TABLE III.—ELIXIR MANDELIC ACID.

Elixir No.	Mandelic Acid Found Gm./100 Cc.	Theoretical Amount Mandelic Acid Gm./100 Cc.	% Theoretical Amount Found.
1	0.2878	0.27	106.5
2	0.2789	0.27	103.2
3	0.2730	0.27	101.1
*4	0.525 (0.25 Gm. mandelic acid added to 3)	0.52	100.9

*0.25 Gram of pure mandelic acid was added to sample No. 4 in order to demonstrate that all of the mandelic acid had been accounted for in the assay.

SUMMARY.

(1) A convenient method is presented for determining mandelic acid in calcium mandelate, monoethanolamine mandelate and elixir of mandelic acid, which involves an ether extraction in acid solution and a direct titration by means of tenth-normal barium hydroxide solution.

(2) The varied application of the method gives promise that it may be of considerable value in estimating the amount of mandelic acid present in other salts of mandelic acid.

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POSSIBILITIES OF SYNONYMY IN GENUS DELPHINIUM.*[1]

BY JOAN COONS AND C. W. BALLARD.[2]

There are many instances of disagreement as to the validity of several species of Delphinium as separate entities and of sub-species and varieties. P. A. Rydburg (1), Britton (2) and Small (3) classed *Delphinium carolinianum* and *Delphinium azureum* as one; while Gray (4) placed a question mark after this classifition. Phillips (5) stated that *Delphinium azureum* was once considered a variety of *carolinianum;* while Leonian (6) said that *carolinianum* was the *azureum* of one botanist and the *virescens* of another, and was probably an analog of *Delphinium azureum* from a different environment.

A similar diversity of opinion exists in regard to *Delphinium virescens*. Rydberg (7) classed *Penardi, virescens* and *albescens* as one; while Davis (8) classed *azureum* and *virescens* as synonyms of *carolinianum*; and Britton (9) stated that *albescens* is confused with *carolinianum*. Gray (4) also stated that *Penardi* has as synonyms both *Delphinium camporum* and *albescens*. Moreover, *Delphinium Nortonianum* is involved in this confusion.

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The attempts of some authors to give distinguishing characters are often refuted by the statements of others. One author (10) said that *albescens* differed from *carolinianum* in the color of the flower and stouter habit; but that its differentiation from *camporum* is not clear as *carolinianum* and *albescens* may have an erect spur, destroying this as a characteristic of *camporum*. An attempt to distinguish *virescens* from *carolinianum* by color of the corolla is open to question, for Perry (11) holds the range of both from white to blue is too broad. Perry also discards stoutness of habit and curvature of spur as distinguishing characteristics and said that it was difficult to establish real differences between *Nortonianum*, *Penardi* and *carolinianum*. Davis (9) classed *carolinianum*, *azureum* and *virescens* as one; while Chapman (12) does not believe that the wider-lobed leaves and larger greenish flowers of *azureum* as contrasted with *virescens*, sufficient to warrant separate specific rank. Mackenzie and Bush (13) hold that *Nortonianum* is most

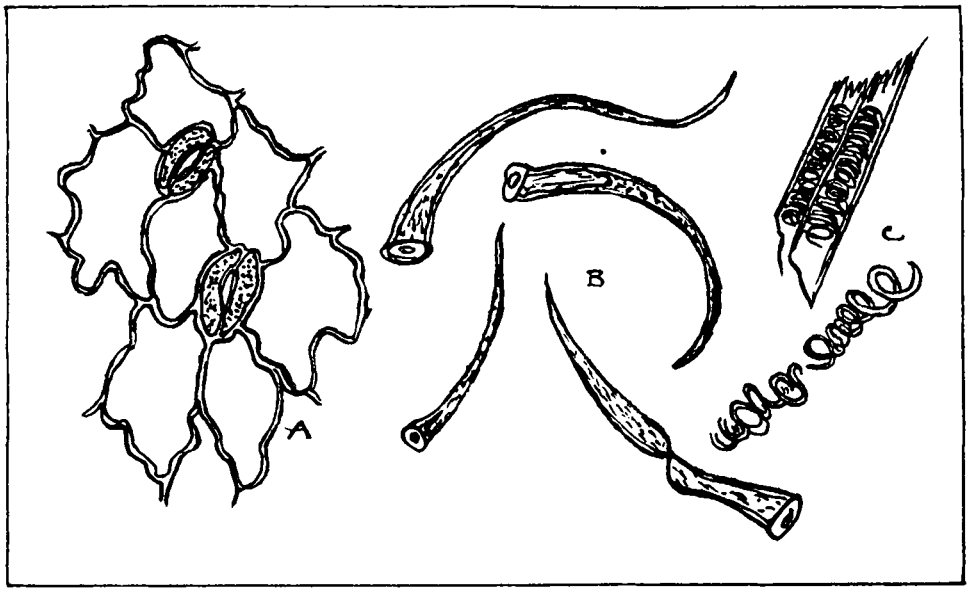

Fig. 1.—(*a*) epidermal cells with stomata; (*b*) trichomes; (*c*) vessels.

closely related to *carolinianum*, but with larger and more strongly rugose squamellate seeds, and more strongly ascending spur; and note that *albescens* is differentiated by deeper blue flowers. This is contradicted by Palmer and Steyermark (14) who state that the characteristics on which *Nortonianum* has been based merge with those of *azureum*, and it therefore should be treated as a variety of the latter.

The attempts to separate species by minor differences are not always satisfactory. The phrase "more or less" adds to the difficulty in that the "more" of one botanist may be the "less" of another. For example, in distinguishing *Delphinium Nortonianum* from *albescens*, Mackenzie and Bush (13) said that the former had deeper blue flowers and more strongly wing-margined seeds than the latter. A survey of the Delphinium specimens of the New York Botanical Gardens shows the typical situation. The folders of *Delphinium virescens* and *albescens* often bore both labels, or other labels, some of which were crossed out and others followed by a question mark. *Delphinium camporum* and *Penardi* were confused

with these; while *azureum* and *carolinianum* were mixed with each of the above as well as with each other.

Due to its inclusiveness, a genus description cannot be as definite as a species description, yet even here the range of variation is frequently broad enough to allow the formation of separate species where one would, perhaps, be better. This is particularly evident in the color range of flowers and the differences in the types of leaves. There are many differences to be found in morphological descriptions of the various species. Take, for example, the following parts of descriptions: flowers, azure blue, varying to white (8), green (16); follicles, oblong erect (8), either erect or spreading (16); spur, erect, horizontal or ascending (15), curved upward (4); sepals, often with brownish spot (8), sky blue or whitish tipped with brown (12); leaf-blades, with linear lobes (8), linear toothed or cleft segments (3), entire acute lobes (12). This serves to show the variability in description and is of importance in that it applies not only to *Delphinium camporum*, but to *Delphiniums albescens, virescens, carolinianum, azureum, Nortonianum* and *Penardi;* through claimed synonymy. Moreover, in cases where the several species are classed separately, the descriptions by one botanist are immediately refuted by the opinions of another. Search of the literature reveals specific examples of such cases, but lack of space prevents their being cited here.

In view of this chaotic situation, it was thought that histological evidence might be of value in species determination. A general microscopic examination was made of the several gross parts of the plant so that it might be determined which of these parts offers the greatest possibilities of histological variation; and it was decided to base the investigation upon variations in histological characters apparent in the leaf, particularly the variations in trichomes.

A preliminary examination of herbarium specimens from the herbaria of Columbia University, College of Pharmacy and the New York Botanical Garden substantiated the several opinions that *Delphinium carolinianum, azureum, virescens, albescens, camporum, Penardi* and *Nortonianum* may in reality be one species. To forestall the possible claim that perhaps all the Delphiniums are alike as to histological structure, several other species of Delphinium (not included in this paper) were examined. It was found that the species discussed above coincide with one another in their histological characteristics and thus constitute a group. Furthermore, it was found that the group characters were different from those of other groups. In the several other groups the various members too are identical with one another, but each group can be distinguished from the others. Correlated with morphological characters, this substantiates the idea that there is no valid basis for establishing the many sub-species noted in the literature, and concerning which there is so much contention.

The possibilities of the particular specimens under observation being exceptions and not typical in the matter of histological structure are minimized by the extensive number examined and their wide range of habitat. Since these characters hold true in plants of a given species from warm sections of the west with low altitudes, from damp eastern parts of the country, and from cold northern places of high altitudes, the factor of climatic conditions may be eliminated in this instance.

The trichomes may be described as slender, slightly curved, non-glandular and unicellular. The walls are of medium thickness and the surface is rough or papil-

lose. The trichome varies from almost colorless to a pale green or greenish shade. These trichomes are important in that they serve as a distinction for the establishing of several groups, the following variations being found: glandular only, non-glandular only, non-glandular and glandular, and each of these may show surface variations as rough or smooth, and finally, in a few species, trichomes are lacking.

A comparatively few exceptions to the foregoing histological structures were noted in the herbarium specimens, but these would seem to be the result of incorrect labeling. Sections were prepared from thirty-nine different specimens of *Delphinium virescens*, including those first labeled *azureum*, *carolinianum* and *albescens*, all of which had been finally relabeled *virescens*. In all but three cases there was a constancy as regards microscopic features, and in the three specimens not conforming to the rule, the presence of glandular hairs places them in one of my other groups.

Since most of the *Delphinium albescens* had been finally relabeled *virescens*, there remained only a few bearing the title *albescens*. Five of six specimens were true to form, the sixth differing in that there were no hairs apparent. Although some of the twenty-two plants labeled *Delphinium azureum* were in the files under the title *carolinianum*, all bore, each on its own sheet, the name *azureum*. In all but one, the histological characters were found to be uniform and to coincide with the general description given for the *Delphinium virescens* group—the one exception having larger and more papillose hairs.

Twenty-one specimens labeled *Delphinium carolinianum* were examined and without exception showed typical and uniform characters. This situation also held true in the cases of *Delphinium Nortonianum* (seven specimens), of *Delphinium Penardi* (ten specimens), and of *Delphinium camporum* (five specimens). The specimens of *camporum* bore a note by R. Martin to the effect that he considered them all to be *Delphinium virescens*.

Since the exceptions were so few, and in most cases bore evidence of several relabelings, it would appear probable that the difference is due rather to incorrect determination on the part of the morphologist than to lack of consistency in structures in a group.

As a result of this investigation there appears justification for considering *Delphinium carolinianum*, *Delphinium azureum*, *Delphinium albescens*, *Delphinium virescens*, *Delphinium camporum*, *Delphinium Penardi* and *Delphinium Nortonianum* as synonyms of one another rather than as separate species. It is realized that this work is far from complete, and is being continued.

It is interesting to note that Robert F. Martin, Junior Botanist of the U. S. Department of Agriculture, is engaged in an investigation of the genus Delphinium coincident with this survey.

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A STUDY OF SOFT SOAP AND SOAPY PREPARATIONS MADE BY A COLD PROCESS.*

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SOFT SOAP LINIMENT.

In 1935 Cox (1) suggested that cottonseed oil be used in place of linseed oil in the preparation of the official soft soap and soft soap liniment. The use of linseed oil soap in the preparation of the liniment was objected to because of the persistent linseed oil odor which remained after its use as a detergent. This odor remains even after the odor of lavender has been removed. Another objection to the U. S. P. X. formula for the liniment was that the preparation contained more alcohol than was necessary.

The following formula was proposed to overcome the objections mentioned above:

Cottonseed oil	305 cc.	Dekanormal Solution of Pot. Hydroxide	65 cc.
Oil of Lavender	20 cc.	Dekanormal Solution of Sod. Hydroxide	32 cc.
Alcohol	200 cc.	Water, a sufficient quantity to make	1000 cc.

Mix the cottonseed oil, oil of lavender, alcohol and the dekanormal solutions. When a clear solution results, add enough water to make the product measure 1000 cc.

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