted to 6 grams of linolic (acid) tetrabromide. After repeated recrystallizations from petroleum ether a melting point of 112° C. was obtained. This was characterized as linolic (acid) tetrabromide.[3]

## O l e i c  A c i d .

The petroleum ether was then recovered from the filtrates and the residue evaporated to dryness. This residue amounted to 40 grams. The bromine content was determined by the Stepanow[4] method and found to be 33.66% , 33.03% and 33.56%, or an average value of 33.4% . Lewkowitsch[5] states that oleic(acid)dibromide contains 36.18% bromine. About 2 grams of the oleic dibromide

was reduced with zinc and hydrochloric acid, the regenerated oleic acid recovered by the aid of ether, dissolved in 5 cc. of sulfuric acid (conc.) and tested with 1 cc. of a 1% alcoholic solution of vanillin superimposed upon the sulfuric acid layer [6]. The characteristic violet coloration of oleic acid (compared by testing with known oleic acid) was obtained. This compound was characterized as being Oleic (acid) dibromide.

.....

1) Lewkowitsch, J., Chemical Technology and Analysis of Oils, Fats and Waxes, ed.6, (1921), v.1, p.554.

2) Ibid. p.581.

3) Ibid. pp.201, 584.

4) Stepanow, A., Berichte der deutschen Chemischen Gesellschaft, (1906), 39, pp.4056-57.

5) Lewkowitsch, J., Chemical Technology and Analysis of Oils, Fats, and Waxes, ed.6, (1921), v.1, p.554.

6) Rosenthaler, L., Der Nachweis organischer Verbindungen, (1914), p.306.

G l y c e r o l .

The aqueous portion of the saponification mixture, after the removal of the fatty acids, was neutralized with sodium carbonate and concentrated on a steam bath, the sodium sulfate and sodium carbonate crystals were filtered off and the filtrate treated with siliceous earth and animal charcoal until practically colorless. This aqueous residue was then extracted with a solvent of 3 parts of alcohol (95%) and 1 part of ether, and the resulting extract concentrated on the steam bath.

Only a small amount of extract was obtained. It is noted here, as an observation on the material for this investigation, that the material remaining after the steam distillation of the petroleum ether extract was hard, and waxy in character. It really resembled carnauba wax except for its color. Therefore, its physical makeup indicated but little glycerine.

Glycerine was tested for according to the methods given by Rosenthaler [1] and Kamm [2]. The sodium hydroxide and copper sulfate test reacted positive; Fehling's solution positive; Schiff's reagent positive; ammoniacal silver nitrate test produced only a poor mirror.

These tests indicated the presence of glycerine, but in relatively small quantities.

1) Rosenthaler, L., Grundzuge der Chemischer Pflanzenuntersuchung. (1928), ed.3, p.66.

2) Kamm, O., Qualitative Organic Analysis, (1922), ed.1, p.142.

## The Saturated Fatty Acids.

The lead salts of the saturated fatty acids were treated with 1:1 hydrochloric acid, under ether, and yielded 121 grams of these acids, or 15.12% of the original 800 grams of fatty material.

The methyl esters of the saturated fatty acids were prepared by dissolving the acids in 250 cc. of methyl alcohol and 600 cc. of ether, adding 3% of 38% hydrochloric acid, 2 grams of granulated zinc and refluxing during 16 hours. During this time a current of HCl gas was drawn through the reaction mixture.

The reaction mixture was cooled, and barium carbonate added to neutralize the free HCl and then this mixture was warmed during 30 mintes. The mixture was then repeatedly washed with a saturated solution of sodium chloride to remove the excess methyl alcohol. Six hundred cc. of ether were added to extract the methyl esters, the ether solution was separated, dehydrated with calcium chloride, filtered, and the ether recovered from the filtrate. Theymethyl esters weighed 100 grams.

The methyl esters were then transferred to a Claisen distilling flask. The flask was carefully insulated with asbestos, connected with an air condenser, leading into a fractional distillation receiver to obtain portions at different distilling temperatures, and the apparatus protected from drafts. Theymethyl esters were then fractionally distilled under reduced pressure.

| Sample No. | Weight | Bath | Distillation Temperature | Pressure. |
|---|---|---|---|---|
| 1 | 4.3 | 155-210° | 83-150° | 3 mm. |
| 1a | 32.8 | 210-260° | 150-176° | 3 mm. |
| 2 | 20.3 | 260-298° | 176-200° | 3 mm. |
| 3 | 6.0 | 305-313° | 185-222° | 4 mm. |
| 4 | 10.6 grams | 338-342° | 215-223° | 4 mm. |

It was more difficult to maintain low pressure and an even high temperature during the final stages of the distillation, due to break down of the joints of the apparatus and bumping of the esters by the intense heat.

## M y r i s t i c  A c i d .

Distillate No. 1, of the distilled methyl esters of the saturated fatty acids, amounted to 4.2 grams. It was titrated with N/20 KOH volumetric solution and found to have a free acid value of 2.65 , and a saponification value of 226.

The fatty acid was liberated from the saponification mixture by heating with an excess of hydrochloric acid, cooled, the solid fatty acid filtered off and dissolved in chloroform. It was washed free of hydrochloric acid and evaporated to dryness. The residue was taken up with ether, dried with anhydrous sodium sulphate, filtered and evaporated to dryness. The residue, 2.0780 grams, was dissolved in neutral alcohol by the aid of heat. It was refluxed with a measured excess of N/2 KOH volumetric solution and the excess alkali back titrated with N/2 HCl volumetric solution. The fatty acid residue had a neutralisation value of 242. Myristic acid[1] has a neutralisation value of 246.1; palmitic acid[2] 219.1 . Therefore the distillate No.1 was believed to contain largely Myristic Acid.

The distilling range, 63°-150°, with the temperature rapidly moving through this range, (pressure 3 mm.) indicates the probability of other lower members of the saturated fatty acid series. These members were not isolated due to the limited amount of material in this fraction.

Distillate No.1a, distilling at 150°-176° C., under 3 mm. pressure, amounted to 32.8 grams. This fraction solidified at 17°-19° C. Two samples, of 1.4196 and 1.4210 grams respectively, had a saponification value of 236, using a measured excess of N/2 KOH alcoholic volumetric solution and back titrating the excess alkali with alcoholic N/2 HCl V.S. Methyl myristate has a saponification value of 231.6 [3].

The fatty acid was liberated from the saponification mixture by heating with an excess of hydrochloric acid, the mixture cooled, and the solid acid filtered off, dissolved in chloroform, washed with water, and evaporated to dryness. The acid was then recrystallized repeatedly from methyl alcohol until a constant melting point of 52.5°-53.5° C. was obtained. An authentic sample of Myristic Acid from the Eastman Kodak Co. melted at 52.5°-53.5°C., and no depression of the melting point of the mixed samples was noted.

A sample of 0.228 gram of the fatty acid had a neutralization value of 260, equivalent to a molecular weight of 215. Myristic Acid [4] has a neutralization value of 246, and a molecular weight of 228.

The following is a summary of the preceding data:

| Acid from Achillea Millefolium Linne | | Reported for Myristic Acid. |
|---|---|---|
| Methyl ester distilled 150-176° C. (5 mm.) | | 167-168°C. (15 mm.) [5] |
| Saponification value of the Methyl ester | 236 | 232 [3] |
| Melting point | 53° C. | 53.8°C. [4] |
| Neutralization value | 260 | 246 [1] |
| Molecular weight | 215 | 228 [1] |

The acid from Achillea Millefolium Linne' was characterized as Myristic Acid.

.....

1) Lewkowitsch, J. Chemical Technology and Analysis of Oils, Fats and Waxes, ed.6, v.1, p.524 (1921).

2) Ibid.

3) Calculated from $C_{13}H_{27}COOCH_3$

4) Lewkowitsch, J., Chemical Technology and Analysis of Oils, Fats and Waxes, (1921), ed.6, v.1, p.160.

5) Lewkowitsch, J., Chemical Technology and Analysis of Oils, Fats and Waxes, (1921), ed.6, v.1, p.161.

## Palmitic Acid.

The distillate No.2 of the methyl esters of the saturated fatty acids, distilling 176°-200°C., at 3 mm. pressure, amounted to 20.3 grams. Most of this fraction distilled 188°-200° C.

This fraction was repeatedly recrystallized from methyl alcohol. The saponification value of the ester was found to be 203.7; methyl palmitate has a saponification value of 207.6 [1].

Due to indications of unsaturated acid or acids being present [2] this fraction of the esters was again subjected to the lead ether method for removal of the unsaturated fatty acids. The saturated fatty acid was recovered, as previously described, (p. ), and amounted to 5.5 grams. The saturated acid was recrystallized from ethyl alcohol and acetone until the melting point was constant at 61-62°. Palmitic acid melts 62.6° C. [3]

***********

1) Calculate from $C_{15}H_{31}COOCH_3$

2) Methyl oleate shows a saponification value of 189 (calculated) and distils 212-213°C., at 15 mm. pressure, (Lewkowitsch, Chem. Tech. & Analysis, ed.6, v.1, p.152), and oleic acid distils 166° at 0.25 mm. pressure, (ibid. p.185); thus it was possible to have oleic acid or methyl oleate present in the distillate.

3) Lewkowitsch, J., Chemical Technology and Analysis of Oils, Fats and Waxes, (1921), ed.6, v.1, p.162.

## Acid from Distillate No. 3

This fractions amounted to 4 grams and distilled 185°-222°C., at 4 mm. pressure. Saponification value of the ester was found to be 191, using 0.5 and 2.0 gram samples. This ester was considered as being impure.

The acid was recovered from the saponification mixtures by refluxing with concentrated hydrochloric acid, the alcohol recovered and the acid allowed to solidify by cooling. This solid acid was filtered off, washed, and recrystallized successively from acetic acid, methyl alcohol, absolute alcohol, and benzene, until the melting point was constant at 75°-76° C. Titrated with N/20 KOH, using petroleum ether to dissolve the fatty acid, gave neutralizationvalues of 149 and 142, equivalent to molecular weights of 377 and 394, using 0.2 and 0.1 gram samples respectively.

The methyl ester was then recrystallized from alcohol and a saponification value of 151 was found, using a 1.1883 gram sample.

Calculation of the saponification value of $C_{23}H_{47}COOCH_3$ gives 146.7; $C_{23}H_{47}COOH$ [1] has a molecular weight of 368 and a neutralization value of 152.

Grun [2] states the melting point of this acid (lignoceric) is 80.5oC.

This acid from Achillea Millefolium Linne', melting at 75°-76° C., is considered as not definitely characterized, due to insufficient amount of material to adequately work with in view of the fact that the literature on these higher fatty

acids is not dependable.

1) Grün, A., Analyse der Fette und Wachse, (1925), v.1, p.143.
2) Ibid., p.112.

## Isolation of Cerotic Acid.

The No. 4 distillate of the distilled methyl esters of the saturated fatty acids was purified by repeated recrystallizations from 95% alcohol. The melting point of this fraction, finally, was 60-61° C., and the saponification value was found to be 126, using two 1 gram samples and alcoholic N/2 KOH and back titrating with aqueous N/2 HCl volumetric solution. From the saponification value mixture the solvents were removed by the aid of the steam bath and the free acid liberated by refluxing with 10 cc. of concentrated HCl.

After cooling, the free fatty acid was filtered off, washed with distilled water and finally filtered on a suction filter, using a small amount of absolute EtOH to remove last traces of water. It was then recrystallized from ethyl acetate and finally from toluene, by dissolving with the aid of heat and allowing to crystallize at 0-5°C. By such repeated recrystallizations the melting point was raised from 68° to 78° C. The melting point of 78° C. was obtained on material dried over KOH and $CaCl_2$ for 2 days, under a water-pump vacuum. This melting point is 1° to 1.5° C. lower than that obtained for cerotic acid from Chinese Insect Wax, but is strongly indicative of this acid being present.

A sample of 0.2430 gram of this acid (from Achillea Millefolium Linne' ) had a neutralization value of 138, equivalent to a molecular weight of 405; $C_{25}H_{51}COOH$ has a calculated neutralization value of 141 and a calculated molecular weight of 396.42.

The following is a summary of the preceding data:

| Acid from Achillea Millefolium L. | Cerotic Acid from Chinese Insect Wax |
|---|---|
| Methyl Ester melts 60-62° C. | 61.5° C. |
| Saponification value 126 | 136.8 (1) |
| Melting point acid 78° C. | 79.5° C. |
| Molecular weight acid 405 | 396.42 (1) |
| Neutralization value 138 | 141 (1) |

(1) Value calculated from $C_{25}H_{51}COOH$.

## Retort Residue.

The residue left in the retort, after distillation of the methyln esters, was a dark color and of a waxy consistency. Decomposition of the original material seemed to have occurred, and therefore no investigation was made of this residue.

## Triacontane.

The portion of the non-saponifiable treated with acetic anhydride and bromine (p.117) was divided roughly into that relatively insoluble and that relatively more soluble in the acetic anhydride. The portion insoluble was dissolved in 2000 cc. of alcohol (95%) by the aid of heat, cooled and filtered. The part insoluble on cooling (on the filter paper) was then repeatedly recrystallized successively from alcohol (95%), ethyl acetate, chloroform,

acetone, toluene and absolute alcohol until a constant melting point of 65° C. was obtained.

The sample was then tested for sterols and found to be sterol free. It was then treated with hot concentrated sulfuric acid and was found to be stable and not charred. Therefore, the substance was characterized as a hydrocarbon.

Triacontane[2] melts at 65.6°C. The substance from Achillea Millefolium Linne' was definitely characterized as triacontane.

*************

1) Mathews, A.P. Physiological Chemistry, (1921), ed.3, p.82.

2) Gascard, A. Annales de Chimie, (1921), 15, p.342.

## C e r y l  A l c o h o l

A portion of the non-saponifiable material was repeatedly recrystallized from 95% and absolute alcohol, and from benzene until a constant melting point of 79-80° C., was obtained. Ceryl alcohol[1] from Chinese Insect Wax mixed with the above purified material showed no depression of the melting point.

The acetate was prepared by refluxing the above with acetic anhydride, during 30 minutes, the excess acetic anhydride evaporated off and the residue repeatedly recrystallized from benzene until the melting point became constant at 63-64°C. The ceryl acetate[1] prepared from Chinese Insect Wax ceryl alcohol melted at 64° C. Sterols were absent. The material charred under the influence of warm sulfuric acid (conc.).

This non-saponifiable substance from Achillea Millefolium Linne'[2] was characterized as Ceryl Alcohol.

*************

1) McMurray, R.L., Unpublished Work on Chinese Insect Wax.

2) Lewkowitsch, J., Chemical Technology and Analysis of Oils, Fats and Waxes, (1921) ed.6, v.1, pp. 245, 440, & 617.

s t e r o l .

The non-saponifiable material amounted to 182 grams. It was originally determined to use the digitonide method for isolating the sterol from this material. No digitonin was available for some time so most of the non-saponifiable material was treated with acetic anhydride and bromine for isolation of the hydrocarbon.

Three grams of the remaining portion of the non-saponifiable material was treated with digitonin according to the method of Fritzsche.[1] This 3 gram portion was dissolved in 150 cc. of 95% alcohol, heated to 65° C. and then 250 cc. of a 1% digitonin solution (65°C.) was added gradually and with stirring to the non-saponifiable solution. The precipitate was filtered off the next day, washed with ether, the sterol extracted by xylene and then repeatedly recrystallized from alcohol (95%) and absolute alcohol, until a constant melting point of 136°C. was obtained.

The sterol reacted positively to the Liebermann-Buchard[2] color reaction test for sterols, when compared simultaneously with a known sample of cholesterol.

1) Rosenthaler, L., Grundzuge der Chemischen Pflanzenuntersuchung, (1928), ed.3, p.62.

2) Mathews, A.P., Physiological Chemistry, (1921), ed.3, p.82.

# EXPERIMENTAL

## Botany.

## MORPHOLOGY.

### General:

The following description of Achillea Millefolium Linne' is founded upon observations made upon the wild plants of Ohio and Wisconsin, and the cultivated plants grown in the Pharmaceutical Garden of the Wisconsin Pharmaceutical Experiment Station.

### Roots:

The root system is a well developed stoloniferous rhizome which generally spreads laterally a few inches below the surface. Numerous roots provide an ample system for the plant to tap the soil. The system is tenacious, and when pulled from the soil brings away a matted mass of roots and earth together. The rhizomes are reddish in color; the roots grayish.

### Stem:

The stem is erect, stiff, and generally hollow, which thus provides strength to support the corymb of flowers. The height varies from a few inches to occasionally over 3 feet. The stem may be simple or forked, and roughly pentagonal in cross section. It is longitudinally furrowed along the entire main portion and branches. Appressed, gray hairs are present and modify the green color of the stem to a greenish-gray appearance. The relative number of hairs may cause the appearance of the stem to vary from nearly smooth, to arachnoid or lanate. A waxy cuticle covers the epidermis of the stem.

Leaves:

The leaves are green and more or less covered with long, simple, appressed hairs. The number of hairs depends upon the environment. The leaves are bipinnately divided. The stem leaves are fewer and smaller than the basal rosette leaves and the number varies, though they commonly amount from 8 to 15, set in a spiral manner. Basal rosette leaves are generally a luxuriant green color and have long petioles; the stem leaves are a gray green and either sessile or have short petioles.

Inflorescence:

The inflorescence occurs in dense corymbose heads, each head composed of ray and disk flowers with the subtending bracts. The heads are densely pubescent.

Ray Flowers: (See Plate II)

The ray flowers are commonly white though they may be pink or red. The red types are found mostly under cultivation. The ray flowers are located at the outer portions of the head and average 5 in number, rarely more than 10. The ray flowers have a characteristic strap shape and are imperfect, with the style cleft. The ray flowers are 1.5 to 2.5 mm. in length.

Disk Flowers: (See Plate I)

The disk flowers are located within the outer circle of strap flowers in each head. They are white to yellow in color, depending upon the age. The disk flowers are perfect. The calyx is tubular, composed of 5 sepals, green in color, and covered with appressed hairs. The corolla is regular,

partly tubular, spreading when open and composed of 5 connected white petals. The 5 stamens (Plate IV) are inserted on the corolla, are ascending and appear yellow due to the abundance of the yellow pollen. (Plate IV) The anthers (Plate III) are united in a tube (syngenesious).

The style is cleft into 2 divisions which lie contiguous and equal before the opening of the flower. After the flower opens the style increases in length while the tip parts into 2 branches which spread out and curve downward, presenting greatly changed and improved conditions for pollination (Plate IV) by insects if pollination has not occurred previously unaided. Thus the stigma becomes exserted. The stigma under high magnification (500x) appear papillate.

Akenes: (Plate III)

These are about 1 mm. long by 1/4 mm. wide, tapering, somewhat flattened, ovoid and yellowish brown to straw colored. The akenes present a winged appearance, and have no pappus.

Involucre: (Plate IV.)

The flowers are subtended by densely hairy bracts that more or less envelope the flower before it opens. The bracts are 3-5 mm. long and of a yellowish green color.

# HISTOLOGY.

## General:

The material used for this histological study of Achillea Millefolium Linne' consisted of representative plants growing near Madison, Wisconsin, collected while in blossom during October, 1930. They were cut into convenient lengths and preserved in 95% alcohol; then imbedded in paraffin, cut into sections by a microtome and mounted on slides. These sections were stained with safronin and counter stained with gentian violet, and finally permanently mounted with balsam.

## Stem:

Two groups of slides were made to study the histology of the stem in both cross and long sections. The sketches herewith presented are the constructed results of more than one slide.

## Cross Section: ( See Plate V )

The stem shows epidermal hairs and a wrinkled, waxy cuticle. The epidermis consists of a layer of thick walled cells. The subepidermis adjoins the epidermis and consists of a layer of cells strongly appressed in places, obscuring its observation. Next is the cortical parenchyma and then the larger cells of the endodermis.

Adjoining the endodermis are the pericyclic fibers in varying amounts with their characteristically thick walls.

following this comes the rather thick-walled secondary xylem. The primary xylem is scattered at intervals. Following this is a medium walled, lignified pith cell portion adjoining the innermost tissue, the pith parenchyma.

L o n g  S e c t i o n :  ( See Plate VI ).

The stem is bounded by an epidermis consisting of somewhat elongated adjoining cells, bearing a wrinkled waxy cutiele and trichomes. The subepidermis, of similarly shaped appressed cells, lies inside and adjacent to the epidermal layer.

Following this is the cortex, consisting of roughly rectangular cells which contain chloroplastids. The outer part of the cortex consists of an obliterated layer of cells from which the adjoining collenchyma is formed. The parenchyma cells are moderately thin-walled and so shaped and arranged that they show numerous intercellular spaces. The pericycle portion consists of about 8 rows of moderately long, slightly overlapping thick-walled sclerenchyma. Following this is the food conducting tissue known as the phloem, and composed of about 6 layers of elongated, thin-walled cells. Adjoining is the spiral duct tissue, separated from the 5 or more layers of pitted ducts by a row of parenchyma cells. Inside of the pitted ducts are 3 or more rows of spiral ducts. The xylem parenchyma of about 4 rows of elongated cells is between the pitted ducts and the inner-most tissue.

The inner-most tissue is called the spongy parenchyma, or pith, and consists of very large, rectangular cells, showing numerous intercellular spaces. The pith is circular inside the stem, but not diametrically continuous--i.e., the stem is hollow in the middle.

L e a f :

It was possible to study only the cross section of the leaf. The sketches herewith presented are the constructed results of more than one slide.

C r o s s  S e c t i o n : ( See Plate VII.).

The upper surface of the leaf is covered with a waxy cuticle resting upon the epidermis. The walls of the epidermal cells are thickened and cutinized. Adjoining is the palisade tissue of cells richly filled with starch and containing chloroplastids. The palisade layer shows numerous intercellular spaces.

Scattered at intervals throughout the leaf are bundles which contain the phloem, bast and xylem units. The xylem shows the characteristically heavy walls and large lumen.

Below the palisade layer lies the mesophyll consisting of more or less rectangular, parenchymatous cells. Again, intercellular spaces are conspicuous. These cells are large, irregularly shaped, thin walled, and contain a few chloroplasts. Adjoining is the under-epidermis and finally the cuticle.

Stomata : (See Plate VII ).

The stomata presents the ordinary characteristics when observed either in cross or surface view. The stoma are surrounded by wavy walled, epidermal cells.

Cuticle :

A scaly, waxy cuticle was observed to be present on both the upper and lower sides of the leaf. It was also present on the stem, bracts and flower heads. This cuticle tends to wrinkle and curl.

Trichomes : (See Plate VII ).

The trichomes arise by elongation and division of the epidermal cells. They are made up of from 6 to 8 cells, projecting a considerable length from the epidermis and ending in a pointed apical cell. The trichomes are very striking in appearance, not only in their length, but especially their peculiar structure and the greatly elongated apical cell.

Secreting Glands : (See Plate X ).

On the epidermis one finds a number of secreting trichomes or glands. On treatment with alcohol the contents of these are dissolved. In consequence they are best observed in fresh material.

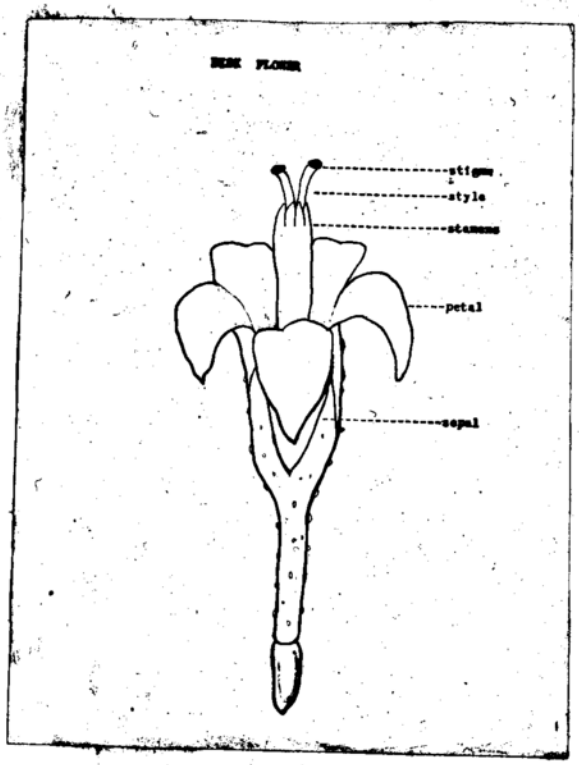
Viewed from above these glands appear oval in outline and contain 2 inner parts of a granular nature. From a side view the gland seems to be built up of about 4 basal cells, above which rises a sac-like structure that is more or less

translucent and distended by the liquid contents. This distended sac rises above the surrounding epidermis; the basal cells lie within a cavity below the epidermal layer, thus protected from easy destruction.

It is presumed that the glands secrete the volatile oil, but micro-chemical and optical tests have not conclusively satisfied this point.

# ACHILLEA MILLEFOLIUM Linne'.

I

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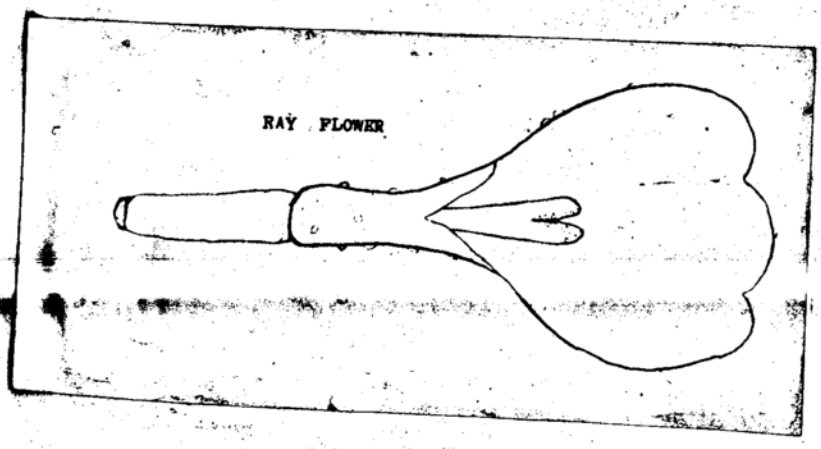
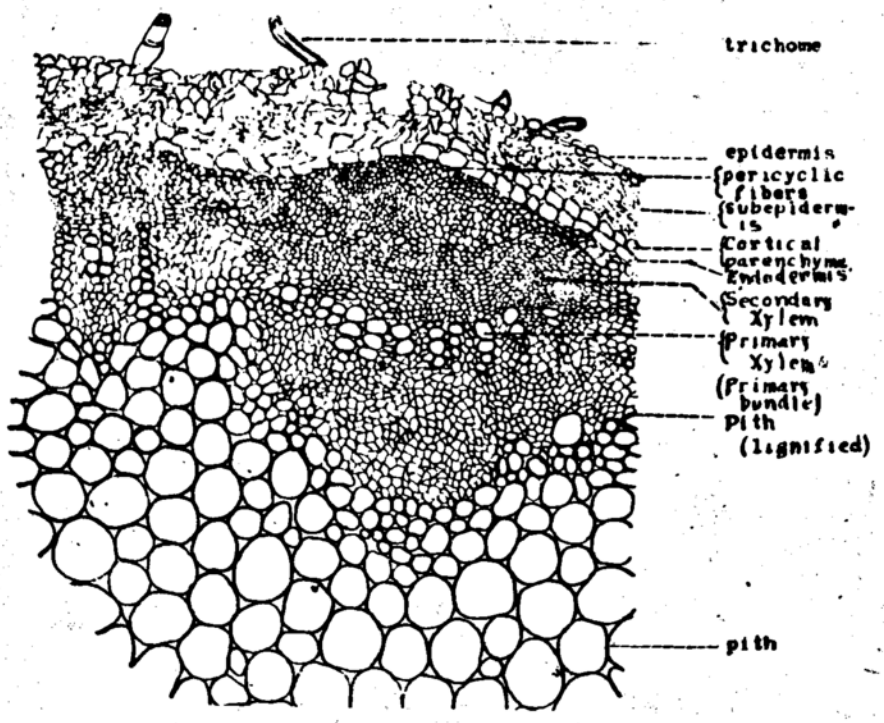


# ACHILLEA MILLEFOLIUM Linne'

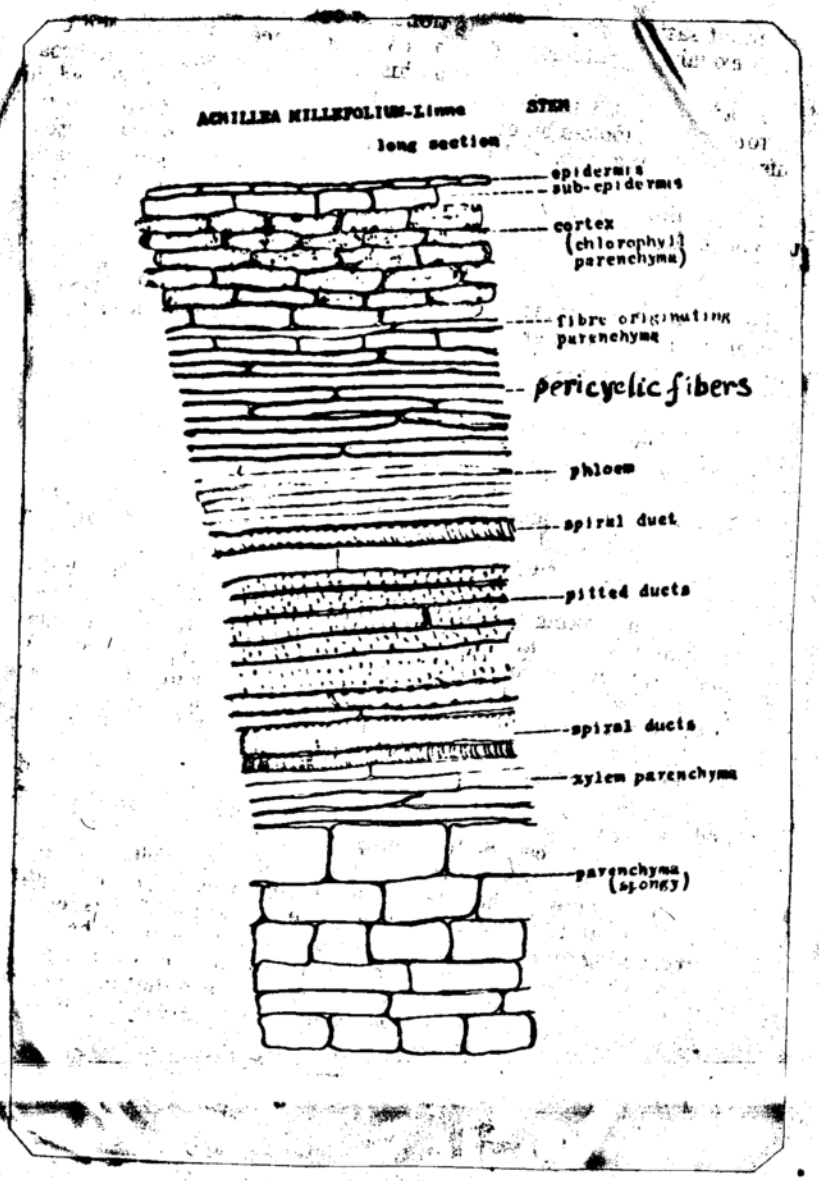
STEM cross section



# ACHILLEA MILLEFOLIUM Linne'

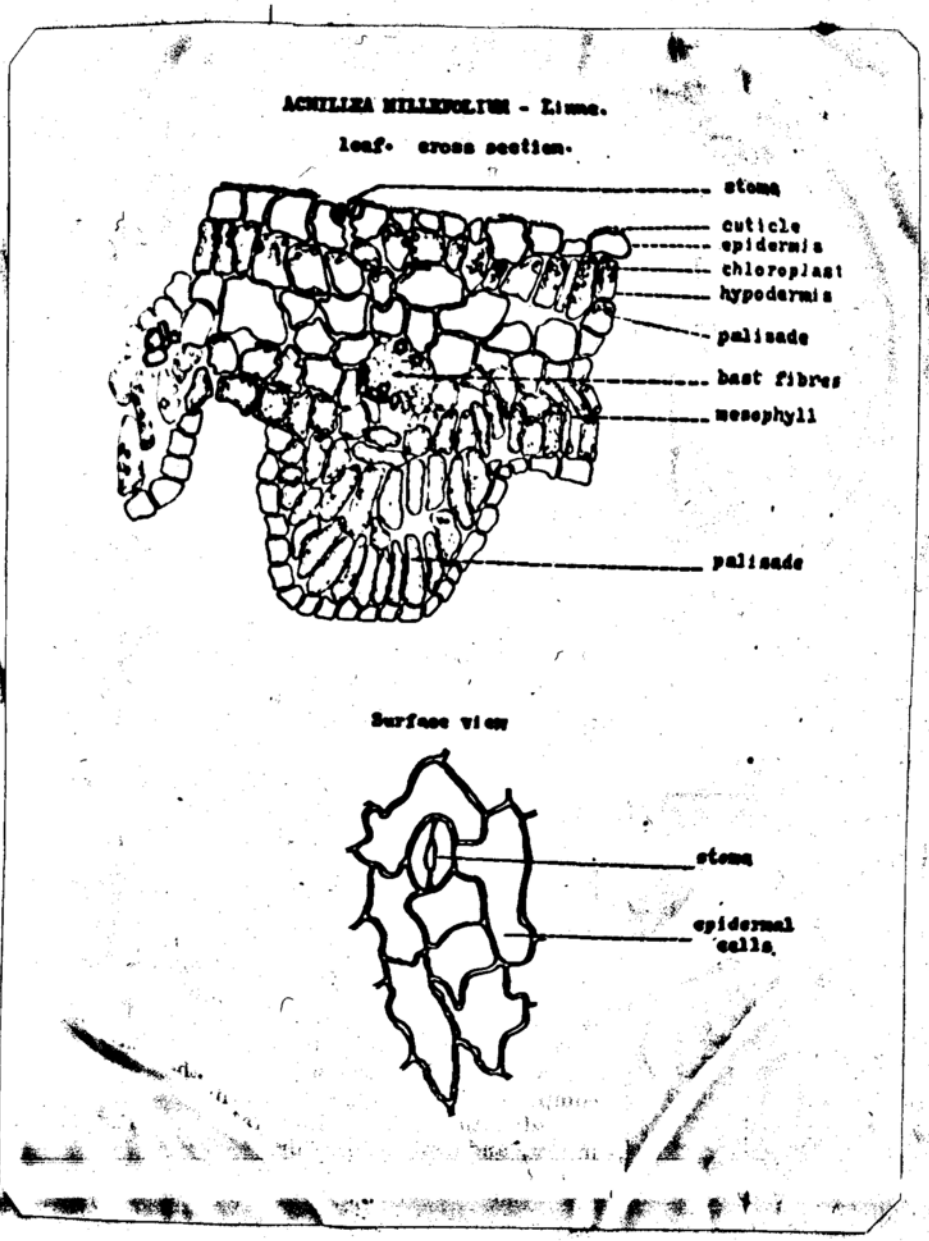
STEM long section

VI



ACHILLEA MILLEFOLIUM Linne'

VII.



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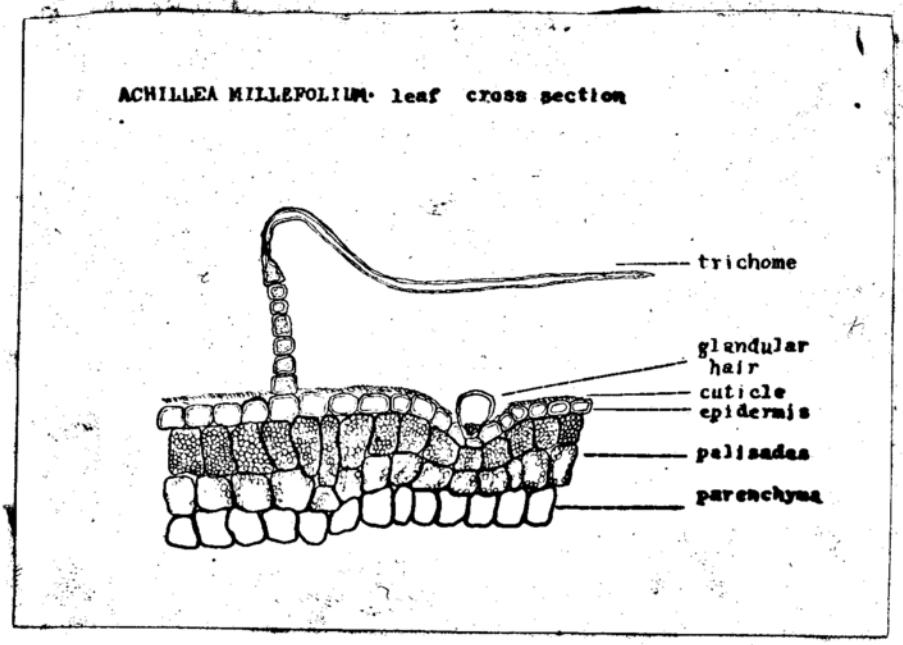
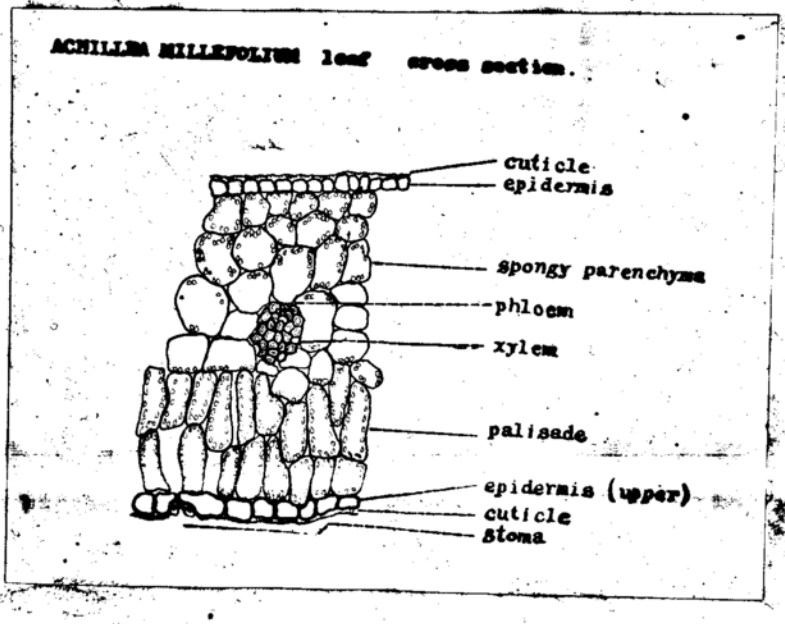
VIII

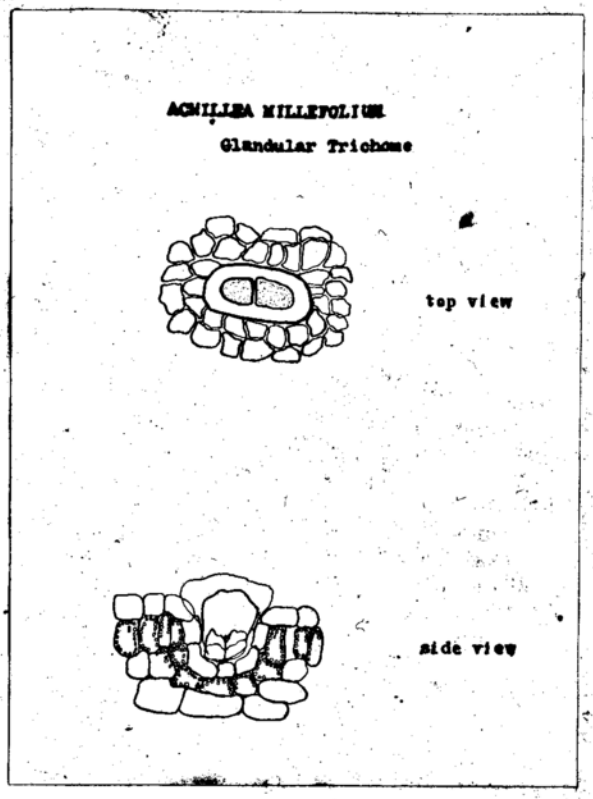



IX



# ACHILLEA MILLEFOLIUM Linne'

X



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Gives synonyms and uses.

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Barbarus, H. 1534.

(Millefolium stratiotes pennatum terrestre.)

Horti Lugduno-batavi, Catalogus, p.----. (Ray, Catl.Plant., pt.1, p.100)

(Original not obtainable.)

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Cordus, E. 1534.

Millefolium, Stratiotes.

Botanologicon, p.107. (Bauhin, Pinax, p.140; Linne'; Sp. Plant., 1 ed., v.2, p.899.)

Gives description, names and uses.

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Fuchsius, L. 1542.

Stratiotes Millefolia.

De Historia Stirpium, p.726. (Ray, Catl.Plant., pt.1, p.100; Bauhin, Pinax, p.140)

Fuchs gives a wood cut illustration of the plant, including blossoms, leaves, stems, and roots, with nomenclature.

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Bock, H. 1552.

Vulgare Millefolium.

De Stirpium maxime, pp.477-78. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

Gives description, illustration, synonyms, references and uses.

Laguna, A. 1552.

(Stratiotes Millefolia.)

Commentaria in Dioscoridem. (Bauhin, Pinax, p.140; Linne', Sp.Plant., 1 ed., v.2, p.899)

(Original not obtainable)

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Matthiolo, P. 1554.

Millefolium. cap. CX.

Pedacii Dioscoridis Anazarbei, de Materia Medica, p.373.

Gives description, virtues and uses of Myriophyllum.

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Gesner, C. 1561.

(Millefolium vulgare.)

Horti Germaniae, p.---. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

(Original not obtainable.)

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Anguillara, A. 1561.

(Stratiotes)

Horti Patavini tertius, p.---. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

(Original not available).

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Laguna, A. 1566.

Del Stratiote Milefolio;

Pedacio Dioscorides Anazarbeo, Acercade la Materia Medicinal, p.441.

Gives description, illustration and references (in Spanish) to Dioscorides, cap.CXVI.

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Mattioli, P. 1568.

(Millefolium majus)

I discorsi di M.Pietro Andrea Matthioli ne i sei libri della materia medicinale di Pedacio Dioscoride Anazarbeo, p.---. (Bauhin, Pinax, p.140; Ray, Hist. plant., v.1, p.345; Hudson, Flora, angl., p.375.)

(Original not available).

Lonicerus, A. 1569.

(Achillea).

Herbarium Eucharii Roslin, p.---. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

(Original not available).

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Pena, P., & l'Obel, M. 1570.

(Militaris, sive Millefolium Flore Albo.)

Stirpium adversaria nova, p.6--. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899; Ray, Catl. Plant., pt.1, p.100.)

(Original not obtainable.)

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Matthiole, P.A. 1572.

De la Millefeuille.

Commentaires de M.Pierre Andre Matthiole Medecin Senois sur les six livres de Ped. Dioscoride Anazarbeen de la Matiere Medecinale, Chap. XCVIII.

"Millefeuille Grande". Gives illustration, references, description.

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Clusius, C. 1576.

De Stratiote flore luteo.

Rariorum stirpium historiae, p.370.

Gives illustration and description, references and synonyms.

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Lobel, M. 1576.

Millefolium terrestre vulgare.

Stirpium Historia, p.430.

Gives uses, illustration and references for the Stratiotes Millefolium of Dioscorides.

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Dodoens, D. R. 1578.

Of Yarrow or Common Milfoyle.

A Nievve Herball, pp.144-145.

Gives illustration, description, history, habitat, flowering time, etymology, synonyms and native uses.

Dodoens, R. 1578.

Yarrow.

Histoire of Plants, pp.102-103.

Gives description, habitat, flowering time, nomenclature, etymology, action and uses.

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Matthioli, P. 1581.

Delle Stratiote millefoglio.

I Discorsi---Di Pedacio Dioscoride Anazarbeo della materia medicinale, p.720.

Gives uses, illustration, habitat, synonyms, and refers to Dioscorides.

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Cæsalpino, A. 1583.

(Millefolium majus)

De plantis, libri XVI, p.---. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

(Original not obtainable.)

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Dodonæus, R. 1583.

De Millefolio sive Achillea.

Stirpium Historiae, pp.100-101. (Bauhin, Pinax, p.140; Sp. Plant. 1 ed., v.2, p.899; Apotheek Haegsche, (1762), p.18, Linne', Hort. Cliff., p.413; Linne', Flora Suec., 1 ed., p.705.)

Gives description and refers to Dioscorides and Pliny, illustration and synonyms.

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Durante, C. 1585.

(Stratiotes millefolia).

Herbario nuove, p.---.(Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

(Original not obtainable.

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Dalechamps, J. 1587.

Stratiotes Millefolia cap. XXXVI.

Historia Generalis, pp.762-769. (Bauhin, Pinax, p.140; Linne', Sp.Plant., 1 ed., v.2, p.899)

Gives illustration, synonyms and references. The illustration bears the title, "Stratiotes Millefolia major. Matth.".

Thalius, J. 1588.

(Millefolium).

Sylva Hercynia, p.---. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899)

(Original not obtainable).

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Camerarius, J. 1588.

(Millefolium).

Hortus medicus et philosophicus, p.---. (Bauhin, Pinax, p.140; Linne', Sp. Plant., 1 ed., v.2, p.899.)

(Original not obtainable)

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Tabernaemontanus, J.T. 1590.

Millefolium purpureum.

Iconum Stirpium et plantarum, p.130.

"Purpurrot Schaffgarbe". Illustration, and references.

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Tabernaemontanus, J.T. 1590.

Millefolium terrestre minus, Dioso.

Iconum Stirpium et plantarum, p.130.

"Gemein Schaffgarbe". Illustration.

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Bauhin, C. 1596.

Millefolium vulgare album.

Pinax Theatri Botanici, p.140. (Ray, Catl.Plant., pt.1, p.100; Linne', Sp.Plant., ed.4, v.3, pt.3, p.2209; Linne', Hort. Cliff., p.413; Linne', Flora Suec., 1 ed., p.705; Linne', Mat.Med., 1 ed., p.397; Vaillant, Hist. Acad. Royal Sciences,(1720), p.320.

Gives synonymy to previous authors

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GERARDE, J. 1597.

Millefolium terrestre vulgare

The Herbal, or General History of Plants, pp.913-914. (Gray, Br.Plants, v.2, p.457)

Gives description, habitat, flowering time, Nomenclature,and uses. Illustrations.

Clusius, C. 1601.

Millefolium rubre flore.

Rariorum Plantarum Historia, p.331. (Bauhin, Pinax, p.140; Hudson, Flor. Angl., p.375; Ray, Hist. Plant., v.1, p.345; Willdenow, Linne's Spec. Plant., 4 ed., v.3, pt.3, p.2208).

Gives illustration, description, and uses.

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Besler, B. 1613.

Millefolium flore albo.

Hortus Eystettensis, p.153. (Bauhin, Pinax, p.140; Linne', Spec. Plant., 1 ed., v.2, p.899)

Gives illustration, description and uses.

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Besler, B. 1613.

Millefolium flore rubro.

Hortus Eystettensis, p.153. (Bauhin, Pinax, p.140; Hudson, Flora Angl., p.375; Ray, Hist. Plant., v.1, p.345)

Gives illustration, description and uses.

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Stevens, C., Liebault, J. 1616.
Surplet, R.

Milfoile.

The Coventry Farme, p.206.

Gives habitats and uses. Mentions using the distilled water of this for curing of the burning of the urine in men and the whites in women.

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Bauhin, C. 1623.

Achillea sive Millefolium.

Theatri Botanici, p.140. Gives species with references.

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Gerarde, J. 1633.

Millefolium terrestre vulgare.

The Herball or General Historie of Plants, ed.2, p.1072. (Woodville, Med. Bot., ed.2, v.1, p.36; Curtis, Flora Lond., v.2, pt.6, p.61; Hudson, Flora Angl., p.375)

Gives description, synonyms, history, uses and illustration of the common yarrow.

Parkinson, J. 1640.

Millefolium vulgare.

Theatrum Botanicum, p.693. (Woodville, Med. Bot., ed.2, v.1, p.36; Curtis, Flora Lond., v.2, pt.6, p.61; Hudson, Flora Angl., p.374; Ray, Catl.Plant., pt.1,p.100; Ray, Hist.Plant., v.1, p.345; Gray, Br. Plants, v.2, p.457)

Gives description, illustration, etymology and uses.

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Dodonaeus, R. 1644.

Van Gruwe oft Millefolium.

Herbarius oft Cruydt Boeck, p.137.

Gives description, illustration and references.

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Ray, J. 1660.

Millefolium vulgare album.

Catalogus Plantarum circa Cantabrigiam, pt.1, p.100.

Gives references to previous authors.

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Tabernaemontanus, J.T. 1664.

(Millefolium purpureum)

Historia plantarum, p.130. (Willdenow, Linne's Spec.Plant., ed.4, v.3, pt.3, p.2208; Linne, Sp. Plant., ed.1, v.2, p.899).

(Original not available)

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Bauhin, C. 1671.

Millefolium Vulgare Album.

Pinax Theatri Botanici, p.140. (Linne, Spec.Plant.,1 ed., v.2, p.899; Apotheek Haegsche (1672), p.18; Nieuwe, Britische Apotheek,(1772), p.182; Woodville, Med. Bot., ed.2, v.1, p. 36; Curtis, Flora.Lond., v.2, pt.6, p.61; Hudson, Flora Angl., p.375; Flora Danica, v.5, p.4; Linne', Hort.Cliff., p.413)

Bauhin gives references and names of Millefolium with references to Dioscorides and Pliny.

Bauhin, C. 1671.

Millefolium purpureum majus.

Pinax Theatri Botanici, p.140. (Hudson, Flora Angl., p.375; Ray, Hist. Plant., v.1, p.345; Linne', Spec.Plant., 4 ed., v.3, pt.3, p.2209; Linne, Hort. Cliff., p.413)

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Book,H. 1680.

Harb. Schaeffripp.

Kreuterbuch, pp.171-172.

Gives colored illustration, description and references.

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Ray, J. 1686.

De Millefolio.

Historia plantarum, v.1, p.345. (Woodville, Med. Bot., ed.2, v.1, p.36).

Gives references, synonyms, description, history, and uses of this plant.

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Tabernaemontanus, J.T. 1687.

Millefolium terrestre majus.

Neu Wollkommen Krauter-Buch, pp.371-379. (Bauhin, Pinax, p.140; Linne', Spec. Plant., 1 ed., v.2, p.899).

Gives history, synonyms, illustration, description and uses of this and allied species, with habitats. States that it is one of the 5 common species of milfoil, and that Dioscorides described only one milfoil which seemed to closely agree with this species. Dioscorides named it Stratiotes Chilio-phyllus.

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Ray, J. 1690.

Millefolium vulgare album

Synopsis methodica stirpium britannicarum, ed.1, p.183; ed.2, (1696), p.91; ed. 3, (1724), p.183. (Curtis, Flora Lond., v.2, pt.6, p.61; Hudson, Flora Angl., p.375; Gray, Br. Plants, v.2, p.457; Woodville, Med. Bot., ed.2, v.1, p.36)

Gives references to previous authors, synonyms and habitat.

Tournefort, P. 1697.

Millefolium vulgare album.

Histoire des Plants, p.118.

Describes its properties, uses, and refers to Bauhin.

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Tournefort, P. 1700.

Millefolium vulgare album.

Institutiones Rei Herbariae, v.1, p.496, v.3, pl.283. (Linne, Flora Suec., 1 ed. p.705; Linne, Hort.Cliff., p.413; Vaillant, Hist. Acad.Royal Sciences, (1720), p.320)

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Gives references and illustration of the floral parts of this plant.

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Baier, J.J. 1714.

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Millefolium. (Pritzel, G.A., Thesaurus Lit.Bot., ed.1, p. 10, No.403, p.447.)

(Original not obtainable)

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Henninger, J.S. 1713.

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De Millefolio. (Pritzel, G.A., Thesaurus,Lit.Bot., ed.1, p. 115, No.4364; p.447)

(Original not available).

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Vaillant, S. 1718.

(Achillea tanaceti folio, flore purpureo)

Flores compos., p.593. (Willdenow, Linne's Spec. Plant., ed.4, v.3, pt.3, p.2308).

(Original not available)

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Hoffmann, F. 1719.

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De Millefolio, germanice Schaaf-Garben. (Pritzel, Thesaurus Lit.Bot., ed.1, p.121,No.4565, p.447; Neumann, Chymiae Medicae Dogmatico Experimentalis, v.2, pt.3, p.371; Haller, Bibliotheca Botanica, v.2, p.22)

(Original not available.)

Vaillant, S. 1720.
Des Corymbiferes ou de la seconde classe des Plantes a Fleurs Compose'es.

Histoire de L'Academie Royale des Sciences, avec les Memoires de Mathematique & de Physique, pp.320-323. (Linne, Hort. Cliff., p.413; Linne, Flora Suec., ed.1, p.705; Linne, Phil.Bot., p.140; Miller, Gard. Dict., ed.9, p.12; Scopoli, Flora Carniol., ed.1, p.372)

Gives description of the genus Achillea, and lists 29 species, including Achillea vulgaris, flore albo, with references, and illustrations of the flowers. Named after Achilles.

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Vaillant, S. 1727.
Millefolium vulgare album.

Botanicon Parisiense, p.128.

Millefeuille. Refers to Bauhin.

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Miller, P. 1733.
Millefolium.

The Gardener's Dictionary, ed.2, p.---.

Gives historical account of Achilles.

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Linne, C. 1738.
Achillea.

Systema Naturae, ed.1, v.---, p.---. (Ind. Kew., ed.1, v.1, p.22 )

(Original not available)

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Gronovius, J.F. 1739.
(Achillea foliis bipinnatis nudis)

Flora virginica, ed.1, p.101. (Linne, Spec. Plant., ed.1, v.2, p.899; Willdenow, Linne's Spec. Plant., ed.4, v.3,pt.3, p.2208)

(Original not obtainable--see 1767 edition)

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Linne, C. 1737.

Achillea foliis bipinnatis nudis.

Hortus Cliffortianus, p.413. (Linne, Sp. Plant., ed.1, p.899; ed.4, v.3, pt.3, p.2208; Linne, Flora Suec., 1 ed., p.705)

Gives Latin description and references to previous authors.

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Blackwell, M. 1739.
Yarrow.

A Curious Herbal, v.1, pl.18. (DeCandolle, Prodromus, v.6, p.2%)

Gives illustration, description, habitat, synonyms, and uses.

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Royen, A. van 1740.
Compositae Floribus Radiatus.

Flora Leydensis, p.127. (Linne, Spec. Plant. ed.4, v.3, pt.3, p.2208)

Lists as Millefolium officinarum.

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Miller, P. 1741.
Millefolium.

Gardener's Dictionary, v.2, p.---.

"Yarrow.Milfoil.Nosebleed? Common sort is used in medicine.

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Haller, A. 1742.
Achillea foliis pinnatis, pinnis longe aequalibus, pinnatis, pinnubis trifidis et quinquefidis.

Enumeratio methodica stirpium, p.107 (Woodville, Med. Bot., ed.2, v.1, p.36; Curtis, Flora Lond., v.2, pt.6, p.61.)

Linne considers this the Achillea Millefolium L.

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Quincy, J. 1742.
Millefolii.

English Dispensatory, ed.12, p.99.

Gives synonyms and uses.

Ruppius, H.B. 1745.
(Ptarmica).

Flora Jenensis, p.174. (Ind. Kew. ed.1, v.1, p.22, v.4, p.651)

(Original not available).

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Linne, C. 1745.
Achillea foliis bipinnatis nudis.

Flora Suecica, ed.1, p.705. (Linne, Sp.Plant., ed.1, v.2, p.899 )

Linne gives botanical data, synonyms, habitat, uses and references.

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Linne, C. 1747.
Ageratoides.

Classes plantarum, p.527. (Ind. Kew., v.1, pp.22,58).

Linne's Ageratoides is by Kew considered the same as Achillea.

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Lewis, W. 1748.
Millefolium.

The Pharmacopoeia of the Royal College of Physicians at Edinburgh, p.45.

Lists.

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Linne,C., 1749.
Achillea foliis bipinnatis nudis.

Materia Medica, ed.1, p.397. (Linne, Sp.Plant., ed.1, p.899; Linne, Sp.Plant. ed.4, v.3, pt.3, p.2208; Linne, Flora Suec., p.745).

The Millefolium vulgare album of Bauhin, with properties and uses.

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Dalibard, T.F. 1749.
(Achillea foliis bipinnatis nudis)

Florae Parisiensis Prodromus, p.263. (Linne, Sp. Plant. ed.1, p.899; ibid,ed.4, v.3, pt.3, p.2208).

(Original not available).

Linne, C. 1751.
Achillea.

Philosophia Botanica, pp.140,170,187.

States that the Achillea of Pliny is the same as the "achilleios" of Theophrastus and of Dioscorides.

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Neumanns, K. 1752.
De Millefolio.

Chymiae Medicae Dogmatico-Experimentalis, v.2, p.3, pp.366-374.

Gives synonyms, etymology, history, mention of other species, description, notes a blue volatile oil obtained by distillation, properties, uses, constituents and preparations.

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Lewis, W. 1753.
Millefolium.

New Dispensatory, p.161.

Gives description, synonyms, uses and notes that an elegant blue oil is obtained by distillation.

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Linne, C. 1753.
Achillea Millefolium.

Species Plantarum, ed.1, v.2, p.899. (Griffith, Med.Bot., 403, Index Kew., ed.1, v.1, p.23).

Linne gives Pre-Linnean names for Achillea Millefolium, with references for each, also the habitat and character of the plant.

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Lewis, W. 1753.
Millefolium.

New Dispensatory, ed.1, p.161.

Gives synonyms, description and therapeutic uses.

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Miller, P. (Ptarmica) 1758.

The Gardener's Dictionary, p.---. (Ind. Kew., Suppl.5,p.211)

(Original not available.)

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Royen, D.van (Achillea foliis bipinnatis nudis) 1754.

Oratio de hortis publicis praestantissimis scientiae botanicae adminiculis, p.175. (Linne, Spec. Plant. ed.1, v.2, p.899)

(Original not available).

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Hill, J. Millefolium. 1756.

The British Herbal, p.458. (Ind. Kew., suppl.5, p.168)

Describes the common and yellow yarrows. =the Millefolium vulgare album of Bauhin, and Millefolium tomentosum luteum of Bauhin, with illustrations opposite p.464.

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Linne, C. Achillea foliis pinnatopinnatis. 1737-1760.

Flora Lapponica, p.311. (Griffith, Med. Bot., p.404; Linne, Spec. Plant. ed.1, v.2, p.899; Linne, Spec. Plant., ed.4, v.3, pt.3, p.2208; Linne, Hort. Cliff., p.413)

The Achillea Millefolium Linne'.

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Scopoli, J.A. Achillea. 1761.

Flora carniolica, ed.1,pp.372-73. (Curtis, Flora Lond., v.2, pt.6, p.61; Linne, Spec. Plant. ed.4, v.3, pt.3, p.2208; Scopoli, Flora Carn. ed.2, v.2, p.180.

Gives Latin description with references.

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Ludwig, C.G. (Achillea foliis bipinnatis nudis) 1760

Ectypa vegetabilium, p.67. (Linne, Spec. Plant., ed.4, v.3, pt.3, p.2208.)

(Original not available).

Lewis, W. 1761.
Millefolium.

An Experimental History of Materia Medica, p.375.

Gives synonyms, description, therapeutics, and states the blue essential oil was obtained by distilling with water.

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Adanson, M. 1763.
Millefolium.

Familles des plantes, v.2, p128. (Ind. Kew., ed.1, v.1, p.22; v.3, p.238.)

Gives references and description.

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Linne, C. 1764.
Achillea Millefolium.

Species Plantarum, ed.3, p.1267.( Curtis, Flora Lond., v.2, pt.6, p.61; Hudson, Flora Angl., p.374; Ann. Sci. Nat. Bot., s.6, v.16, p.309; Gray, Br. Plants, v2, p.457; DeCandolle, Prodrom., v.6, p224; Scopoli, Flora Carn., ed.2, v.2, p.180).

Gives Latin description and references.

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Kniphof, J.H. 1757-1764.
(Achillea tanaceti folio, flore purpureo)

Botanicon in originali, cut.5, mel. (Linne, Spec.Plant.ed.4, v.3, pt.3, p.2208)

(Original not available)

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Kniphof, J.H. 1757-1764.
(Achillea foliis bipinnatis nudis)

Botanicon in originali, cut 7, n.l. (Linne, Spec. Plant., ed. 4, v.3, pt.3, p.2208).

(Original not available.)

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Gronovius, J.F. 1767. 1762?

Achillea foliis duplicato-pinnatis glabris.

Flora Virginica, ed.2, p.127.

"Achillea foliis duplicato-pinnatis glabris, laciniis linearibus acutis laciniatis" with references.

Haller, A. 1768.
Achillea foliis pinnatis.

Historia Stirpium Indigenarum Helvetiae, p.108. (Curtis, Flora Lond., v.2, pt.6, p.61; Hudson, Flora Angl., p.374; Linne, Spec.Plant. ed.4, v.3, pt.3, p.2208; Scopoli, Flora Carn., ed.2, v.2, p.180)
Lists.

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Miller, P. 1768.
Achillea (Millefolium).

The Gardeners Dictionary, ed.8, p.7.(Ind.Kew.,ed.1,v.1,p.24)

Gives latin definition, synonyms and reference.

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Scopoli, J.A. 1772.
Achillea Millefolium (No.1095)

Flora Carniolica, ed.2, v.2, p.180.( Curtis, Flora Lond., v.2, pt.6, p.61; Linne, Spec. Plant., ed.4, v.3, pt.3, p. 2208).

Gives references.

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Nieuwe, Van De. 1772.
Millefolii.

De Nieuwe Britische Apotheek, p.182.

Gives uses of the several parts of the plant and synonyms.

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Blackwell, E. 1750-1773.
(Millefolium vulgare album)

Herbarium Blackwelliamum, p.---.(Linne, Spec. Plant., ed.4, v.3, pt.3, p.2208).

(Original not available).

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Regnault, N.F., & C. 1774.
La Mille Feuille.

La Botanique, p.68.

Gives colored illustration, references, description, properties and uses.

Boldinger, E.G. 1776.
Millefolium.

Pharmacopoea Edinburgensis, pp.84,170,177, 212, 219, 221, 229. (Woodville, Med.Bot., ed.2, v.1p.36)

Gives desdription and lists official parts and preparations.

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Adelung. J.C. 1777.
Die Schafgarbe.

Deutsches Worterbuch, v.3, p.1652.

Considers meaning of the names for this plant.

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Mawe, T. 1778.
Abercrombie, J.
Achillea.

The Universal Gardener and Botanist, p.----.

Description with varieties.

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Hudson, G. 1778.
Achilleia Millefolium.

Flora Anglica, p.374. (Woodville, Med. Bot., ed.2, v.1, p.36; Curtis, Flora Lond., v.2, pt.6, p.61)

Gives description and references.

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Lamarck, C. 1778.
Achillea lanata.

Flore Francoise, v.3, p.640. (Ind. Kew., ed.1, v.1, p.23)

Kew considers this the Achillea Millefolium of Linne'.

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Pollich, J.A. 1776-1778.
(Achillea foliis bipinnatis nudis).

Historia Plantarum, p.820. (Linne, Spec. Plant. ed.4, v.3, pt.3, p.2208).

(Original not available.)

Gilibert, J.E. 1781.
(Achillea subhirsuta)

Flora Lithuanica in Chcata, v.1, p.217.(Ind. Kew., ed.1, v.1, p.24)

(Original not available)

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Oeder, G.C. 1782.
Achillea Millefolium.

Flora Danica, v.5, pl.737. (Smith Engl.Flora,ed.2,v.3,p. 463; DeCandolle, Prodromus, v.6, p.24; Linne, Syst.Veget. ed.14, p.778; Kunth, Pharm. Borus. off. Gewachse, p.265; Linne, Spec. Plant., ed.4, v.3, pt.3, p.2208).

Gives colored illustration, with references and synonyms.

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Linne, C. 1784.
Achillea Millefolium.

Systema vegetabilium, ed.14, p.778. (Curtis, Flora Lond., v.2, pt.6, p.61).

Lists this and 20 other Achillea species.

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Lewis, W. 1785.
Millefolii.

New Dispensatory, ed.3, p.178.

Gives synonyms, description, and uses, with mention of the essential oil.

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Lewis, W. 1785.
Millefolii Folia.

The New Dispensatory, ed. 5, pp. 178, 369.

Gives synonyms, references, description, and uses and notes an elegant blue oil is obtained by distillation. Milfoil flowers: 14 pounds, (Avoin) yielded 4 drams (Avoir) of oil, or 1 part of oil from 448 parts of plants.

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Batt, W. 1785.
Millefolium.

Pharmacopoea Gemmensi, p.9.

States it to be the Achillea Millefolium Linne'.

Withering, W. 1787.
Achillea Millefolium.

A Botanical Arrangement o f Plants, ed.2, v.2, pp.941-942. (Woodville, Med. Bot., ed.2, v.1, p.36)

Gives detailed taxonomic description, with references.

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Roth, A.W. 1788.
Achillea Millefolium.

Tentamen Florae Germanicae, v.1, p.369; v.2,p.356. (Linne', Spec.Plant., ed.4, v.3, pt.3, p.2208)

Gives Latin description with references.

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Remler, J.C.W. 1788.
Achillaea millefolium.

Taschen Buch für Scheidekunstler und Apotheker, 9, pp.192,193.

The herb,Schaafgarbe, loses 13/16 moisture on drying.

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Remler, J.C.W. 1789.
Schafgarbenblumen.

Taschen Buch für Scheidekunstler und Apotheker, 10, p.171.

Achyllea millefol. flowers lose 11/16 moisture on drying.

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Willdenow, K.L. 1789.
(Achillea foliis bipinnatis glabruisculis)

Tractatus botanico medicus de Achilleis, cui accedit supplementum generis Tanaceti, pp.47-53. (Pritzel, Thesaurus Lit.Bot., ed.1, p.437; Linne, Spec. Plant., ed.4, v.3,pt.3, p.2208)

(Original not available)

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Smith, J.E. 1790.
Sowerby, J.
Achillea.

English Botany, v.11, p.758. (Griffith, Med.Bot., p.403; Kunth, Pharm.Borusa.officin.Gewachse,p.265; DeCandolle, Prodromus,v.6,p.24)

Gives botanical description, uses, colored illustration and references.

Necker, N.J. 1790.
Ptarmica.

Elementa botanica, v.1, p.18 . ((Ind.Kewensis, ed.1, v.4, p.651)

The genus Ptarmica of Necker is considered by Kew to be the genus Achillea recognized by Linne'.

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Hoffmann, G.F. 1791.
(Achillea Millefolium.

Deutschlands Flora, p.304. (Linne, Spec. Plant., ed.4, v.3, pt.3, p.2208)

Listed.

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Haenke, T. 1791.
(Achillea magna)

p.103.

Beobachtungen auf Reisen nach dem Riesengebirge, ^ (Ind. Kew., ed.1, v.1, p.23)

(Original not available)

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Jussieu, A.L. 1791.
Achillea Millefolium.

Genera Plantarum, p.207.

Gives taxonomic classification.

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Lewis, W. 1794.
Millefolium.

The Edinburgh New Dispensatory, ed.4, p.197.

Gives description, uses and states that an elegant blue oil is obtained by distillation.

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Lamarck, C. 1795.
Achillea Millefolium.

Flore Francoise, ed.2, v.2, p.132.

Gives taxonomic description, and refers to Linne.

Salisbury, R.A. 1796.
Achillea tenuifolia.

Prodromus stirpium in horto , p.204. (Ind.Kew., ed.1, v.1, p.24).

Considered by Kew to be the Achillea Millefolium of Linne'.

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Willdenow, C.L. 1797.
Achillea Millefolium.

Linne's Species Plantarum, ed.4, v.3, pt.3, p.2208. (Pursh, Fl.Amer.Septen., v.2, p.563)

Gives taxonomic description with references.

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Miller, P. 1797.

Achillea Millefolium.

Gardener's and Botanist's Dictionary, ed.9, p.13.

Lists 27 species,including Achillea Millefolium with its 3 varieties-ordinary,purple,alpine-, gives references, botanical description, uses and properties.

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Hudson, G. 1798.
Achilleia Millefolium.

Flora Anglica, p.374. (Curtis, Flora Lond., v.2, pt.6, p. 61.)

Gives description, and references.

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Curtis, W. 1798.
Achillea Millefolium.

Flora Londinensis, v.2, pt.6, p.61. (Woodville, Med.Bot., ed.2, v.1, p.36).

Gives colored illustration of entire blooming plant, English and Latin descriptions, uses, habitat and references.

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Withering, W. 1801.
Achillea Millefolium.

A systematic arrangement of British Plants, v.3, p.725.

Describes the plant taxonomically, and cites references.

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Plenck, J.J. 1803.
Achillea Millefolium.

Icones Plantarum Medicinalium, v.7, pl.631, p.18. (Kunth, Pharm.Boruss. officin. Gewachse,p.265; Esenbeck & Ebermaier, Handbuch d.med.pharm.Botanik,v.2, p.766).

Gives colored illustration with Latin description.

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Smith, J.E. 1804-1805.
( * * )

Flora Britannica, p.908. (Woodville, Med.Bot., ed.2, p.36; Purah, Fl.Amer.Sept., v.2, p.563)

(Original not available.)

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Miller, P. 1807.
Achillea Millefolium.

Gardener's and Botanist's Dictionary, v.1, p.---.

Twenty seven species of Achillea are described with uses and references, including Achillea Millefolium.

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Schkuhr, C. 1808.
( * * )

Deutschlands Flora, v.1, f.30, t.16. (DeCandolle, Prodromus, v.6, p.24)

(Original not available)

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Bulliard, P. 1809.
Achillea Millefolium.

Histoire des Plantes Medicinales, p.163. (DeCandolle, Prodromus, v.6, p.24; Griffith, Medical Botany, p.403)

Gives colored illustration, references and description.

Campe, J.H. 1810.
Die Schafgarbe.

Worterbuch der Deutschen Sprache, v.4, p.59.

Gives etymology of the word and states that the sheep readily eat it.

---

Woodville, Wm. 1810.
Achillea Millefolium.

Medical Botany, ed.2, v.1, pp.36-38.

Gives synonyms, references, description, uses, states that it was probably the plant mentioned by the Greeks, and a colored illustration of the above ground portion of the blooming plant.

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Rafinesque, C.S. 1811.
An Essay on the Exotic Plants, mostly European, which have been naturalized and now grow spontaneously in the Middle States of North America.

Medical Repository of New York, Hexade 3, v.2, p.334.

Achillea Millefolium is not confirmed to be either natural or introduced-dubious.

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Opiz, P.M. 1813.
(Achillea sudetica)

Nesperus, p.623. (Ind.Kew., ed.1, v.1, p.24).

(Original not available).

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Culpepper, N. 1813.
Yarrow.

Herbal, p.391.

Gives synonyms, habitat and uses.

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Pursh, F.T. 1814.
Achillea tomentosa.

Flora Americae Septentrionalis, v.2, p.563. (MacMillan, Metasperm.Minn.Valley, p.549; Gray, Syn.Flora N.Amer., v.1,pt.2, p.363; Ind.Kew., ed.1, v.1, p.24).

Gives Latin description and references. Kew considers this the Achillea Millefolium of Linne'.

Lamarck, C.
Candolle, A.P. 1815.
Achillea Millefolium.

Flore Francaise, ed.3, v.4, p.215.

Gives taxonomic description, habitat, uses, and references.

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Pursh, F. 1816.
Achillea Millefolium.

Flore Americae Septentrionalis, ed.2, v.2, p.563.

Gives taxonomic description, with references.

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Nuttall, T. 1818.
Achillea Millefolium.

Genera of North American Plants, v.2, p.171.

Gives taxonomic description.

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Barton, W.P.C. 1818.
Achillea Millefolium.

Florae Philadelphicae, v.2, p.127.

Gives description with references.

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Eaton, A. 1818.
Achillea Millefolium.

Manual of Botany for the Northern and Middle States, ed.2, pt.1, p.122.

Gives description.

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Swatopluk, J.
Presl, J.s, & K.B. 1819.
(Achillea Seidlii.)

Flora cechica, indicalis, p.173. (ord Flora cechica indicalis medicinalibus, oeconomicis technologicisque plantis.)
(Ind. Kew., ed.1, v.1, p.23).

(Gives technical description)
(at St.Louis)

McMurtrie, H. 1819.
Achillea Millefolium.

Sketches of Louisville, (Ky.), p.213.

"Milfoil, common"

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Tausch, J.F. 1821.
Beschreibungen neuer Pflanzen aus dem Riesengebirge.

Flora, 4, p.567. (Ind.Kew., ed.1, v.1, p.23).

Gives Latin description of Achillea Haenkeana, which Kew states is the same as Achillea Millefolium of Linne'.

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Schleicher, J.C. 1821.
Achillea intermedia

Catalogus hucusque absolutus omnium Plantarum in Helvetia, ed.4, p.5. (Ind. Kew., ed.1, v.1, p.23)
Under Plantae Phanerogamae (arranged alphabetically by genera and species) lists the above species with 18 others. Kew considers it the same as the Achillea Millefolium of Linne'.

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Gray, S.F. 1821.
Achillea. Theophrastus

Natural Arrangement of British Plants, v.2, p.457.

"Achillea millefolia". Gives description, habitat, and uses. Notes a rose variety.

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Elliott, S. 1824.
Achillea Millefolium.

Botany of South Carolina and Georgia, v.2, p.405.

Gives description with references.

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Rostkovio, F.G.T. 1824
Schmidt, W.L.G.
Achillea Millefolium.

Flora Sedimensis, p.544.

Gives taxonomic description

Schweintz, L.D. von. 1825.
A catalogue of plants collected in the North Western territory by Mr.Thomas Say, in the year 1823.

Narrative of an expedition to the source of St.Peter's River, Lake Winnepeek, lake of the woods, performed in the year 1823, by the order of the hon. J.C.Calhoun, under the command of Stephen H.Long. Compiled from the notes of Major Long, Messers. Say, Keating et Calhoun, by Wm.Keating, v.2, p.119. (Ind.Kew., ed.1, v.1, p.24; Pritzell, Thesaurus.Lit.Bot., ed.1, p.10; Gray, Syn. Flora N.Amer., v.1, pt.2, p.363; MacMillen, Metasperm. Minn.Valley, p.349)

The Achillea setacea Schweintz is considered by Kew to be the Achillea Millefolium of Linne'.

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Torrey, J. 1826.
Achillea Millefolium.

Compendium of the Flora of the Northern and MiddlesStates, p.308.

Gives taxonomic description.

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Esenbeck, N.von. 1826.
Achillea Millefolium.

Plantae Medicinales der Sammlung offizineller Pflanzen, v.2, No.246.

Gives colored illustration of the plant and floral parts, description, references, synonyms, and list of illustrations by other authors.

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Rley, L.F. 1826.
Chemische Untersuchung der Schafgarbenwurzel (Radix Achilleae millefolii).

Trommsdorff neues Journal der Pharmacie, s.2, 16, pt.1, pp.245-274. (Arch.Apoth.Vereins, 27, p.309; ibid.,38, 236; Journ.Amer.Pharm.Assoc., 10, p.252; Tromm.n.Journ. d.Pharm., 24, p.122)

Gives the results of an extensive analysis of the root.

Bley, L.F. 1828.
Chemische Untersuchung des Schafgarbenkrautes (Herba Millefolii).

Trommsdorf's Neues Journal der Pharmacie, s.2, 16, pt. 2, pp.94-120. (Journ.Amer.Pharm.Assoc., 10, p.252; Pharm.Review, 25, p.18; Arch.Apoth.Vereins, 38, p.234)

Gives the result of an extensive analysis of the herb.

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Bley, L.F. 1828.
Chemische Untersuchung der Schafgarbenblüthen (Flores Achilleae Millefolii L).

Trommsdorff Neues Journal der Pharmacie, s.2, 17, pt.1, pp.46-69. (Arch.d.Apoth.Vereins,38,p.234)

Gives the results of an extensive analysis of the flowers.

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Bley, L.F. 1828.
Chemische Untersuchung des Schafgarbensamen (Semen Millefolii).

Trommsdorff Neues Journal der Pharmacie, s.2, 17, pt.2, pp.58-80. (Arch.d.Apoth.Vereins, 38, p.235).

Gives the results of an extensive analysis of the seed.

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Rafinesque, C.S. 1828.
Achillea Millefolium.

Manual of Medicinal Botany, v.2, p.185.

Gives synonyms, habitat, uses, and preparation.

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Becker, J. 1828.
(Achillea sylvatica)

Flora der Gegend um Frankfurt A/M., p.295 (Ind. Kew., ed.1, v.1, p.24)

(Original not obtainable)

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Smith, J.E. 1829.
Achillea Millefolium.

English Flora, ed.2, v.3, p.463.

Gives taxonomic description and references.

Loudon, J.C. 1829.
Achillea Millefolium.

Encyclopaedia of Plants, pp.726,1073.

Gives data for and location in Linnean and Jussieuean systems of botanical classification.

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Lindley, J. 1829.
Achillea Millefolium Linne'.

The British Flora, p.151.

Gives synonyms, description and habitat.

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Withering, W. 1830.
Achillea Millefolium.

An Arrangement of British Plants, ed.7,v.3, p.957.

Gives description, synonyms and references.

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Reichenbach, H.G.L. 1830.
(Achillea collina)

Flora Germanica Excursoria, p.350. (Ind.Kew., ed.1, v.1, p.22)

(Original not available)

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Eichwald, E. 1830.
(Achillea Ochroleuca)

Naturhistorische Skizze von Litthauen, p.149 (Ind. Kew., ed.1, v.1, p.23)

(Original not available)

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Meyer, E.H.F. 1830.
(Achillea Millefolium.var. nigrescens)

De plantis labradoricis, libri tres., p.--. (Gray, Syn.Flora N.America, v.1, pt.2, p.363; MacMillan, Metasperm.Minn.Valley, p.549)

(Original not available).

Esenbeck, L.N.
Ebermaier, C.H. 1831.
Achillea Millefolium Linne',

Handbuch der medicinisch-pharmaceutischen Botanik, v.2, pp.766-768.

Gives references, description and uses of this plant.

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Host, N.T. 1831.
Achillea Millefolium L.

Flora Austriaca, v.2, p.512.

Gives description and references.

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Host, N.T. 1831.
Achillea scabra.

Flora Austriaca, v.2, p.512. (Ind.Kew., 1 ed., v.1, p.23)

Kew considers this the same as the Achillea Millefolium of Linne'.

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Reichenback, L. 1830-32.
Achillea dentifera DeC.

Flora Germanica Excursoria, p.230. (Ind.Kew., ed.1, v.1, p.22)

No. 1461. Gives technical Latin description, and makes comparison with other species.

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Watson, H.C. 1832.
Achillea Millefolium.

Geographical Distribution of British Plants, p.197.

Gives habitats.

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Bley, L.F. 1832.
Prufung der Rad.Achilleae Millefolii, auf Scharfegehalt.

Trommsdorff.Neues Journal der Pharmacie, 24, p.122. (Annal.Chem., 4, p.284)

Obtained an oil by steam distillation; acetic acid detected, also an oleoresin, chlorophyll, malic acid, phosphoric acid, resin, tannic acid, and extractive material.

Wallich, N. 1832.
(Achillea cuspidata)

Catalogue, No. 3230. (Ind. Kew., ed.1, v.1, p.22)

(Original not available)

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Bongard, H.G. 1832.
Observations sur la Vegetation d L'ile de Sitcha.

Memoires de L'Academie Imperiale des Sciences de St.Petersbourg, s.6, v.2, p.149. (Ind.Kew., ed.1, v.1, p.22; Gray, Syn.Flora N.Amer., v.1, pt.2, p.363; Torrey and Gray, Flora N.America, v.2, p.409)

Bongard creates Achillea borealis as a new species which Kew considers as Achillea Millefolium of Linne'. Gives a latin description.

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Rafinesque, S. 1832-33.
Constantino, S.
(Achillea gracilis)

Atlantic Journal, p.177. (Ind.Kew., ed.1, v.1, p.23).

(Original not available).

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Beck, L.C. 1833.
Achillea Millefolium.

Botany of northern and middle states, p.213.

It is found from Virginia north to Aretic America, west to Mississippi River, Canada to Carolinas. "Introduced".

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Kunth, K.S. 1834.
Achillea Millefolium L.

Anleitung zur Kenntniss sämmtlicher in der Pharmacopoea Borussica aufgefuhrten officinellen Gewächse nach naturlichen Familien, pp.265-66.

Gives references, description and use in medicine.

Nuttall, T. 1834.
A catalogue of a collection of plants made chiefly in the Valleys of the Rocky Mountains, or Northern Andes, towards the sources of the Columbia River.

Journal of the Philadelphia Academy of Science, v.7, p.36. (Ind. Kew., ed.1, v.1, p.23)

The Achillea lanulosa Nutt. is considered by Kew to be the Achillea Millefolium of Linnel.

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Bley, L.F. 1834.
Uebersicht der Ausbeute an ätherischen Oelen von verschiedenen Vegetabilien, welche bei einer Reihe Oeldestillationen erhalten wurde.

Buchner's Repertorium f.d.Pharm., s.1, v.48, p.95. (Chem. Zentralblatt, 5, p.780.)

Twenty four pounds of blossoms,dried, gave 3½ dr. oil; 24 pounds of herb gave 2 dr. of beautiful dark blue oil; 5 pounds of air dried seeds gave 1 scruple of green oil; 8 pounds of roots air dried gave 20 grains of colorless oil.

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Redtel, R. 1834.
(Die Quantitat von Extract, welche man im Durchschnitt aus verschiedenen Substanzen erhält.)

Erfahrungen in der prakt. Pharm., p.75-77. (Chem. Zentralblatt, 5,p.742)

(Original not available)

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Riddell, J.L. 1835.
Achillea Millefolium.

Flora of the Western States, p.63.

Occurs in Ohio and vicinity, and gives uses.

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Eaton, A. 1836.
Achillea Millefolium.

Manual of Botany for North America, ed.7, p.141.

Gives description.

Rafinesque, C.S. 1836.
Achillea Millefolium. L.

New Flora of NorthnAmerica, p.50.

Describes this species with its varieties, and 6 other species.

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Rafinesque, C.S. 1836.
Achillea gracilis Raf.

New Flora of North America, p.50. (Candolle, Prodromus, v.6, p.24; Ind.Kew., ed.1, v.1, p.23)

Kew considers this the Achillea Millefolium of Linne'.

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Candolle, A.P. 1837.
Achillea gracilis Rafin.

Prodromus systematis naturalis, v.6, p24. (MacMillan, Metasperm.Minn.Valley, p.549; Gray, Syn.Flora N.Amer., v.1, pt.2, p;363; Ind. Kew., ed.1,v.1, p.23)

Kew considers it to bd the Achillea Millefolium of Linne'.

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Candolle, A.P. 1837.
Achillea Millefolium L.

Prodromus Systematis Naturalis, v.6, p.24.

Gives taxonomic classification with references.

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Candolle, A.P. 1837.
Achillea occidentalis Rafin.

Prodromus Systematis Naturalis, v.6, p.24. (MacMillan, Metasperm.Minn.Valley, p.549; Ind.Kew., ed.1, v.1, p.23)

Kew considers it to be the Achillea Millefolium of Linne'.

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Schlickum, J. 1837.
Ueber Ausbeute an Extracten.

Chem.Zentralblatt, 8, p.675.

The herb yields 1/4 its weight as an aqueous extract.

Forcke, ---- 1839.
Einige Bemerkungen über ätherische Oele

Archiv. d. Pharmacie, 67, pp.177-78. (Chem.Zentralblatt, 10, p.618)

Obtained a volatile oil from Achillea Millefolium by steam distillation.

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Loudon, J.C. 1839.
Achillea.

Hortus Britannicus, pp.555,579,607.

Lists 78 Achillea species or varieties, including Achillea Millefolium Linne, with history and description.

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Smith, J.E. 1839.
Sowerby, J.
Achillea Millefolium

English Botany, ed.2, v.6, p.94, pl.1184.

Gives colored illustration of blooming plant, with botanical desdription and references.

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Steudel, E.G. 1840.
Achillea crassifolia Kort.

Nomenclatur Botanicus, ed.2, v.1, p.13 (Ind. Kew. ed.1, v.1, p.23)

Under Achillea species lists the above , which Kew considers the same as the Achillea Millefolium of Linne'.

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Eaton, A. 1840.
Wright, J.
Achillea Millefolium, ed.3, p.113

North American Botany, ed.6, p.113.

Gives description.

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Torrey, J. 1840.
Gray, A.
Achillea Millefolium L.

Flora of North America, v.2, p.409.

Gives taxonomic description, with references.

Sullivant, W.S. 1840.
Achillea Millefolium Linne'.

Plants in vicinity of Columbus, Ohio, p.29.

"Yarrow".

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Steudel, E.T. 1840.
Achillea millefolium L.

Nomenclator Botanicus, v.1, p.13.

Lists synonyms.

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(-----) 1840.
Millefolium.

Pharmacopoea Universalis, v.2, pp.242-245.

Gives synonyms, references, preparations and uses for Achillea Millefolium L.

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Hooker, W.J. 1842.
Achillea Millefolium

British Flora, v.1; p.200.

Gives taxonomic description.

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Torrey, J. 1843.
Gray, A.
Achillea Millefolium.

Flora of North America, v.2, pt.3, p.409. (Griffith, Medical Botany, p.403)

Gives taxonomic description, distribution and references.

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Ledebour, K. 1844.
Achillea marginata.

Flora rossica, v.2, pt.2, p.532. (Ind.Kew., ed.1, v.1, p.23).

"Achillea marginata Turcz. "
Kew considers it the same as the Achillea Millefolium of Linne'.

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Ledebour, K.F. 1844.
Millefolium officinale.

Flora rossica, v.2, p.532. (Ind.Kew., ed.1, v.3, p.258)

Kew considers it to be the Achillea Millefolium of Linne'.

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Ledebour, K.F. 1844.
Millefolium vulgare.

Flora rossica, v.2, p.532. (Ind.Kew., ed.1, v.3, p.258)

Kew considers it to be the Achillea Millefolium of Linne'.

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Scheele, A. 1844.
Beitrage zur Kenntniss der Pflanzenwelt.

Linnaea, 18, pp.471-472. (Ind.Kew., ed.1, v.1, p.23)

Gives taxonomic description of and differentiation of Achillea pannonica Scheele from Achillea Millefolium L., noting that the latter is more glabrous. Kew considers it to be the Achillea Millefolium of Linne'.

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Knapp, F. H. 1846.
Achillea Millefolium.

Botanical Chart of British Flowering Plants, p.1.

Occurs in British Isles. Highlanders use it to make an ointment to heal wounds.

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Zanon, B. 1846
Ueber Achillein und Achilleasaure, neue, in der Schafgarbe (Achillea Millefolium L.) entdeckte wesentliche organische Bestandtheile.

Annalen der Chemie ul Pharm., 58, pp.21-36. (Amer.Journ. Pharm., 19, p.57; VanRijn, Die Glykoside, ed.1, p.470; Annal.Chem., 155, p.155; Chem.Zentralblatt, 17, p.716; ibid.,16, p.512; Jahresbericht u.d. Fortschritte d. Chemie,(1870),p.882; Wiesner, D.Rohstoffe d. Pflanzenreiche, ed.4, v.2, p.1801)

Obtained achilleic acid and the glucoside achilleine,from this plant. He prepared the K,Na,$NH_4$, Ca Mg and quinine salts of the isolated acid. Gives a description of the method.

Griffith, R.E. 1847.
Achillea Millefolium.

Medical Botany, pp.403-404.

Gives synonyms, distribution, description, medical uses, and notes on allied species.

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Boissier, E.
Reuter, G.F.
( • • ) 1849.

Diagnoses plantarum novarum hispanicarum, s.l, v.11, p.14. (Ind. Kew. ed.1, v.1, p.22 & 200)

(Original not available)
Kew considers the Arthrolepis of Boissier the same as the Achillea of Vaillant/Linne.

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Lindley, J. 1849.
Achillea Millefolium. L.

Medical and Economical Botany, p.229.

Gives description and uses.

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Lea, T.G. 1849.
Achillea Millefolium L.

Plants in vicinity of Cincinnati, Ohio, p.19.

"Yarrow".

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( --- ) 1850.
Aschenanalysen.

Jahresbericht uber die Fortschritte der Chemie, p.661, table B.

Ash of Achillea Millefolium is as follows: K 30.37%, Ca 13.40%, Mg 3.01%, Iron Oxide, 0.21% $H_2SO_4$ 2.44%, "Kieselerde"9.99%, "Thonerde"-, carbonic acid 9.36%, phosphoric acid 7.13%, KCL 20.49, NaCl 3.63; Ash per cent of dried substance8-13.45; Sulfur in 1000 parts of dried material 1.67.

Koch, K. 1851.
Beitrage zu einer Flora de Orientes.

Linnaea, 24, p.325. (Ind.Kew., ed.1, v.1, p.23)

Kew considers the Achillea cesica to be the Achillea Millefolium of Linne. Koch gives references.

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Schleiden, M.J. 1852.
Achillea Millefolium.

Handbuch der Medicinisch-pharmaceutischen Botanik, p.368.

"Schafgarbe". Describes the plant briefly.

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Clapp, A. 1852.
Achillea Millefolium L.

Medicinal Plants of the United States, p.116.

Gives references and uses.

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Buchner, J. 1852.
Millefolium.

Homeopathische Arznei Bereitungslehre, ed.2, p.364.

Gives scientific name, synonym, habitat, description and time of collection.

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Pritzel, G.A. 1855.
Achillea Millefolium.

Iconum Botanicarum Index., p.10.

Gives references.

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Darby, J. 1855.
Achillea Millefolium.

Botany of the Southern States, pt.2, p.400.

Gives taxonomic description.

Hayne, F.G. 1856.
Achillea Millefolium.

Darstellung und Beschreibung der Arzneigewaechse, v.9, No.45; plate 45. (Kunth, Pharm.Borus.off.Gewaechse, p.265; Esenbeck & Ebermaier, Botanik, p.766)

Gives synonyms, references, description, uses, consituents, colored illustration of whole plant and of 12 separate parts.

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Lindley, J. 1856.
Achillea Millefolium.

Medical and Economical Botany, ed.2, p.229.

Gives taxonomic description and uses, with an illustration.

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Koch, W.D.J. 1857.
Achillea Millefolium.

Synopsis Florae Germanicae, ed.3, v.1, p.319.

Koch lists 17 species of Achillea and 6 varieties of Achillea Millefolium, with detailed taxonomic description.

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Klasiwetz, H. 1857.
Notiz ueber die Achilleasaure .

Sitzungsber. der Akad. der Wissensch. zu Wien, math., naturw. Kl., 24, p.268. (Chem.Zentralblatt, 28, p.735; Arch. d. Pharmacie, 146, p.186; Journ. f. prakt.Chem., 72, p.429; Jahrber.Fersch.Chem.(1857),p.331; Czapek, Biochem.Pflanz., v.2, p.439)

Achilleic acid is aconitic acid, and occurs as the Ca salt. It is non-volatile, soluble in water, alechol and ether, acid taste, and forms salts of K,$NH_4$, Ca, Pb., Ba, Ag, Na, and Mg having been reported.

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Gäreke, A. 1858.
Achillea Millefolium L.

Flora von Nord - und Mittel-Deutschland, ed.4, p.176.

Describes the plant-Schafgarbe.

Tilyard, C. 1859.
( " " )

Maryland Journal of Pharmacy, p.---. (Proc.Amer.Pharm. Assoc., v.8, p.86).

(Original not available. Make a fluidextract using 8 oz. to the pint).

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Newberry, J.S. 1860.
Achillea Millefolium.

Flowering Plants and Ferns of Ohio, p.23

Lists.

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Chapman, A.W. 1860.
Achillea Millefolium.

Flora of the Southern United States, p.242.

Gives taxonomic description.

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Ludwig, De V. 1860.
Millefolium.

Homöopathische Pharmacopöe, p.66.

Gives description, characteristics and preparations of Achillea Millefolium L.

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Cosson, E. 1861.
German, S.P.
Achillea Millefolium.

Flore des Environs de Paris, p.489.

Gives taxonomic description and references.

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(Sears, Ch.C.) 1862.
( " " )

Journal of the Maryland College of Pharmacy, 2, p.74. (Proc. A. Ph.Assoc., 10, p.113)

(Original not obtainable)
(Achillea Millefolium L. was analyzed by C.C. Sears, who obtained a volatile oil, tannin, resin, albumen, yellow coloring matter, starch, gum, bitter extractive, and chlorophyll)

Scudder, J.M. 1862.
Achillea Millefolium.

Eclectic Medical Journal, 21, p.241.

Gives use of this in medicine.

---

Henkel, J.B. 1862.
Achillea Millefolium.

Botanik, p.126.

Gives description, constituents, and physiological action of the plant.

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Martrin-Donos, V. 1862.
(Achillea monticola)

Plantes critiques du deparment du Tarn, p.31. (Ind. Kew., ed.1, v.1, p.23)

(Original not available)
Kew considers it to be the Achillea Millefolium of Linne'.

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Henkel, J.B. 1863.
Achillea Millefolium.

Atlas zur medizinisch-pharmaceutischen Botanik, p.10, pl.25.

Gives illustration of disk and ray flowers.

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Waring, E.J. 1863.
Note on the Medicinal Properties of Achillea Millefolium L. = Yarrow, Milfoil.

Pharmaceutical Journal, 23, pp.504-506.

Gives history, constituents and medicinal uses with references.

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Cockayne, T.O. 1864.
Yarrow.

Leechdoms, Wortcunning & Starcraft, v.1, pp.195-199; v.3, p.385. (Murray, English Dictionary, v.10, pt.2, sect.2, p.20)

Gives legend concerning use by Achilles and therapeutic uses, withnearly names in original.

Bentham, G. 1865.
Achillea Millefolium.

The British Flora, p.453.

Gives taxonomic description, with illustration, No. 515.

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Scudder, J.M. 1865.
Achillea Millefolium.

Eclectic Medical Journal, 25, p.94.

Gives indications for use of Yarrow.

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Herder, F. von 1865.
Plantae Raddeanae Monopetalae.

Bulletin de la Societe Imperiale des Naturalistes, Moscov, v.38, pp.403-404. (Ind. Kew., ed.1, v.1, p.22)

(~~Original not available~~)
(Achillea anethefolia Fisch. is considered by Kew to be the Achillea Millefolium of Linne(.)

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Wimmer, F. 1866.
( " " )

Theophrasti Eresii Opera, pp.131;138.

The only Achillea or similar word referred to barley. No reference was found to the plant now known as Achillea Millefolium L.

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Berg, O. 1866.
Achillea Millefolium L.

Pharmaceutische Botanik, ed.3, p.320.

Gives taxonomic classification and description. Named in honor of Achilleus who withnit healed Telephos.

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Dulac, J. 1867.
(Alitubus Millefolium.)

Flore du department des Hautes-Pyrenees. p.500. (Ind. Kew., ed.1, v.1, pp.22,76)

(Alitubus Millefolium Dulac is considered by Kew to be the Achillea Millefolium of Linne)
(Original not obtainable)

Bowman, H.K. 1869.
Quantitative Determination of the Amount of Tannin in Various Vegetable Astringents.
American Journal of Pharmacy, 41, p.194.

Achillea Millefolium L. contains 4.15% of tannin.

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Fourreau, J. 1869.
Catalogue des Plantes dud Cours du Rhone.

Annales dd la Societe Linneenne de Lyon, n.s.17, p.91.
(Ind.Kew. ed.1, v.1, pp.22,595)

Kew considers the genus Conforata to be the same as the genus Achillea.

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Fourreau, J. 1869.
Catalogue des Plantes du Cours du Rhone.

Annales de la Societe Linneenne de Lyon, n.s. 17, p.91.

Lists Achillea Millefolium L.

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Planta-Richenau, A. 1870.
Die Iva (Achillea moschata)

Annalen der Chemie und Pharmacie, 155, pp.145-161.
(Amer.Journ.Pharm., 43, p.86; Pharm.Centralhalle,12,p.8; Bullet.Soc.Chim.,s.2,v.15,p.136(1871); Chem.Zentralblatt, 41, p.668; Wiesner, D. Rohstoff d. Pflanzenreichs, ed.4, v.1, p.56)

The author made a chemical examinationnof the extracts and of the volatile oil. He also worked with Achillea Millefolium from which he isolated achilleina as well as from Achillea moschata. He reported a volatile oil, ivain, stearic acid, achillein, moschatin, achilletin, and constituents of the ash.

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King, C. 1871.
Catalogue of the Known Plants of Nevada and Utah.

Report of the Geological Exploration of the Fortieth Parallel, Professional Papers of the Engineer Department, U.S.Army, No.18pp.179.

Achillea Millefolium L., and variety rosea, found in Nevada and Utah.

Gibbons, W.P. 1871.
The Medical Flora of California.

Proceedings of the American Pharmaceutical Association, 19, pp.297-308.

Achillea Millefolium L. occurs.

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Wolff, H. 1871.
Achillea Millefolium.

Aschen analysen von landwirthschaftlichen producten, fabrik-abfällen und wildwachsenden pflanzen, p.138.

100 parts of the ash contains: $K_2O$ 47.81; $Na_2O$ 2.12; CaO 14.79; MgO 3.32; $Fe_2O_3$ 0.23; $P_2O_5$ 7.84; $SO_3$ 2.69; $SiO_2$ 10.95; Cl 13.17; crude ash 13.45; $CO_2$ 12.73.

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Tieghem, Ph. van 1872.
Memoire sur les canaux secreteurs des plantes.

Annales des Sciences Naturelles Totanique, s.5, v.16, pp.126, 132, 134.

A study of Compositae secretory canals, including Achillea Millefolium.

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Pollock, A. 1872.
Milfoil.

A Botanical Index to all the Medicinal Plants, pp.8, 95.

Gives synonyms.

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Schübeler, F.C. 1873.
Achillea Millefolium L.

Die Pflanzenwelt, Norwegens, p.244.

Gives synonyms, habitat and uses.
Norway: Rylk, Ryllik
North: Olkall
Sweden: Pieis kidgik; Jardhumall, Vallhumal.
North cap--71°10'
s. Norway--4000 ft. elevation.
Tobacco substitute, snuff; fortify beer.

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Coleman, E. 1874.
Achillea Millefolium L.

Flowering Plants of Southern Peninsula of Michigan, p.22.

Occurs.

Parry, C.C. 1874.
Botanical Observations in Western Wyoming.

American Naturalist, 8, p.108.

Achillea Millefolium L. occurs in a dwarfed form in the high alpine crest at the head of Stinking Water.

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Hitchcock, C.H. 1874.
Catalogue of the Plants of New Hampshire.

The Geology of New Hampshire, v.1, p.401.

Achillea Millefolium L. occurs.

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Groves, H. 1874.
Notes on some indigenous Tuscan remedies.

Pharmaceutical Journal, 34, p.232.

The tops of Achillea ageratum, Achillea tomentosum and Achillea Millefolium are used as a stomachic.

---

Low, Fr. 1875.
Achillea Millefolium.

Botanische Zeitung, 33, p.386.

The nematode galls of this plant are discussed. Tylenchus Millefolii was found on the leaves, and but seldom on the stem; up to 6000 ft. elevation.

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Lapham, I.A. 1875.
Achillea Millefolium L.

A Catalogue of the Plants of Minnesota, p.16.

Occurs in Minnesota.

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Boissier, E. 1875.
Achillea Millefolium L.

Flora Orientalis, v.3, p.255.

Gives botanical description, with references.

Boissier, E. 1875.
Achillea ambigua.

Flora Orientalis, v.3, p.255 (Ind.Kew, ed.1, v.1, p122)

Kew considers this to be the Achillea Millefolium of Linne', "Achillea ambigua Boiss. in Ky. exs.1846"

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Guibourt, N.J.B.G. 1876.
Planchon, G.
Millefeuille.

Histoire Naturelle des Dregues Simples, v.3, p.51.

Gives description and uses for Achillea Millefolium L.

---

Langethal, E. 1876.
Achillea Millefolium.

Handbuch der landwirthschaftlichen Pflanzenkunde und des Pflanzenbaues, pp.133.

Gives illustration and mention of this plant.

---

Bentham, G. 1876.
Hooker, J.D.
Achillea.

Genera Plantarum, v.2, p.419. (Ind.Kew., ed.1, v.1, p.22)

Gives taxonomic description and classification, with references; No. 971.

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Allen, T.F. 1877.
Millefolium.

The Encyclopedia of Pure Materia Medica, v.6, pp.366-371.

Gives extensive monograph on the action and uses with references.

---

Careke, A. 1878.
Achillea Millefolium L.

Flora von Deutschland, ed.13, p.207.

Schafgarbe, flowers white or red; describes the plant.

Wheeler, G.M. 1878.
Reports Upon the Botanical Collections made in Portions of Nevada, Utah, California, Colorado, New Mexico and Arizona during the years 1871, 1872, 1873, 1874 and 1875.

Report upon United States Geographical Surveys west of the One Hundredth Meridian, pp.174; 366.

Achillea Millefolium L. is found in Nevada, Utah, Colorado and Arizona, in the pine region of the White Mountains; also in California.

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Palmer, E. 1878.
Plants used by the Indians of the United States.

American Journal of Pharmacy, 50, p.590. (Yrbk.Br. Pharm. Conf., 16, p.191; Pharm.Journ. 38, p.774)

"Yarrow of the settlers of Utah. The Pah-Utes make a tea from this plant, and take it internally for weak and disordered stomachs. It is much used by the whites in the form of bitters"

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( " " ) 1878.
Achillea Millefolium.

Pharmaceutical Journal, 37, p.142.

Used anciently as vulnerary and astringent, and called "nosebleed" because its leaves put into the nose cause bleeding.

---

Grimm. J. 1878.
Grimm. W.
Garbe. Garwe.

Deutsches Wörterbuch, v.4, p.1335

Gives forms and meaning, synonyms and references.

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Thomas, F. 1879.
Achillea Millefolium L.

Botanische Zeitung, 37, p.96.

Subject to galls.

Steele, J.G. 1879.
Achillea Millefolium.

Proc. Amer. Pharm. Association, 28, p.613.

Yarrow is reported to be prevalent in California, growing to a height of 2 feet. Successfully used by local practitioners as an emmenagogue.

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Pickering, C. 1879.
Achillea Millefolium.

Chronological History of Plants, pp.170, 935, 943, 958, 969.

Gives history and references of this plant.

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Saint Lager, - 1880.
Reforme de la nomenclature botanique.

Annales de la soc. bot. de Lyon, 7, p.118. (Ind.Kew., ed.1, v.1, p.24)

The Achillios Millefoliatus is considered the one of Dioscorides. Kew considers this the Achillea Millefolium of Linne'.

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Bentley, R. 1880.
Trimen, H.
Achillea Millefolium.

Medicinal Plants, v.3, p.153.

Gives colored illustration, references, habitat, description, uses and properties.

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Wiesner, J. 1880.
Die heliotropischen Erscheinungen im Pflanzenreiche.

Botanische Zeitung, 38, p.653.

The Achillea genera is mentioned.

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Thoreau, H.D. 1880.
Achillea Millefolium.

The Maine Woods, p.320.

A plant found by river and log paths, and by Smiths.

Badger, C.P. 1881.
Yarrow.

English-Arabic Lexicon, p.1237.

Gives Arabic and Egyptian names.

---

Barnes, C.R. 1881.

Achillea Millefolium.

Plants of Indiana, p.15.

Occurs.

---

Gärdke, A. 1882.
Achillea Millefolium.

Flora von Deutschland, ed.14, p.207.

Gives description

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Thompson, A.W. 1883.
Achillea Millefolium.

(Muller's, (H.), Fertilisation of Flowers, p.325.

Describes insect pollination in detail, noting that about 87 insect species visited this plant.

---

Costantin, J. 1883.
Etude comparee des tiges aeriennes et souterraines des dicotyledones.

Annales des Sciences Naturelles Botanique, s.6, v.16, p.147.

Gives histology and drawings of Achillea Millefolium, fig. 85, 86, = stem and rhizome.

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Hoek, K. 1883.
Verhalten gefärbter atherischer Oele.

Archiv d. Pharmacie, s.3, 21, p.17. (Jahresbericht u.d. Fortschritte d.Chemie, (1883), pp.1422-23).

Schafgarbenöl showed 3 bands of absorption in the red and orange ranges.

Macoun, J. 1883.
Achillea Millefolium L. var. lanata Koch.

Catalogue of Canadian Plants, pt.1, p. 251.

The Geological Survey of Canada found this plant in British Columbia, and the variety nigrescens on the coast of Labrador.

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Franchet, A. 1883.
Plantes du Turkestan.

Annales des Sciences Naturelles Botanique, s.6, v.16, p. 309.

Achillea Millefolium L. is found in Turkestan, as the purple flowered type. Four other species also occur.

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Gray, A. 1884.
Achillea Millefolium L.

Synoptical Flora of North America, v.1, pt.2, p.363.

Gives taxonomic description, synonomy, and distribution.

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Hedges, H.T. 1884.
Achillea.

A Polyglot Index of all the Principal Articles in the Materia Medica, pp.12-13.

Achillea Millefolium L. - gives Latin, English, French, German, Swedish and Norwegian synonyms.

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Hooker, J. D. 1884.
Achillea Millefolium.

Student's Flora of the British Islands, ed.3, p.212.

Gives taxonomic desorkption.

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Johnson, L. 1884.
Achillea.

A Manual of the Medical Botany of North America, p.181.

Gives description, habitat, part used, constituents, preparations, medical properties, uses and an illustration of the plant.

Meehan, T. 1884.
Catalogue of Plants Collected in July, 1883 during an excursion along the Pacific Coast in Southeastern Alaska.

Proceedings of the Academy of Natural Sciences, v.36, p.86.

"Achillea Millefolium L. at Port Townshend, W. T.; Victoria, B.C., Harrisburg, Alaska. Much more vigorous and hairy than eastern plant, and generally with deep rosy, occasionally with pinky white, but rarely if ever, with pure white flowers"

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Eastes, H.J. 1884.
Unofficial Indigenous medicinal Plants.

Pharmaceutical Journal, 45, p.842.

Generic name from Achilles. Used in Norway for rheumatism; Swedes use it to increase the intoxicating powers of beer; as a styptic and as a vulnerary anodyne, for toothache. Gives synonyms.

---

Coulter, J.M. 1885.
Achillea Millefolium L.

Manual of the Botany of the Rocky Mountain Region, pp.139, 198.

Gives taxonomic description. (New.Mex.-British bd.)

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Lange, J. 1885.
Achillea Millefolium.

Icones Plantarum Officinal Scandinaviae, v.2, pl.131.

Gives colored illustration, including roots, stems, leaves, flowers, and strap and perfect flowers.

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Schur, P.J.F. 1885.
Achillea tenuis Schur.

Enumeratio plantarum Transsilvaniae, nova editio, p.329. (Ind. Kew., ed.1, v.1, p.24; Pritzel, Thesaurus Lit. Bot., ed.1, p.291.)

No. 1907. Gives Latin technical description and habitat. Kew considers it to be the Achillea Millefolium of Linne'.

Redfield, J.H. 1886.
Insular Floras.

Bulletin of the Torrey Botanical Club, 13, p.246.

Achillea Millefolium occurs on a small island (less than 1 acre in size) between Little Cranberry and Baker's Islands off the coast of Maine.

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Forbes, F.B. 1886.
Hemsley, W.B.
Enumeration of all the plants known from China Proper, Formosa, Hainan, The Corea, The Luchu Archipelago, and the Island of Hongkong, etc.

Journal of the Linnean Society of Botany, 23, p.436.

Gives stations from which Achillea Millefolium was collected. Mt. Omei, Szechuen, at 2500 ft. elevation.

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Meehan, T. 1886.
On the Interdependence of Plants.

Proceedings of the Academy of Natural Sciences, 38, p.344.

Achillea Millefolium found to be associated with blackberry.

---

Geissler, E. 1886.
Moeller, J.
Achillea Millefolium L.

Real Encyclopädie der Gesammten Pharmacie, v.1, pp.62-64.

Gives synonyms, description, constituents and illustration of the plant

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Millspaugh, C.F. 1887.
Millefolium.

American Medicinal Plants, #85.

Gives colored illustration of flowering top and parts, synonyms, description, history, habitat, part used, constituents and action.

Brendel, F. 1887.
Achillea Millefolium.

Flora Peoriana, p.52.

Occurs in middle Illinois.

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Mürrle, G. 1887.
Aetherische Oele.

Jahres Bericht Chemischen Technologie, 33, p.795.

Yield of 0.80 kilogram of volatile oil from 100 kilograms of Achillea Millefolium. Schafgarben-Kraut, using Mürrle's apparatus.

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Daner, L. 1887.
(Achillea Millefolium)

Unkrauter und pflanzliche Schwarotzen, Ein Beitrag zur Erkenntniss und Bekampfung desselben fur Landwirte und Gartenfreunde, p.---. (Iowa Geol.Survey, Bulletin No.4, p.736)

(Original not available).

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Skeat, W.W. 1888.
Yarrow. Yare. Garbe. Gear.

An Etymological Dictionary of the English Language, p.723; 228; 230.

Gives early uses, meanings and references.

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Moore, S.M. 1888.
The Influence of Light upon Protoplasmic Movement.

Journal of the Linnean Society of Botany, 24, pp.364,365.

The chlorophyll grains of Achillea Millefolium were not moved after several hours in the sunlight.

---

Dame, L. 1888.
Collins, F.S.
Achillea Millefolium L.

Flora of Middlesex County, Massachusetts, p.64.

"Yarrow. Very common. Form with pink flowers not uncommon. July - Sept."

Formanek, E. 1888.
Beitrag zur Flora von Bosnien und der Hercegovina.

Oesterreichische Botanische Zeitschrift, 38, p.306.

"Achillea Millefolium L., var. collina.
Becker ex Kock Syn. ed.I,1837.
Krupa,Bistrica,Vrbanja."

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Day, D.F. 1888.
Achillea Millefolium L.

Catalogue of the Niagara Flora, N.Y., p.38.

Yarrow occurs on Goat Island.

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Kellerman, W.A. 1888.
Achillea Millefolium L.

Flora of Kansas, p.101.

Gives taxonomic description.

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Fream, W. 1888.
Flora of Water Meadows.

Journal of the Linnean Society of Botany, 24, pp.456,463.

Achillea Millefolium occurred in water meadows of England. Such regions are adjacent to rivers and irrigated periodically; also in dry meadows.

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Scott, R. 1889.
"Achilleios"

A Greek-English Lexicon, p.267.

Gives references to the word in Greek literature.

---

Douliot, H. 1889.
Recherches sur le periderm.

Annales des Sciences Naturelles Botanique, s.7, v.10, p.387.

Achillea Millefolium studied: the periderm is under the epidermis.

---

Moeller, J. 1889.
Herba Millefolii.

Lehrbuch der Pharmakognosie, p.314.

The blooming herb of Achillea Miblefolium gives 0.08% of volatile oil. "Achilleasaure" is aconitic acid. Gives description and states it is used as a folk medicine.

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Tafel, L.H. 1890.
Boericke, F.A.
Millefolium.

American Homoeopathic Pharmacopoeia, ed.4, p.319.

Gives synonyms, description, and preparation of the tincture.

---

Daniel, L. 1890.
Recherches anatomiques et physioliques sur les bractees de l'involucre des Composees.

Annales des Sciences Naturelles Botanique, s.7, v.11, pp.51; 79.

Gives a histological study of the bracts of Achillea Millefolium with fig. No. 32,33.

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Rand, E. 1890.
Some further notes on the flora of Rangeley Lakes.

Bulletin of the Torrey Botanical Club, 17, p.34.

Achillea Millefolium has invaded the region as a weed.

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Masclef, A. 1891.
Achillea Millefolium.

Atlas des Plantes de France, pl.184.

Colored illustration of the plant and individual flowers.

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Dymock, W. 1891.
Warden, C.J.H.
Hooper, D.
Achillea Millefolium.

Pharmacographia India, v.2, p.271.

A native of India.

Cockerell, T.D.A. 1891.
Note on the flora of higher altitudes in Custer County, Colorado.

Bulletin of the Torrey Botanical Club, 18, pp.169-170.

Achillea Millefolium was collected above 10,000 feet elevation on the Wet Mts. It was the last flower of the year(Oct.10) at that high altitude. Occurs near lakes.

---

Chamberlain, J.C. 1891.
A comparative study of the styles of Compositae.

Bulletin of the Torrey Botanical Club, 18, p.204.

The styles of Achillea Millefolium are described and illustrated.

---

Eggert, H. 1891.
Achillea Millefolium L.

Catalogue of the Phaenogamus and Vascular Cryptogamous Plants in the Vicinity of St.Louis, Mo., p.3.

Listed.

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Frankk, J. 1892.
Gerw.

Etymologisch Woordenboek, p.286.

"vr. Uit glb. mnl. gherwe , garwe (zie erg) b.a ohd. garawa mhd. garbe, ags. gearewe, vr. eng. yarrow, millefolium."

---

Vogel, A. 1892.
Herba Millefolii.

Pharmakognosie, p.48.

Gives description and natural history of the plant, microscopic description, chemical analysis, and official recognition in pharmacopoeias of variouscountries.

---

Millspaugh, C.F. 1892.
Achillea Millefolium.

Medicinal Plants, v.1, pl.85, p.85.

Gives colored illustration, synonyms, description, history, habitat, part used, preparations, constituents, and action of the plant.

---

Meyer, A. 1892.
Herba Millefolii.

Drogenkunde, v.2, p.471.

"Schafgarbe, Achillea Millefolium L., Compositae. Domestic drug".

---

Coulter, J.M. 1892.
Achillea Millefolium.

Manual of the Phanerogams and Pteridophytes of western Texas, Contributions from the U.S. National Herbarium, v.2, No.2, p.239.

Gives taxonomic description.

---

MacMillan, C. 1892.

Achillea Millefolium.

Metaspermae of the Minnesota Valley, p. 549.

Listed, with references.

---

Lettenbaur, K. 1892.
Die Pflanzen Welt und unsere deutsche Göttersage.

Berichte d. Pharm. Gesellschaft, 2, p.297.

Achillea Millefolium L. (Schafgarbe) is used as a folk medicine.

---

Grimm, J. 1893.
Grimm, W.
Schafgarbe.

Deutsches Wörterbuch, v.8, p.2037

Gives etymology, meanings and references.

Villers, A. 1893.
Thumen, F.
Achillea Millefolium.

Die Pflanzen des Homoopathischen Arzneischatzes, v.2, pl.1.

Gives colored illustretion of plant and flowers.

---

Rowlee, W.W. 1893.

Studies upon akenes and seedlings of plants of the order Compositae.

Bulletin of the Torrey Botanical Club, 20, p.11.

Gives a description of the akene and seedlings of Achillea Millefolium, with illustrations.

---

Flot, L. 1893.

Recherches sur la zone perimedullaire de la tige.

Annales des Sciences Naturelles Botanique, s.7, v.18, p.101.

Notes on the pith and perimedullary zone of Achillea Millefolium.

---

Halsted, B. 1893.
A Century of American Weed Seeds.

Bulletin of the Torrey Botanical Club, 20, p.53

A list of 100 weeds, including Achillea Millefolium, Yarrow, a perennial; New Jersey district.

---

Heller, A.A. 1893.
Preliminary report on the flora of Luzerne County, Penn.

Bulletin of the Torrey Botanical Club, 20, p.63.

Achillea Millefolium.was collected at Long Pond.

---

Bailey, W.W. 1893.
Collins, J.F.
A list of plants found on Block Island, R.I..

Bulletin of the Torrey Botanical Club, 20, p.235.

Achillea Millefolium (pink variety) common.

MacLeod, J. 1893.
Over de bevruchting der bloemen in het Kempisch gedeelte van Vlaanderen.

Botanisch Jaarboek, v.5, pp.156,452.

Gives illustrations and description of the flower.

---

Greene, E.L. 1894.
Achillea Millefolium.

Botany of San Francisco Bay, p.208.

Gives taxonomic description and habitat.

---

Rand, E.L. 1894.
Redfield, J.H.
Achillea

Flora of Mount Desert Island, Maine, p.118.

Achillea Millefolium, and form rosea, and Achillea ptarmica occur.

---

Gattinger, A. 1894.
Achillea Millefolium.

The medicinal plants of Tennessee, p.40.

Gives taxonomic description; used in veterinary practise.

---

Jackson, J. 1894.
Achillea Millefolium L.

Flora of Worcester County, Massachusetts, p.30.

Listed, with synonyms.

---

( • - ) 1894.
Milfoil Oil.

Semi-Annual Report of Schimmel and Co., Oct., p.38.

Found cineol to be present.

---

Bonnier, G. 1895.
Recherches experimentales sur l'adaptation des plantes au climat alpin.

Annales des Sciences Naturelles Botanique, s.7, v.20, pp.269, 330, 334, 335.

A comparative study of alpine and plain effects on the Achillea Millefolium,L., giving description of morphology and histology, with illustrations.

---

Gray, A. 1895.
Achillea Millefolium.

Field,Forest and Garden Botany, p.250.

Gives taxonomic description.

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Lubbock, J. 1895.
Stipules, their forms and functions.

Journal of the Linnean Society of Botany, 30, p.505.

Achillea Millefolium has petioles dilated at the base.

---

Willis, J.C. 1895.
Burkill, I.H.
Flowers and Insects in Great Britain.

Annals of Botany, 9, p.238.

Achillea Millefolium abundant. Visited chiefly by flies, also by many Microlepidoptera. Lists insects visiting this species.

---

Karsten, H. 1895.
Achillea Millefolium

Flora von Deutschland, Oesterreich und der Schweiz, v.2, p.670.

Gives taxonomic description and detail illustrations.

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Mennella, A. 1895.
(Ueber Wirkung und Anwendung von Achillea Millefolium.)

Deutsch.Med.Ztg.--p.--. (Pharm. Zentralhalle,36, p.717; Jahresbericht d. Pharm., 55, p.64)

(Original not obtainalbe)
(Used for stomach catarrh, diuretic, and heart remedy)

Drude, O. 1896.
Achillea Millefolium.

Deutschlands Pflanzengeographie, v.4, pt.1, p.156.

Found innndry meadows and ridges of the low ground, and belongs to the xerophytic Compositae.

---

Millspaugh, C.F. 1896.
Nuttall, L.W.
Achillea Millefolium L.

The Flora of West Virginia, Field Columbian Museum Publication 9, botanical series v.1, No.2, p.232.

Occurs.

---

Rydberg, P.A. 1896.
Achillea Millefolium.

Flora of the Black Hills of South Dakota, Contributions from the U.S. National Herbarium, v.3, No. 8, p.509.

Gives stations.

---

Engler, A. 1896.
Drude, O.
Willkomm, M.
Achillea Millefolium.

Die Vegetation der Erde, v.1, pp.121, 319.

Achillea Millefolium L., and Achillea Millefolium L.β macrocephala Lge. occur in the hilly and subalpine regions of Spain.

---

( * - ) 1897.
Millefolium.

Pharmacopeia of the American Institute of Homeopathy, p.400.

The whole fresh plant is used, from which is made a tincture. Gives synonyms, description, habitat history, and references. Introduced into this practice in 1837.

---

Engler, A. 1897.
Prantl, K.
Achillea Millefolium L.

Die Naturlichen Pflanzenfamilien, v.4, pt.5, p.272.

Gives taxonomic classification.

---

Brandes, W. 1897.
Achillea Millefolium L.

Flora der Provins Hannover, p.216.

Gives habitat.

---

Monnelia, A. 1897.
Action therapeutique de l'Achillea Millefolium L.

Comptes-Rendus du Congres International de Medecine, 2, sect.4, b, pp.9-10. (Cat.Scient.Papers, s.4, v.17, p.158).

Gives action and uses.

---

Selby, A.D. 1897.
A First Ohio Weed Manual.

Bulletin of the Ohio Agricultural Experiment Station, No. 83, p.356.

Gives illustration and description.

---

Millspaugh, C.F. 1898.
Achillea Millefolium Linne'.

Coastal and Plain Flora of Yucatan, Field Columbian Museum Publication, 25, botanical series, v.1, No.4, p.394.

"Achillea Millefolium Linn. Sp.Pl.899, Alcanfor. Campo about Merida, not in flower, April 1887 (Millspaugh, 47)."

---

Pabst, G. 1863-98.
Kohler, F.E.
Achillea Millefolium.

Medizinal Pflanzen, v.2, p.648.

Gives colored illustration of plant, and the parts, description, habitats, synonyms, history, preparations, constituents, uses and references.

Hyams, C.W. 1898.
Medicinal Plants.

Bulletin of the North Carolina Agricultural Experiment Station, 150, p.365.

Gives medical uses of Achillea Millefolium L.

---

Engler, A. 1898.
Achillea Millefolium.

Syllabus der Pflanzenfamilien, ed.2, p.194.

Listed.

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Moore, D. 1898.
Achillea Millefolium.

Cybele Hibernica, ed.2, p.181.

Occurs from sea level to 2550 ft. elevation in Ireland.

---

Meehan, T. 1898.
The Plants of the Lewis and Clark's Expedition across the Continent, 1804-1806.

Proceedings of the Academy of Natural Sciences, v.50, p.30.

"Achillea Millefolium (erroneously designated Achillea tomentose by Pursh, Flora 563) on the banks of the Kooskooskee, M.Lewis".

---

Coues, E. 1898.
Notes on Mr. Thomas Meehan's Paper on the Plants of the Lewis and Clark's Expedition across the Continent, 1804-1806.

Proceedings of the Academyof Natural Sciences, v.50 p.304.

The author refers to Meehan's work in the same volume, and states that the correct station for the collection of Achillea Millefolium (Achillea tomentosa Pursh Fl.563,nec.Wild.) was May 20, 1806, Camp Chopunnish.

Abromeit, J. 1898.
Achillea Millefolium.

Flora von Ost- und Westpreussen, p.406.

Gives occurrence.

---

Nash, G.V. 1898.
List of plants in the grounds of the New York Botanical Garden and in the temporary greenhouse, 1897.

Bulletin of the New York Botanical Garden, 1, pp.137, 202, 223, 361.

Achillea Millefolium listed as a wild flower, with the rosea and rubra varieties.

---

Dragendorff, G. 1898.
Achillea Millefolium.

Die Heilpflanzen, p.674.

Gives uses, part used, synonyms, and notes 20 other species of Achillea.

---

Engler, A 1898.
Drude, O.
Pax, F.
Achillea Millefolium.

Die Vegetation der Erde, v.2, pp.105, 108, 111, 128.

Occurs in the Carpathian Mts. district, as do other Achillea species, and gives habitats.

---

Fitzpatrick, T.J. 1899.
Achillea Millefolium L.

Manual of the Flowering Plants of Iowa, p.91.

Taxonomically described.

---

Pollard, C.L. 1899.
The genus Achillea in North America.

Bulletin of the Torrey Botanical Club, 26, pp.365,371.

Discusses the genus Achillea and 10 individual species, including Achillea Millefolium, with descriptions and a key.

Jelliffe, S.E. 1899.
Achillea Millefolium L.

Flora of Long Island, N.Y., p.153.

"Common throughout the island".

---

Engler, A. 1899.
Drude, O.
Radde, G.
Achillea Millefolium.

Die Vegetation der Erde, v.3, pp.49, 68, 161, 258.

In the Caucus Mountain region, Achillea Millefolium L., and Achillea Millefolium L a nobilis L. occur.

---

Sanders, D. 1899.
Muret, "
Schmidt, J.
Garbe.

Encyklopädisches Wörterbuch, pt.1, p.795.

Gives etymology and meanings of the word.

---

Griffiths, D. 1899.
Some northwestern Erysiphaceae.

Bulletin of the Torrey Botanical Club, 26, p.141.

Achillea Millefolium collected at Sylvan Lake South Dakota.

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Kirk, T. 1899.
Achillea Millefolium.

Flora of New Zealand, p.319.

Naturalized on north and south islands. Flowers during Feb. and March.

---

Ascherson, P. 1899.
Graebner, P.
Achillea Millefolium.

Flora des Nordostdeutschen Flachlandes, ed.2, pp.656,721.

Gives taxonomic description and refers to Plinys 24/95.

Gildemeister, E. 1899.
Hoffmann, F.
Schafgarbenöl.

Die Aetherischen Oele, ed.1, p.881.

Gives data concerning the oil of Achillea Millefolium and states that it was first prepared by Bley in 1828.

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Lyons, A.B. 1900.
Achillea Millefolium L.

Plant Names, Scientific and Popular, p.12.

Gives synonyms in English, German and French. The flowering plant or flowers are used. Stimulant, tonic, vulnerary, astringent, diuretic.

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Barnes, W.D. 1900.
Reppert, F.
Miller, A.A.
Achillea Millefolium L.

Flora of Scott and Muscatine Counties, Iowa, p.233.

Listed: notes rose colored form is infrequent.

---

Chauveaud, G. 1900.
Recherches sur le Mode de Formation des Tubes Cribles dans la Racine des Dicotyledones.

Annales des Sciences Naturelles Botanique, s.8, v.12, p.392.

Notes on the origin of the sieve tubes in Achillea Millefolium L.

---

Harper, R.M. 1900.
Flora of Middle Georgia.

Bulletin of the Torrey Botanical Club, 27, p.329.

Achillea Millefolium found in fields and pastures and along the roads.

Brainard, E. 1900.
Jones, L.R.
Eggleston, W.W.
Achillea Millefolium.

Flora of Vermont, p.83.

Grows wild.

---

Harshberger, J.W. 1900.
An Ecological Study of the New Jersey Strand Flora.

Proceedings of the Academy of Natural Sciences, v.52, pp.653, 660, 670.

Gives ecology for Achillea Millefolium.L.
Grows on marsh dune formations.

---

Ellis, J.B. 1900.
Everhart, B.M.
New Species of Fungi.

Bulletin of the Torrey Botanical Club, 27, p.54.

Phoma erysiphoidea E.& E. found living on the leaves of Achillea Millefolium L.

---

Pound, R. 1900.
Clements, F.E.
Achillea Millefolium.

The phytogeography of Nebraska, ed.2, pp.87, 298, 306, 350.

Widely distributed.

---

Heller, A.A. 1900.
Achillea.

North American Plants north of Mexico, ed.2, p.236.

Lists Achillea Millefolium,-borealis, Californica gigantea, lanulosa, alpicola, ligustica, multiflora and Ptarmica.

Tschirch, A. 1901.
Untermuchung über die Sekrete.

Archiv. der Pharmacie, 239, p.14.

A description of the secreting (ƒ) glands of Achillea Millefolium Linné. No volatile oil was detected in the glands.

---

Engler, A. 1901.
Drude, O.
Beck, G.
Achillea Millefolium L.

Die Vegetation der Erde, v.4, pp.217, 225, 246, 258, 278, 282, 283.

Occurs in the Illyrian district (Servia, Kroatia Montenegro, Albania, etc.)

---

Marquand, E.D. 1901.
Achillea Millefolium.

Flora of Guernsey and the lesser channel islands, pp. 114, 367, 426.

Occurs on Guernsey (a native) Alderney and Sark islands.

---

Engler, A. 1901.
Drude, O.
Graebner, P.
Achillea Millefolium.

Die Vegetation der Erde, v.5, pp. 149, 151, 159, 166, 196, 209, 216, 219, 226, 241, 246, 247, 257, 259, 267 273, 279, 281, 283, 285, 287, 288.

Gives locations in north Germany heath regions.

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Jepson, W.L. 1901.
Achillea Millefolium.

Flora of Western Middle California, p.514.

Gives taxonomic description. Common throughout California. Flowers March-July.

Gattinger, A. 1901.
Achillea Millefolium.

The Flora of Tennessee, p.172.

"Millfoil. Yarrow. Roadsides and pastures. June-November"

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Pease, A.S. 1901.
Achillea Millefolium.

Some Wild Flowers of Andover, Mass., p.6.

"Yarrow, Milfoil. Fields. Flowers 6/6/1895; 5/27/1896; 5/20/1897.

---

Britton, N.L. 1901.
Achillea.

Manual of the Flora of the Northern States and Canada, p.1013.

Gives taxonomic description of 4 species: Ptarmica, borealis, lanulosa and Millefolium.

---

Cook, M.P. 1901.
A list of plants seen on the island of Monhegan, Maine, June 20-25, 1900.

Rhodora, 3, p.189.

Achillea Millefolium occurs as an introduced species on this island, 16 miles from the mainland.

---

Mohr, C. 1901.
Achillea Millefolium.

Contributions from the U.S. National Herbarium, v.6, Plant Life of Alabama, p.812.

Occurs in Alabama; also northern hemisphere. Labrador to Alaska, south to Gulf, Florida, to Texas and California.

Britton, N.L. 1901.
Rydberg, P.A.
An enumeration of the flowering plants collected by R.S. Williams and J.B. Tarleton.

Bulletin of the New York Botanical Gardens, 2, p.185.

Achillea lanulosa was collected in the Yukon Valley, in 1899, at Dawson, and above Fort Selkirk.

---

Copeland, E.B. 1902.
The Mechanism of Stomata.

Annals of Botany, v.16, p.342.

The stomata of Achillea Millefolium L. were studied.

---

Harshberger, J.W. 1902.
Additional Observations of the Strand Flora of New Jersey.

Proceedings of the Academy of Natural Sciences, v.54, p.664.

Achillea Millefolium was taken at Absecon Beach near Atlantic City on made land.

---

DeHalacsy, E. 1902.
Achillea Millefolium.

Conspectus Florae Graecae, v.2, p.47.

The Achillea Millefolium variety setacea Koch and the Achillea Millefolium of E. Formanek are probably the Achillea setacea. (W. et K.)

---

Wall. C. 1902.
Achillea.

Notes on Pharmacognosy, p.93.

Gives description, constituents and uses of this plant.

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Chesnut, V.K. 1902.
Achillea Millefolium L.

Plants used by the Indians of Mendocino County, California, Contributions from the U.S. National Herbarium, v.7, No.3, p.391; 401.

"Nun-alt'-mil" A tea made of the leaves is used for consumption, respiratory troubles,

Graebner, P. 1902.
Achillea Millefolium.

Lehrbuch der Ökologischen Pflanzengeographie, pp.78, 221, 336, 346.

Found in oak woods, pastures; varies in different fields; forms a rosette mat in mountainous habitats.

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Mathews, F.S. 1902.
Achillea Millefolium.

Field Book of American Wild Flowers, p.514.

Gives description.

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Aubert, A.B. 1902.
A Preliminary Note on the Oil of Milfoil.

Journal of the American Chemical Society, 24, pp. 778-780; 691. (Yrbk.Br.Pharm.Conf.,40, p.22; Chem. Zentralblatt,73, p.593; ibid.,p.798; Jahresbericht u.d. Fortschritte d.Chemie,(1902),p.955; ibid.1576; Chem.Soc.Journ., 82, p.810; Berichte.v.Schimmel & Co., (1902),pt.2,p.81).

Gives chemical and physical constants; terpenes believed to be present.

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Small, J.K. 1903.
Achillea Millefolium.

Flora of the Southeastern United States, p.1297.

Gives taxonomic description.

---

Schimper, A.F. 1903.
Achillea.

Plant Geography, pp.104-106.

Achillea Millefolium was found to be growing on slate and limestone soil.

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Howell, T. 1903.
Achillea Millefolium L.

Flora of Northwest America, v.1, p.361-362.

Gives taxonomic description. Common from Alaska to California, and across the continent. Perhaps several species-very variable.

Britton, W.E. 1903.
Vegetation of North Haven Sands.

Bulletin of the Torrey Botanical Club, 30, pp.585,615.

Achillea Millefolium collected in the Quinnipiac River Valley on a narrow sandy plain.

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Millspaugh, C.F. 1904.
Chase, A.
Plantae Yucatanae.

Field Columbian Museum Publication 92, botanical series, v.3, No.2, p.145.

Achillea Millefolium L. was found in this region. Gives description, habitat and illustration.

---

Henkel, A. 1904.
Weeds Used In Medicine.

U.S. Dept. of Agriculture, Farmers Bulletin, No.188, pp.35,36.

Gives synonyms, habitat, description, part used, import notes and prices.
Eaten by cows, it imparts a bitter taste to dairy products. Price 2-5¢ per lb.

---

Abrams, LeRoy, 1904.
Achillea.

Flora of Los Angeles and Vicinity, p.435.

Gives taxonomic description of Achillea lanulosa Nutt. only. Rather common in pine belt of San Gabriel and San Bernardino Mountains.

---

Warming, E. 1904.
Achillea.

Handbook of Systematic Botany, pp.568,570,572.

The style of Achillea Millefolium L. divides at the apex into two branches, both of which generally bear on the inner surface 2 lines of stigmatic papillae. Gives illustration. Chaff-like bracts occur on the receptacle.

Harshberger, J.W. 1904.
A phyto-geographic sketch of extreme south-eastern Pennsylvania.

Bulletin of the Torrey Botanical Club, 31, pp.152,156.

Achillea Millefolium L. inhabited the meadows and roadsides.

---

Fawcett, N.S. 1904.
Variation in Ray Flowers of Anthemis cotula and other Composites.

Proceedings of the Iowa Academy of Sciences, v.12, pp.55-69.

A study of variation in ray flowers, including Achillea Millefolium L.
No. of Rays per Head.

| 2 | 3 | 4 | 5 | 6 | 7 | total |
|---|---|---|---|---|---|---|
| 1 | 33 | 261 | | 82 | 2 | 1164 |
| | | | 785 | | | |

The ray flowers of plants found in the Bitter Root Mts. of Montana are much larger and purer white in color than those of Iowa.

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Muret-Sanders 1905.
Garbe.

Encyclopaedic German-English Dictionary, v.1, p.795.

"A sheaf". Gives etymology and meaning.

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Muret-Sanders. 1905.
Schaf-garbe.

Encyclopaedic German-English Dictionary, v.2, p.1716.

Schaf-, a breed of sheep.
Schaf-garbe, (common) milfoil, tansy; nose bleed, yarrow, sanguinary, Achillea Millefolium.

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Sarton, A. 1905.
.Recherches experimentales dur l'anatomie des plantes affines.

Annales des Sciences Naturelles Botanique, s.9, v.2, pp.94-95.

Achillea Millefolium L., or white, rose or red varieties of the same station (Bordeaux) did not vary histologically, but from different stations did vary, which is attributed to temperatures and humidity differences.

---

Czapek, F. 1905.
Achilleasaure.

Biochemie der Pflanzen, v.2, p.439.

It is the same as aconitic acid:
$COOH-CH=C(COOH)CH_2-COOH$.

---

Gilg, E. 1905.
Herba Millefolii.

Lehrbuch der Pharmakognosie, pp.330-331.

Gives description and illustration of herb and tops.

---

Blankenship, J.W. 1905.
Native Economic Plants of Montana.

Bulletin of the Montana Agricultural Experimental Station, 56, pp.5, 36.

Gives medicinal uses.

---

Avebury, J.B. 1905.
Achillea Millefolium L.

British Flowering Plants, p.240.

Gives taxonomic description.

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Selby, A.D. 1906.
A Second Ohio Weed Manual.

Bulletin of the Ohio Agricultural Experiment Station, No. 175, pl.4, p.370.

Gives illustration and description of Achillea Millefolium L.

Henshaw, J.W. 1906.
Yarrow.

Mountain Wild Flowers of Canada, p.74.

Achillea lanulosa. Milfoil. Describes this species.

---

Tieghem, Ph.van 1906.
Sur la dyssymetrie des folioles laterales dans les feuilles composee.

Annales des Sciences Naturelles Bbtanique, s.9, v.4, p.215.

Gives the morphology of Achillea.

---

Cheeseman, T.F. 1906.
Achillea Millefolium.

New Zealand Flora, p.1076.

Occurs in fields and roadsides; not uncommen; on the north and south islands.

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Dauphne, A. 1906.
Recherches sur les variations de la structure des rhizomes.

Annales des Sciencew Naturelles Botanique, s.9, v.3, pp.352-355.

Achillea Millefolium L. rhizomes were histologically studied. Gives 2 morphological sketches, fig. 30 & 31.

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Piper, C.V. 1906.
Achillea Millefolium lanulosa.

Flora of the State of Washington: Contributions from the United States Herbarium, v.11, p.56.

This occurs throughout a wide altitudinal range. Gives references and habitats

Rydberg, P.A. 1906.
Achillea.

Flora of Colorado, p.382.

Lists stations for Achillea lanulosa Nutt. and Achillea alpicola Rydb.

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Felter, H.W. 1906.
Achillea.

Eclectic Medical Journal, 66, p.540.

Gives therapeutic properties.

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Felter, H.W. 1906
Achillea Millefolium.

Eclectic Medical Journal, 66, p.585.

Gives case histories of the use of this for female troubles.

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Laubert, R. 1906.
Ambrosia artemisiaefolia Linne', ein interessantes eingewandertes Unkraut.

Landwirtschaftliche Jahrbucher, 35, p.735. (Iowa Geol.Surv.Bull., No.4, p.698)

Achillea Millefolium L. was found in the same habitat as Ambrosia artemisiaefolia.

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Clark, G.H. 1906.
Fletcher, J.
Achillea Millefolium. L.

Farm Weeds of Canada, p.54, pl.36, fig.61.

Describes this as a weed and pictures the seeds.

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Semmler, F.W. 1906.
Achillea Millefolium L.

Die ätherischen Öle, v.1, pp.367, 759, 841; v.2, p.590; v.3, pp.265, 791; v.4, p.406.

Data and references are given for the volatile oil.

Greene, W. 1907.
Achillea L.

Plants of Iowa, p.233.

"Achillea Millefolium L., Yarrow, in dry open places; a common weed."
Achillea Lanulosa also present; infrequent.

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Lewis, C.T. 1907.
Short, C.
Millefolium.

New Latin Dictionary, p.1144.

Gives other spellings for this and references to Pliny.

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Britten, J. 1907.
Rendle, A.B.
Achillea Millefolium L.

British Seeds Plants and Ferns, p.16.

This is exhibited in the Dept. of Botany of the British Museum.

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Brockmann, J. 1907.
Achillea Millefolium.

Die Flora des Puschlav, p.221.

Grows up to 2400 meters altitude.

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Sievers, A. 1907.
Oils from Milfoil.

Pharmaceutical Review, v.25, pp.215-218. (Yrbk.Br. Pharm.Conf., 45, p.5; Pharm.Zentralhalle, 49, p.823; Chem.Zentralblatt,78, p.909; Jahresbericht u.d. Fortschritte, d.Chemie, (1905-1908), p.3063; Bericht v.Schimmel & Co.,(1907), Oct., p.88)

A report of a chemical investigation of this oil, with table showing percentage yield and some physical constants of oils of various species of Achillea.

Engler, A
Drude, O.
Pax, F.
1909.

Achillea Millefolium L.

Die Vegetation der Erde, v.10, pp.59, 72, 165, 207, 224.

Occurs in the Carpathian Mountains, but may be modified in form by the mountain conditions.

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Harper, R.M.
1908.

Some Native Weeds and Their Probable Origin.

Bulletin of the Torrey Botanical Club, 35, p.352.

Achillea Millefolium L; is a native weed in southern New England and western half of Long Island.

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Gray, A.
1908.

Achillea Millefolium. L.

New Manual of Botany, ed.7, p.845.

Common Yarrow, Milfoil; gives description, and habitat.

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Parry, E.J.
1908.

Achillea Millefolium. L.

The Chemistry of Essential Oils and Artificial Perfumes, ed.2, p.328.

Gives data for the oil (volatile).

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Hatton, R.G.
1909.

Yarrow.

The Crafteman's Plant Book, p.303.

Gives illustration and description of Achillea Millefolium L.

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Engler, A.
Drude, O.
Adamovic,
1909.

Achillea Millefolium. L.

Die Vegetation der Erde, v.11, pp.119, 182, 244, 329.

Occurs in various regions of the Balkans.

Landegardh, H. 1909.
Uber de reduktionsteibung in den Pollen-mutterzellen einiger Dicotylen Pflanzen.

Svehsk Botanisk Tidskrift, 3, pp.78-124. (Bull.Torrey, Bot.Club, 40, p.590)

Considers meiosis and somatic mitosis in Achillea Millefolium (p.91) with plates, fig. 15-21, 75, 78, 79. Believes chromosome number is 48, but difficult to ascertain.

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Coulter, J.M. 1909.
Nelson, A.
Achillea Millefolium L.

New Manual of Rocky Mountain Botany, p.564.

Gives taxonomic description. Achillea lanulosa Nutt. and Achillea alpicola Rydb. are forms of Achillea Millefolium.

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Brown, S. 1909.
Notes on the Flora of the Bermudas.

Proceedings of the Academy of Natural Sciences, v.61, p.494.

Achillea Millefolium L. was found in grassy woods, south shore woods, Devonshire; also observed in cultivated ground near Hamilton.

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Wünsche, O. 1909.
Achillea Millefolium.

Die Verbreitetsten Pflanzen Deutschlands, ed.5, p.251.

Gives description, habitats and time of flowering.

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Harshberger, J.W. 1909.
The plant formations of the Hockamixon Rocks, Pennsylvania.

Bulletin of the Torrey Botanical Club, 36, p.668,672.

Achillea Millefolium L. inhabited a rock cliff formation- a sheer wall 300 ft. above the base. Considered an invading weed.

Ewart, A.J. 1909.
Achillea Millefolium.

The Weeds, Poison Plants and Naturalised Aliens of Victoria, p.70.

A naturalized weed in Australia.

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Massart, J. 1910.
Botanique de la Belgique.

Recueil Institut Botanique Leo Errera, Bruxelles, v.7, pt.2, pp.144, 187, 234; pl. 121, 272.

Gives habitat and illustrations for Achillea Millefolium L.

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Pammel, L.H. 1910.
Achillea Millefolium.

Manual of Poisonous Plants, pt.1, p.140.

A poisonous forage plant.

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Potonie, H. 1910.
Achillea Millefolium.

Illustrierte Flora, v.2, p.328.

Gives an illustration.

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Stevens, G.T. 1910.
Achillea Millefolium.

Illustrated Guide to the Flowering Plants, p.688.

Gives a taxonomic description.

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Rydberg, A. 1910.
Rocky Mountain Flora.

Bulletin of the Torrey Botanical Club, 37, p.455.

Discusses confusion concerning the species Achillea Millefolium L. Gives habitat. It is less villous and has shorter hairs than other species. Describes the plant.

Leimbach, R. 1910.
Schafgarbenöl.

Die ätherischen Öle, p.312.

Gives data for the volatile oil of Achillea Millefolium L.

---

Henkel, A. 1911.
American Medicinal Leaves and Herbs.

Bulletin of the U.S. Dept. of Agriculture, Bureau of Plant Industry, No. 219, p.39. (Bericht.v.Schimmel & Co., (1912), April, p.145)

Gives synonyms, habitat, description, collection, prices and uses, with an illustration.

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Pammel, L.H. 1911.
Achillea Millefolium.

Manual of Poisonous Plant, pt.2, pp. 756, 786, 787.

A poisonous common weed, whose toxic action is said to be due to the alkaloid achillein.

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Stone, W. 1911.
Achillea Millefolium.

Annual Report of the New Jersey State Museum, for 1910, p.730.

Occurs in southern New Jersey.

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Ifel, L.H. 1911.
Boericke, F.A.
Millefolium.

American Homoeopathic Pharmacopoeia, ed.9, p.319.

Gives synonyms, description, and directions for preparing the tincture.

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Flynn, N.F. 1911.
Achillea Millefolium L.

Flora of Burlington, Vermont, p.85.

Gives synonyms, habitat, and flowering time.

Shimek, B. 1911.
The Praires.

Bulletin of the State University of Iowa, Nat.Hist.,6,p.174.

Achillea Millefolium L. is common on the praires and occurs in these areas: rolling, flat, ridges, praire openings, alluvial and sand dunes.

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Harshberger, J.W. 1911.
Achillea Millefolium L.

Phytogeographic Survey of NorthAmerica, pp.379; 527 564,570, 571.

Occurs: small islands off New England coast. praires of Nebraska; mountain meadows; subalpine and alpine formations of the higher Sierras of the Great Basin.

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Wijk, H.L.G. van 1911.
Achillea Millefolium L.

A Dictionary of Plant Names, v.1, pp.16-17.

Gives synonyms in English, French, German and Dutch languages, with references.

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Beal, W.J. 1911.
Michigan Weeds.

Michigan Agricultural College Experiment Station Bulletin, No. 267, p.414

Illustration and short description of Achillea Millefolium L.

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Joxe, A. 1912.
Sur l Ouverture des fruits indehiscents a la germination.

Annales des Sciences Naturelles Botanique, s.9, v.15 p.295.

Gives description of the fruit.

Gilmore, M.R. 1912.
Uses of Plants by the Indians of the Missouri River Region.

Annual Report of the Bureau of American Ethnology, 33, p.134.

Used by the Winnebago Indians tonbathe swelling, & for earache.
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Bergman, H.F. 1912.
(Achillea Millefolium.)

Flora of North Dakota, p.302.

Does not list this species, but states that Achillea lanulosa and Achillea multiflora have been reported.

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Dalla Torre, K.W. 1912.
Sarnthein, L.G.
Achillea sordida (Koch).

Flora der Gefursteten Grafschaft Tirol, v.6, pt.3 p.529 (Ind.Kew., Suppl. 5, p.3)

Kew considers this the Achillea Millefolium var. sordida Koch.

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Pammel, L.H. 1913.
Achillea Millefolium L.

Iowa Geological Survey Bulletin No.4, pp.358, 359, 360, 491, 674, 698, 720, 736, 740, 741, 778, 787.

Gives description, illustration, state distribution, and other data.

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Malzew, A. 1912.
Die Unkräuter im Wintergetreide im Herbst.

Trudy po prikladnoi botanike i shkoktsii, v.5, pp.165-172.

Gives habitat, form of growth, and illustration of Achillea Millefolium L.

Shimek, B. 1913.
An artificial praire.

Bulletin of the State University of Iowa, Nat.Hist., 6, p.39.

Achillea Millefolium L. inhabited a praire habitat previously cleared from a forest, near Homestead, Iowa.

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Moss. C.E. 1913.
Achillea Millefolium.

Vegetation of the Peak District, pp.130,181,203,208.

Gives habitats in the southern Pennines of England.

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Britton, N.L. 1913.
Brown, A.
Achillea.

Illustrated Flora, ed.2, v.3, p.515.

Gives taxonomic description of 4 species, including Achillea Millefolium L.

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Clements, F.E. 1913.
Achillea Millefolium.

Spring Flowers of Minnesota, ed.3, p.38.

Listed.

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Simpson, N.D. 1913.
The Plants of North west Mongolia and Chinese Dzungaria.

Journal of the Linnean Society of Botany, 41, p.423.

Gives habitats for Achillea Millefolium L.

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Druce, G.C. 1913.
Notes on Nomenclature.

Reports of the Botanical Exchange Club of the British Isles, v.3, pp.434, 439. (Ind.Kew., Suppl. 5, p.211)

Ptarmica and Millefolium are considered by Kew to be the same as Achillea.

Gleason, H.A. 1914.
McFarland, F.T.
Introduced vegetation in the vicinity of Douglas Lake, Michigan.

Bulletin of the Torrey Botanical Club, 41, pp.512, 514, 517, 519, 520.

Achillea Millefolium L. considered as probably introduced, and is found around settlements.

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Clements, F.E. 1914.
Clements, E.S.
Achillea Millefolium L.

Rocky Mountain Flowers, p.251.

Gives taxonomic description.

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(Ostermaier, J.) 1914.
Achillea Millefolium.

Gehe & Co., Arzneipflanzen Karten, f.6.

Gives colored illustration.

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Vestal, A.G. 1914.
A black-soil prairie station in northeastern Illinois.

Bulletin of the Torrey Botanical Club, 41, pp.355,358.

Achillea Millefolium listed as a xerophytic plant; and as a mesophytic plant.

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Frye, T.C. 1914.
Rigg, G.B.
Achillea millefolium.

Elementary Flora of the Northwest, p.230.

Occurs.

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Youngken, H.W. 1914.
Achillea.

Pharmaceutical Botany, p.91.

Achillea Millefolium L. leaves and flowering tops are mentioned.

Holme, T. 1914.
Achillea Millefolium L.

Merckle Report, 23, pp.142-144.

Gives histology.

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Chitrowo, W. 1914.
Atlas von Samen und Früchten der Feldunkräuter aus Mittelrussland.

Trudy po prikladnoi botanike i selektsii, v.7, pp.181-202.

Gives photographs of the seeds of 211 herbs, including Achillea Millefolium.L.

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Augspurger, L.F. 1915.
The isolation of a blue hydrocarbon from Milfoil Oil.

Science, n.s., v.42, p.100. (Journ.Amer.Chem.Soc., 45, p.718)

A hydrocarbon, $C_{16}H_{18}$, was isolated for the first time from the high boiling fractions of Achillea Millefolium L. Oil.

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Piper, C.V. 1915.
Achillea Millefolium L.

Flora of the Northwest Coast, p.379.

Gives taxonomic description of Achillea Millefolium L. and notes that alpine plants are dwarfed and approach Achillea borealis Bong. of Alaska type. Achillea lanulosa Nutt. apparently absent.

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Bar, J. 1915.
Achillea Millefolium L.

Die Flora des Val Onsernone, p.371.

Gives habitat and height ranges in mountains.

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Levy, E.B. 1915.
Seeds and their identification.

Journal of the New Zealand Department of Agriculture, v.11, p.31.

Gives description and 31 illustrations (10x) of the akenes.

( • ♦ )

Tincture of Yarrow. 1915.

Pharmaceutical Journal, 94, pp.123,264.

A homoeopathic tincture is commercially available.

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Wooton, E.D.
Standley, P.C. 1915.
Achillea.

Flora of New Mexico, Contributions from the U.S. National Herbarium, v.19, p.733.

Records Achillea laxiflora, Achillea lanulosa, Achillea subalpina; Achillea Millefolium is not recorded.

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Rydberg, A. 1916.
Achillea nigrescens.

North American Flora, v.34, pt.3, p.221.(Ind.Kew. Suppl. 6, p.3)

Kew considers this the Achillea Millefolium var. nigrescens, B.Key.

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Rydberg, A. 1916.
Achillea.

North American Flora, v.34, pt.3, pp.219-225.

Gives key and taxonomic descriptions for 24 species, including Achillea Millefolium L., with references.

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Onslow, M.W. 1916.
Achillea.

Anthocyanin Pigments of Plants, pp.43, 85, 155.

Anthocyanin in Achillea is localized in the subepidermal portions of the young leaves. The cultivated and mountainous plants of Achillea Millefolium L. are more pigmented.

Miller, E.R. 1916.
The Chemistry of the Oil of Achillea Millefolium Linné.

Bulletin of the University of Wisconsin, No. 788, pp.341-367. (Chem.Abs.,v.11, p.2135; Journ.Amer.Pharm. Assoc.,14, p.399; ibid. 10, p.252; Yrbk.Amer.Pharm. Assoc.,6,p.337; Yrbk.Br.Pharm.Conf.,55,p.62)

The author isolated l-a-pinene, d-a-pinene, l-limonene, l-borneol, l-camphor,cineol, salicylic acid, formic,acetic,butyric and iso-valeric acids.

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(Eaton, M.E. 1916.
Achillea Millefolium.L.

National Geograph.Magazine, 29, No.6, p.590; ill.p.604.

Describes the plant and gives a colored illustration.

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(Umney, J.C.) 1916.
Achillea Millefolium L.

Perfumery and Essential Oil Record, 7, pp.152-153.

Gives data for the volatile oil.

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Bicknell, E.P. 1916.
Ferns and flowering plants of Nantucket.

Bulletin of the Torrey Botanical Club, 43, p.271.

Achillea Millefolium L. was collected on Nantucket Island.

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Gathercoal, E.N. 1916.
Pharmacopoeial Botanic Drugs of the Twentieth Century.

Journal of the American Pharmaceutical Association, 5, p.288.

Gives recognition in the National Pharmacopoeias.

Gildemeister, E. 1916.
Hoffmann, F.
Schafgarbenöl.

Die Atherischen Öle, ed.2, v.3, p.661.

Gives data concerning the oil, and states that it was obtained first by Bley in 1828.

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Sennen, — 1916
(Achillea geretanica)

Boletin Soc. Arag., v.15, p.235. (Ind.Kew.,Suppl. 6, p.3)

(Original not available)

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Felter, H.W. 1917.
Achillea.

Eclectic Medical Journal, 77, pp.367, 369.

Gives photograph, description and uses of Achillea Millefolium L.

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Long, E. C. 1917.
Achillea Millefolium.

Plants Poisonous to Livestock, p.100.

Imparts a bitter taste and strong odor to dairy products, due to Achilleine.

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Small, J. 1917.
Irritability of the pollen-presentation mechanism in the Compositae.

Annals of Botany, 31, pp.262-268.

Achillea Millefolium, observed in the field, showed lateral movement of the anther tube (after it had opened) when gently touched with a needle. This movement was distinct.

Abrams, Le Roy. 1917.
Achillea.

Flora of Los Angeles and Vicinity, p.397.

Achillea lanulosa Nutt. occurs in southern California.

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Rydberg, P.A. 1917.
Achillea (Vaillant) L.

Flora of the Rocky Mountains, pp.957-959.

Lists 10 species, including Millefolium L., with taxonomic descriptions and key.

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Anselmino, O. 1917.
Der Anbau und das Einsammeln von Arzneipflanzen im Deutschen Reich.

Berichte d. Pharm. Gesellschaft., 27, pp.311, 346.

Discusses the collection of Achillea Millefolium L. in Germany.

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Tschirch, A. 1917.
Herba Millefolii und Oleum Millefolii.

Handbuch der Pharmakognosie, ed.1, v.2, p.992.
(Phasm. Zentralhalle, 67, p.98)

Gives systematic classification of Achillea Millefolium L., synonyms, etymology, description, pathology, chemistry, uses, history, and references.

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Schmalz, H. 1917.
Uber Anbau und das Einsammeln von Arzneikräutern.

Berichte d. Pharm. Gesellschaft, 27, p.277.

Achillea Millefolium L. comes from the Jura Mts.

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Starke, E. 1917.
Die Namen der Arzneimittel.

Pharm. Zentralhalle, 58, p.121.

Considers the possible meanings and etymology of Achillea.

Britton, N.L. 1918.
Achillea Millefolium L.

Flora of Bermuda, p.403.

Gives taxonomic description. Introduced.

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Graebner, P., & Warming, E. 1918.
Achillea Millefolium L.

Lehrbuch d. Ökologischen Pflanzengeographie, pp. 119, 267, 545, 566, 711.

Habitat changes appearances. Rosette growth in xerophytic habitats. More colored in higher altitudes.

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Harper, R.H. 1918.
Plant Population of Michigan.

Bulletin of the Torrey Botanical Club, 45, p.39.

Achillea Millefolium listed.

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Bruntz, L. 1918.
Jaloux, M.
Achillea Millefolium L.

Plantes Officinales, p.218.

Gives recognition in national pharmacopoeias.

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Parry, E.J. 1918.
Oils of Achillea.

The Chemistry of Essential Oils and Artificial Perfumes, ed. 3, v.1, p.282.

The volatile oil of Achillea Millefolium Linne' is included, and for which data is given.

Briquet, J. 1918.
L'Action metabolique de l'obscurite sur le developpement de l' Achillea Millefolium L.

Annuaire du Conservatoire et du Jardin botaniques de Geneve, v.20, pp.295-202.

A study of etiolation, with illustrations of the effect.

---

Small, J. 1919.
Achillea.

The Origin and Development of the Compositae, pp. 55,202,301.

Achillea Millefolium L.: The stamens are irritable to touch. The Mediterranean region seems to be a center of distribution. The gametic number may be 24, the somatic number 48. Achillea by its floral characters and geographical distribution may be considered as the basal genus of the Anthemidinae, but the palaeaceous receptacle is of reversionary nature.

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Heuse, H.D. 19191
Achillea Millefolium L.

N.Y. Legislative Document, 142nd. session, v.53, No.64, pt.3, p.322.

Gives colored illustration and description.

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Engler, A. 1919.
Gilg, A.
Achillea Millefolium L.

Syllabus der Pflanzenfamilien, ed.8, p.349.

Listed.

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Seward, A.C. 1919.
( " " )

Fossil Plants, 4 v.

Achillea Millefolium L. has not been found as a fossil plant.

Marie-Victorien, Fr. des E.C. 19191
(Notes recueillies dans la region du Tamiscamingue)

Naturaliste Canadien, 45, pp.163-169. (Bot.Abstr.,3, p.242.)

(Original not obtainable)

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Hitchcock, A.S. 1919.
Standley, P.C.
Achillea Millefolium L.

Flora of the District of Columbia, Contributions from the U.S. National Herbarium v.21, p.290.

Gives taxonomic description.

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Nichols, G.E. 1920.
The Vegetation of Connecticut.

Bulletin of the Torrey Botanical Club, 47, p.109.

Achillea Millefolium L.was found to inhabit the rocky sea bluffs.

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Bohn, W. 1920.
Schafgarbe.

Die Heilwerte heimischer Pflanzen, ed.3, p.66.

The author gives habitat, description and uses.

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Wright, L.L. 1920.

A Study of the Borneol obtained from the volatile oil of Achillea Millefolium Linne'. University of Wisconsin Thesis.

The borneol was oxidized to camphor and the camphor oxime prepared; gives references.

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Georgia, A. 1920.
Yarrow.

Manual of Weeds, p.486.

Achillea Millefolium L. listed, with illustration.

Pellett, F.C. 1920.
Achillea borealis.

American Honey Plants, p.15.

Alaska bees obtain nectar from Wild Tansy.

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Brenchley, W.E. 1920.
Achillea Millefolium.L.

Weeds of Farm Land, pp. 17, 28, 115, 128, 151, 179, 182, 188, 206.

Gives an account of its weed relationships.

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Merriman, M.L. 1921.
The receptacle of Achillea Millefolium L.

Torreya, 21, pp.21-24.(Bot.Abst. 9, p.51; Hegi, Ill.Flora Mitt.Europ., v.6, pt.2, p.573)

A report on the study of this portion of the plant. Heads with flat receptacles bore an average of 12 flowers per head, and the conical heads from 23 to 27. Elongation of the receptacle resulted in an increase of perfect flowers. Gives diagrams.

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Wiesner, J. 1921.
Achillea Millefolium L.

Die Rohstoffe des Pflanzenreiches, ed.3, v.3, p.608.

Refers to volatile oil, with references.

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Potonie, H. 1921.
( " " )

Lehrbuch der Palaeobotanik,

Achillea Millefolium L. has not been found as a fossil.

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Fearn, J. 1921.
Achillea.

Eclectic Medical Journal, 81, pp.76-77.

Gives synonyms, history, uses and dose.

Prantz. H. 1921.
Achillea Millefolium L.

The Vegetation of the Siberian-Mongolian Frontiers, p.419.

Gives habitats and references.

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Standley, P.C. 1921.
Flora of Glacier National Park, Montana.

Contributions from the United States National Herbarium, v.22, p.5, 432.

Lists Achillea lanulosa Nutt.

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( --- ) 1921.
Yarrow.

Pharmaceutical Journal, 107, p.513.

Gives properties and uses.

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Marzell, H. 1921
Achillea Millefolium L.

Neues illustriertes Krauterbuch, pp.247, 557, 566, 611.

Gives pharmacognostical notes and illustration.

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Engler, A. 1921.
Drude, O.
Cockayne, L.
Achillea Millefolium L.

Die Vegetation der Erde, v.14, pp.282, 288.

Introduced into New Zealand, where it survived on the steppe in spite of stock and fires.

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Kremers, E.E. 1921.
The Chemistry of the Volatile Oil of Milfoil.

Journal of the American Pharmaceutical Association, v.10, pp.252-261. (Journ.Amer.Pharm.Assoc., 14, p.399; Yrbk.Br.Pharm.Conf.,58,p.48; Chem.Abs.,16,p.791; ChemZentralblatt,93,p.764; ChemSoc.Journ.,122, p.505; Bericht.von Schimmel & Co., (1922), p.58)

The author reviews his investigations of this oil, confirms Miller's work, and reports the additional isolation of : formaldehyde, methyl and ethyl alcohols, acetone, furfural, eugenol, pinene, thujone, caryophyllene and azulene.

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Hoffmann, R. 1922.
Achillea Millefolium L.

Flora of Berkshire County, Mass., p.334.

Lists.

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Babington, C.C. 1922.
Achillea Millefolium L.

Manual of British Botany, ed.10, p.206.

Gives taxonomic description.

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Ballean, V. 1922.
The Classic Yarrow.

The American Botanist, 28, pp.52-55.

Gives popular account of yarrow.

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Rydberg, P.A. 1922.
Achillea.

Flora of the Rocky Mountains, p.957.

Gives a taxonomic description of 10 Achilleas including Millefolium L., and habitats.

Marzell, H. 1922.
Achillea Millefolium L.

Unsere Heilpflanzen, pp.208-212.

Describes the plant, and cites references, with an illustration from Fuchs.

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Rosenthaler, L. 1922.
Zur Prüfung der Treubschen Hypothese.

Biochem. Zeitschrift, 134, pp.215-224. (Brit.Chem. Abstracts, 1a, (1926), p.210)

Achillea Millefolium L. showed strong positive tests for: rhodan reaction, iodine and phenolphthalein tests. Nine hundred grams of the blooming plant were used, (among other plants) to test Treub's theory that HCN is the first product in nitrogen assimilation. There was found 0.003 gm/ 100 HCN in the distillate; also $\phi$-CHO (benzaldehyde).

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Greibel, C. 1922.
Die Zusammensetzung von Menstruationspulvern und ähnlichen Präparaten.

Zeitschrift für Untersuchung der Nahrungs- und Genussmittel, 43, pp.361-368. (Chem. Abs., 16, p.3728)

Achillea Millefolium L. was found to be present in menstruation powders and is detected microscopically by the presence of the hairs (gives sketch), pollen grains, and involucral (bracts) leaves.

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Meyer, T. 1922.
Achillea Millefolium L.

Arzneipflanzenkultur und Krauterhandel, ed.4, p185.

Gives description, habitat, constituents and uses.

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Millspaugh, C.F. 1923.
Achillea.

Flora of Santa Catalina Island, Field Museum of Nat.Hist., botanical series, v.5, p.273.

Describes the Achillea lanulosa Nutt., and gives reference.

Kremers, R.E. 1923.
Experiments on Azulene.

Journal of the American Chemical Society, 45, pp.717-723. (Helv.Chim.Acta,9,p.119)

Azulene is a constituent of the volatile oil of Achillea Millefolium L. Data is given for the boiling point, density, absorption spectrum, and for the reduction and oxidation reactions. It is an unsaturated bicyklic compound-further structure is unknown.

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( - - ) 1923.
Identification of Ekantiment.

Chemist and Druggist, 99, p.428.

Identification of a reputedly poisonous plant shows it to be Achillea Millefolium L. An account of the history and uses of the drug is given.

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Murray, J.A.H. 1923.
Yarrow.

A New English Dictionary, v.10, pt.2, sect.2,p.20.

It is uncertain etymology. Gives references to use since A.D. 725.

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Krayser, H. 1923.
Yarrow.

Chemist and Druggist, 99, p.451. (Yrbk.Amer.Pharm. Assoc., 12, p.11; Yrbk.Amer.Pharm.Assoc.,12, p.11)

The author reviews historical instances and etymology of this plant, and suggests this word may have come from Teutonic languages.

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Trail, J.W.H. 1923.
Achillea Millefolium L.

Flora of the City Parish of Aberdeen, p.193.

Gives habitat, synonyms, and notes it is too common on links, pastures etc.

Murakoshi, M. (1923 ?)
Achillea Millefolium L.

Flora of Japan, p.175.

Gives an illustration and an account of, in the Japanese language.

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Parson, F.T. 1924.
Achillea Millefolium L.

How to know the Wild Flowers, p.90.

Gives description and popular uses.

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Rigg, G.B. 1924.
Achillea Millefolium L.

The Pharmacists' Botany, p.172.

Leaves and inflorescence are an unofficial drug.

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Engler, A. 1924.
Achillea Millefolium L.

Syllabus der Pflanzenfamilien, ed.10, p.371.

Listed.

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Fitch, W.H. 1924.
Smith, W.G.
Achillea Millefolium L.

Illustrations of the British Flora, p.133.

Illustration, No. 533, of the plant and flowers.

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Bentham, G. 1924.
Hooker, J.D.
Achillea Millefolium L.

The British Flora, ed.7, p.249.

Gives taxonomic description.

Bailey, L.H. 1924.
Achillea Millefolium L.

Manual of Cultivated Plant, p.754.

Gives a taxonomic description.

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(Showalter, W.J.) 1924.
Common Yarrow.

The Book of Wild Flowers, pp.52,68.

Gives a popular account of Achillea Millefolium L., with a colored illustration.

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Youngken H.W. 1925.
The Drugs of the North American Indian.

American Journal of Pharmacy, 97, p.159.

The Menomini tribe of Wisconsin Indians used Achillea Millefolium L. in the form of a hot tea, and as a poultice.

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Jepson, W.L. 1925.
Achillea.

A Manual of the Flowering Plants of California, p.1136.

Gives taxonomic description of Achillea Millefolium (Linn), var. lanulosa Piper; var. maritima Jepson; var. californica Jepson, and Achillea borealis Bong.

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Tidestrom, I. 1925.
Achillea.

Flora of Utah and Nevada, Contributions from the U.S. National Herbarium, v.25, p.599.

Achillea lanulosa, and Achillea lanulosa alpicola are recorded- Achillea Millefolium not listed.

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Morse, R. 1925.
Palmer, R.
Yarrow.

British Weeds, p.153.

Gives an account of weed relationships of Achillea Millefolium L.

Sobolewskaja, O.J. 1925.
Ueber den Gehalt der aetherischen Oele in duftenden Pflanzen des Sud-Oestlichen Gebietes.

Berichte der Saratower Naturforschergesellschaft (Russia), 1, No. 2-3, p.3-38. (Chem.Zentr. (1927), 1, pp.112-113.

Gives data on the yield of volatile Oil. 0.19-0.44 Per cent; flowers 0.47-63%; leaves 0.51% ; obtained by steam distillation.

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Kroeber, L. 1925.
Extractum Herbae Millefolii fluidum.

Pharm. Zentralhalle, 67, p.98. (Chem.Abs., 20, p.3060)

The extract (hydroalcoholic, 30% EtOH) had a specific gravity of 1.056 @19° C.; weighed (dry residue) 18.6%; and contained 2.80% of ash.

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Rosenthaler, L. 1925.
Uber das Vorkommen eines Blausaure glykosides in Achillea Millefolium L.

Archiv der Pharmazie und Berichte der deutschen Pharmazeutischen Gesellschaft, 263, p.868. (Pharm. Centralhalle 67, p.459; Chem Abs. 20, p.645)

HCN was obtained from Achillea Millefolium L. Considered that a glucoside of benzaldehyde-cyanhydrin present. Other data is submitted.

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Kremers, R.E. 1925.
Oil of Achillea Millefolium L. 1922.

Journal of the American Pharmaceutical Association, 14, pp.399-401. (Pharm Zentralhalle, 66, p.638; ibid. 67, p.98; Zeitschfift f.angewandte Chemie, 40, p.594)

The author shows the following:
(1) "The foregoing investigation revealed that the cultivated milfoil oil obtained in 1922 had a higher density and a greater percentage of borneol than native 1916 and 1919 oils (3), but compared very well with those obtained by Miller in 1924 (2)
(2) The constituents of the oil appeared to be identical with those of the oils previously examined by the writer. Thujone was again the only ketone identified but the failure to isolate it through the bisulphite addition product is puzzling. Fenchone was not found.

(3) The previously observed behavior of azulene toward permanganate oxidation was confirmed, and acetic acid was definitely characterized as a product."

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Finnemore, H. 1926.
Oil of Milfoil.

The Essential Oils, p.841.

Gives data and references for the volatile oil of Achillea Millefolium L.

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Rosenthaler, L. 1926.
Beitrage zur Blausaurefrage.

Pharm. Acta Helv. 1, p167,-168. (Chem.Abs. 21, p.183)

Achillea pseudo-pectinata, of Janka Turkey, yielded HCN.

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Livingston, B.E. 1926.
Achillea Millefolium L.

Palladin's Plant Physiology, 3rd. Amer.Ed., p.278.

This plants shows phototropic bending better if placed in weak or diffused light, and not in direct sunlight.

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Mahler, P. 1926.
Zur Wirkung der Bittermittel auf die Magensaftsekretion.

Zeitschrift für die gesamte experimentelle medizin, 51, pp.267-277. (Chem Abs., 21, p.453)

The glucoside from Achillea Millefolium L. caused an increased secretion of gastric juice in healthy individuals when taken by mouth.

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Ruzicka, L. 1926.
Rudolph, E.A.
Zur Kenntnis der Azulene.

Helvetica Chimica Acta, 9, pp.118-140.

Considers the present knowledge of this compound and presents experimental data upon azulene obtained from Achillea Millefolium L.

Kylin. H. 1926.
Über die gelben Chromatophorenfarbstoffe der höheren Pflanzen.

Zeitschrift für physiologische Chemie, 157, pp.148-162. (British Chem. Abs., A (1926), p.1183).

A study of the pigments in Achillea Millefolium L.

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Sanseido, - 1926.
Yarrow.

Concise English-Japanese Dictionary, -.

Gives the Japanese equivalent (no ko gi ri so)

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Milgendorf, F.W. 1926.
Achillea Millefolium L.

Weeds of New Zealand, p.173.

Listed, with an illustration.

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Boros, A. 1926.
Studien über ungarische Drogen.

Heil und Gewürz Pflanzen, 9, p.43 . (Chem.Abs.,20,p.3536)

Adulterations.

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Pepoon,H.S. 1927.
Achillea Millefolium L.

Annotated Flora of the Chicago Area, p.514.

Gives occurrence, with photograph.

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Walter, H. 1927.
Achillea Millefolium L.

Pflanzengeographie Deutschlands, pp.134,402.

Forms a rosette growth at times. Used as a seasoning plant.

Druce, G.C. 1927.
Achillea Millefolium L.

The Flora of Oxfordshire, ed.2,p.230.

Occurs at Oxfordshire, England.

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Tschernuchin, A.M. 1927.
(Essential Oils of Wild Plants of Voronege District).

Transactions of the Scientific Chemical-Pharmaceutical Institute (Moscow), Transactions No.19, pamphlet No.246, of the Scientific Technical Department of the Supreme Council of National Economy of the U.S.S.R., June 1927, pp.228-230. (Chem.Abs., 23, p.2247; Perfumery and Essential Oil Record, 19, p.393)

(Constants for the oil obtained from Achillea Millefolium L. plants gathered in August and September, 1926, at Voronege Agricultural Institute are as follows:
yield 0.15%; Sp.Gr., 0.904; a(D) -24.040; refractive index, 1.4742, ester No., 23.9; ester No. after acetylization, 81.0 )

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Smith, H.I. 1927.
Materia Medica of the Bella Coola and Neighboring Tribes of British Columbia.

Annual Report of the Department of Mines, Canada, p.65.

Achillea Millefolium L. is used by these Indians as vulnerary or the decoction is used against colds, or the leaves may be chewed previous to applying to burns.

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Kroeber, L. 1927.
Ergebnisse der pharmazeutisch-chemischen Untersuchung einiger heimischer Arzneipflanzen.

Heil-und Gewurzpflanzen 10, pp.36-43. (ChemAbs. 21, p.2166)

States that it was mentioned by Dioscorides and Pliny, and gives uses and constituents, of Achillea Millefolium L.

Schaffner, J.N. 1928.
Achillea Millefolium L.

Field Manual of the Flora of Ohio, p.541.

Gives taxonomic description.

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Ruzicka, L. 1928.
Rudolph, E.A.
Über die Sesquiterpenverbindungen des Kamillenöls und des Schafgarbenöls.

Helvetica Chimica Acta, 11.pp.253-261 (Pharm.Central-Halle, 69,p.110; Chem.Abs., 22, p.1587; Chem.Zentral-blatt, 99, p.1863; British Chem.Abs.(1928), A p.298)

A sesquiterpene and a sesquiterpenol was obtained from Achillea Millefolium L. Experimental data is submitted.

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Fölsch, M. 1928.
( - - )

Reichstoffind, 3, pp.181, 197-98, 217-18; 233-34. (Chem.Abs.,24, p.2235; Perfumery and Essential Oil Record, 21, p.430; British Chem.Abs. (B), (1929), p. 797).

(Original is not available).

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Chernukhin, M.A. 1928.
( - - )

Trans.Sci.Chem.Pharm.Inst.,(Moscow),No.19,pp.196-201. (Chem.Zentr.(1928), II, p.2413; Chem.Abs.24, p.206)

(Original is not available)

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Taylor, N. 1928.
Achillea Millefolium L.

Guide to the Wild Flowers, p.276.

Gives description and habitat.

Weisner, J. 1928.
Achillea Millefolium L.

Die Rohstoffe des Pflanzenreichs, ed.4, v.2, p.1801.

Aconitic acid occurs as the potassium salt. Gives references.

---

Falck, A. 1928.
Herba Millefolii.

Die Offizinellen Drogen und ihre Ersatzstoffe, p.197.

Gives recognition in modern pharmacopoeias, together withmassociated nomenclature, and constituents of the oil.

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Engler, A. 1928.
Drude, O.
Cockayne, L.
Achillea Millefolium L.

Die Vegetation der Erde, v.14, p.213.

Introduced into New Zealand, and found on the grasslands.

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Pissel, C. 1929.
Die neue rumänische Pharmakopie.

Pharmazeutische Monatshefte, 10, p.206.

Gives reference in Pharmacopoea Romana (ed.4, p.242) of Achillea Millefolium L.

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Hottes, A.C. 1929.
Achillea.

The Book of Perennials, ed.3, p.58.

Gives description, varieties, uses, culture and propagation of 5 species of Achillea, including Achillea Millefolium L.

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Roberts, E.A. 1929.
Rehmann, E.
Achillea Millefolium L.

American Plants for American Gardens, pp.20,32.

Suggested for open field or juniper associations.

(Merrin, A.C.) 1929
Achillea Millefolium.

Perfumery and Essential Oil Record, 20, pp.328-333.

Gives data for the volatile oil:
Russia: yield 0.80%; sp.gr. 0.904;
optical rotation + 24

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Gans, O. 1929.
Ueber die Dermatitis durch Achillea Millefolium L.

Deutsche medizinische wochenschrift, 55, pp.1213-1214.
(Pharm. zentralhalle, 70, p.797)

Dermatitis was believed to be caused by Achillea Millefolium L. Long contact with fresh or cooked leaves, or an ether extract of the latter will give rise to the condition. The specific substance in the plant is unknown.

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Stapf, O. 1929.
Achillea Millefolium Linné.

Index Londinensis, v.1, pp.43-44.

Gives list of illustrations from 1761 to 1928 inclusive.

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Rubel, E. 1930.
Achillea Millefolium L.

Pflanzengesellschaften der Erde, pp.204, 210, 216.

Gives associations with other plants.

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Wollenweber, H.W. 1930.
Achillea Millefolium.

Unkräuter im Ackerbau der Neuzeit, pp.370-372.

Notes on weed properties.

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Palmer, E.J. 1930.
The Spontaneous Flora of the Arnold Arboretum.

Journal of the Arnold Arboretum, 11, p.117.

Achillea Millefolium L., yarrow, common in meadows and waste ground.

Zocher, H. 1930.
Stiebel, F.
Dunkelfeldmikroskopie dunnster Filme auf Flussigkeitsoberflachen.

Zeitschrift für Physikalische Chemie, 147, pp.401-435.
(Chem.Zentralblatt, 101, p.363)

The oil of milfoil was examined by dark field illumination.

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Gathercoal, E.M. 1930.
Achillea.

Journal of the American Pharmaceutical Association, v.19, p.191.

Gives a monograph for this plant, consisting of synonyms, definition, and description.

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Ohrysler, M.A. 1930.
The origin and development of the vegetation of Sandy Hook.

Bulletin of the Torrey Botanical Club, 57, pp.167, 175.

Achillea Millefolium L. was found in the maple-holly forest of the sand dunes.

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Coburn, H.R. 1930.
Dean, D.L.
The effect of increased activities and change in mode of transportation upon the distribution of introduced species in the vicinity of Douglas Lake, Michigan.

Bulletin of the Torrey Botanical Club, 57, p.341.

Achillea Millefolium L., an introduced plant, was found(1928), thus resistant to factors which removed 7 out of 15 species found at Indian Hut in 1914.

Pammel, L.H. 1930.
King, C.M.
Achillea Millefolium L.

Iowa Geological Survey Bulletin No.7, Honey Plants of Iowa, pp.804,806.

Gives description and habitat of yarrow. "The nectar is secreted by a small body at the base of the style and is easily reached." Gives distribution in Iowa and in the U.S. Notes visits by bees.

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Ridley, H.N. 1930.
Achillea Millefolium L.

The Dispersal of Plants Throughout the World, pp.24, 31, 103, 125, 216, 360, 440, 462.

Dispersed by wind, water, animals, birds. Floats more than a day. Only survivor of drought.

---

Hegi, G. 1931 ?
Achillea.

Illustrierte Flora von Mittel Europa, v.6, pt.2, pp. 569-473.

Gives descriptions and classification. Lists species, including Millefolium.

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Rosendahl, C.O. 1931.
Butters, F.K.
Achillea.

A guide to the spring flowers of Minnesota, p.54.

Gives taxonomic description of Achillea Millefolium L.

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Gildemeister, E. 1931.
Hoffmann, F.
Schafgarbenöl.

Die Ätherischen Öele, ed.3, v.3, pp.980-982.

Gives source (Achillea Millefolium L.)yield, history, properties and composition of the oil.

Rydberg, P.A. 1932.
Achillea Millefolium L.

Flora of the Praires and Plains of Central North America, p.861.

Gives a description of this plant. Newfoundland to Virginia, Colorado to British Columbia. Flowers June to September. Occurs on shores, hillsides and roadsides.

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Smith, H.H. 1932.
Woolly Yarrow.

Ethnobotany of the Ojibwe Indians, Bulletin of the Public Museum, Milwaukee, Wisconsin, v.4, No.3, p.362.

Achillea Ramulosa Rutt. is used for a poultice and for ceremonial smoking, emmenagogue, and for the entire gastro-intestinal tract.

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Smith, H.H. 1932.
Yarrow.

Ethnobotany of the Ojibwe Indians, Bulletin of the Public Museum, Milwaukee, Wisconsin, v.4, No.3, p.362.

Achillea Millefolium L. was used for ceremonial smoking, and for breaking a fever.

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Penick, S.B. & Co., 1932.
Yarrow Herb.

Price List and Manual of Crude Drugs, p.40.

Gives current wholesale price: 7¢ for whole herb; 16¢ for powdered herb, with intermediate prices.

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