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A COMPARATIVE STUDY OF MARYLAND SENNAS.*¹

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I. INTRODUCTION.

The Maryland sennas, with the exception of *Cassia Medsgeri*, were studied by botanists as far back as the seventeenth century. At that time, Tournefort (1656-1708) placed them in the tribe *Cassia* and later Linné, in his *Species Plantarum* left this classification unchanged. Willdenow, in his work, also accepted the classification of his predecessors. However, in recent years botanists have questioned this classification and have divided the Maryland sennas into two Groups—*Cassia*, which includes *Cassia Marilandica* and *Cassia Medsgeri*; and *Chamæcrista*, which includes *Cassia nictitans* and *Cassia Chamæcrista*. As a result, various papers have been written for and against the separation of the Maryland sennas but up to the present time, no definite conclusions have been reached.

Most of the work attempting to decide the question has been carried out only upon the flowers and pods. In this paper the leaflets of the Maryland sennas are studied and from their study it appears that results are obtained which will be of value in deciding this question. As the study progressed, it became evident that the leaflets of the Maryland sennas possessed characteristics differing greatly from those of the official senna leaflets and it was decided best to include their study with that of the Maryland sennas.

The leaflets of six sennas, therefore, were studied, the two official sennas, those of *Cassia Senna* and *C. angustifolia*, and those of the four Maryland sennas, namely, *C. Marilandica*, *C. Medsgeri*, *C. nictitans* and *C. Chamæcrista*. The official senna leaflets were obtained from stock while the Maryland sennas were obtained in the vicinity of Baltimore, Md.; *C. Marilandica* being found at Owings Mills, Md., and

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on the Hillen Road; *C. nictitans*, on Gwynn Falls Driveway and in Brooklyn, Md.; while *C. Chamæcrista* was gathered at Garland, Rosedale and Essex, Md. *C. Medsgeri* which is rarely found in the neighborhood of Baltimore was discovered (1) at a point east of Carney, Md.

II. DESCRIPTIVE STUDIES.

a. MACROSCOPIC.

1. *Average Sizes of Leaflets.*—The Maryland senna leaflets were pressed immediately after collecting and within an hour they were measured. The average sizes are as follows: *C. Marilandica*, 42.68 mm. by 15.48 mm., *C. Medsgeri*, 35.15 mm. by 13.25 mm., *C. nictitans*, 8.45 mm. by 2.25 mm. and *C. Chamæcrista*, 10.75 mm. by 3.25 mm.

The official senna leaflets were taken from stock and their average sizes are *C. angustifolia*, 26 mm. by 7.85 mm., *C. Senna*, 22.6 mm. by 8.1 mm.

2. *Venations.*—Examining the venation of the leaflets, it is readily seen that the venation occurring in *Cassia nictitans* and *C. Chamæcrista* differs greatly from that of the four remaining species. In these two sennas the midrib is closer to one margin and consequently it divides the leaflets into two unequal parts, the larger showing the veins more numerous and longer and usually with three veins originating at the petiole. The average leaflet of the official sennas, *C. Marilandica* or *C. Medsgeri*, has the midrib running practically through the center of the leaflet and veins on each side of the midrib similar in size and number. Furthermore, the veins in the leaflets of *C. nictitans* and *C. Chamæcrista* are seen extending very close to the margins without any apparent division into veinlets; whereas the four remaining senna leaflets show the terminal branches of the veinlets anastomosing near the margins. This effect, which is seen more clearly in *C. Marilandica* and *C. Medsgeri*, is also characteristic of the leaflets of the official sennas. This peculiar effect is never found in either *C. nictitans* or *C. Chamæcrista*.

3. *Other Observations.*—(a) *C. Marilandica* and *C. Medsgeri* are perennials; *C. nictitans* and *C. Chamæcrista* are annuals. Their seeds are found germinating during first week of May, about the same time shoots of *C. Marilandica* and *C. Medsgeri* are seen sprouting from underground rootstocks. The official sennas are shrubs.

(b) The Maryland sennas behave rather uniformly also in the fall of the year. About October 1st, they begin to disappear, the annuals dying to the ground and the perennials losing their leaves. Within two or three weeks, they have practically disappeared.

b. MICROSCOPIC.

1. *A Study of the Stomata.*—The epidermis after removal is dehydrated by passing it through, and allowing it to stay from half to one hour in each of the following alcohols—35%, 50%, 70%, 85%, 95% and absolute alcohol in the order given. Before passing the epidermis from 50% to 70% alcohol, the specimen is stained for five minutes in Delafield's hæmatoxylin and then washed in 50% alcohol. From absolute alcohol it is passed into oil of clove where it remains for ten minutes. It is then mounted in Canada balsam.

Study of the Upper Surfaces of the Leaflets.—All the stomata were examined under a magnification of 450 diameters. Figures 1, 2 and 3 show the upper epidermis of *C. Marilandica*, *C. Medsgeri* and *C. nictitans*, respectively. Superficial examination shows them free of stomata, as in the figures; closer study shows, however, that some stomata may be present, thus *C. Marilandica* and *C. Medsgeri* may have stomata occasionally only along the midrib whereas in *C. nictitans*, stomata may be found along the midrib, at the base and apex and near the margins, the number along the midrib increasing from the base to the apex. However, if the epidermis of that portion of the leaflet, a short distance within the margin and from the midrib, is examined, stomata are practically absent.

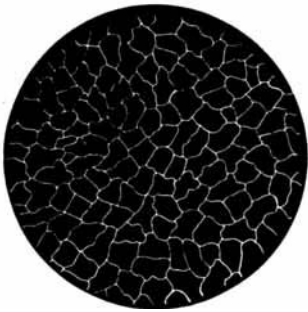


Fig. 1.—*C. Marilandica*—
Upper epidermis.

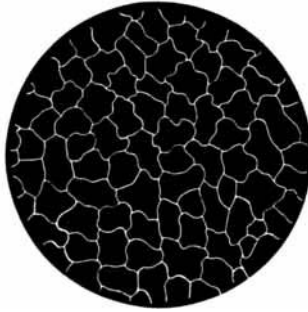


Fig. 2.—*C. Medsgeri*—
Upper epidermis.

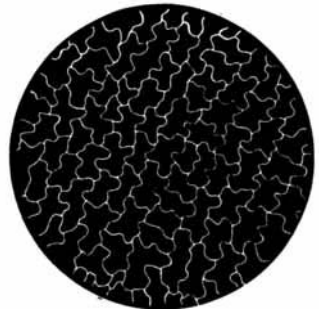


Fig. 3.—*C. nictitans*—
Upper epidermis.

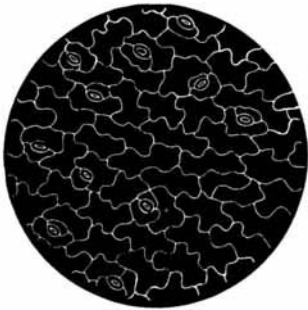


Fig. 4.—*C. Chamæcrista*—
Upper epidermis.

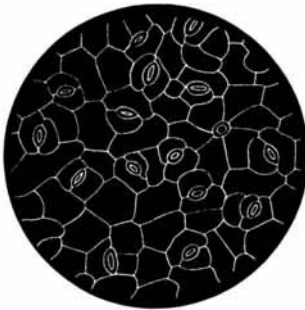


Fig. 5.—*C. Senna*—
Upper epidermis.

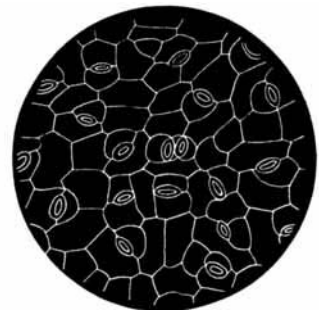


Fig. 6.—*C. angustifolia*—
Upper epidermis.

A study of the upper epidermis of the other three species of *Cassia*, *C. Chamæcrista* (Fig. 4), *C. Senna* (Fig. 5), *C. angustifolia* (Fig. 6), reveals that all three are provided with stomata. In *C. Chamæcrista* they are distributed uniformly, whereas in the remaining two, they are not, there being in each fewer stomata along the margin.

Characteristic of the stomata of the upper epidermis of *C. Senna* and *C. angustifolia* (Fig. 6) is the occasional touching of the guard cells of two adjacent stomata. More frequent is the separation of two stomata only by their neighboring cells. The upper epidermises of the Maryland sennas studied never have the guard cells of two stomata touching. *C. Chamæcrista* frequently shows the neighboring cells separated by one epidermal cell, whereas in *C. nictitans*, the neighboring cells are rarely separated by one epidermal cell but by two or more, usually many.

Study of the Lower Surfaces of the Leaflets.—The stomata on the lower epidermis

of the six sennas examined are more uniformly distributed, although their number may decrease along the margins. Figures 7 to 12, inclusive, show the lower epidermises of the sennas and it is readily seen that the stomata of the official sennas, upon the whole, are the largest. The stomata of *C. nictitans* and *C. Chamæcrista* often are situated not in the center of the two neighboring cells, but pulled toward one neighboring cell, making that cell much smaller than the other. This condition also occurs in the official sennas and in *C. Marilandica* and *C. Medsgeri* but to a lesser degree. However, with *C. nictitans* and *C. Chamæcrista* this is markedly so and aids in their identification. *C. nictitans* has stomata which are smaller than those of *C. Chamæcrista*, there is a greater number per square mm. and the stomata of the former are nearly spherical in outline while those of the latter are elliptical.

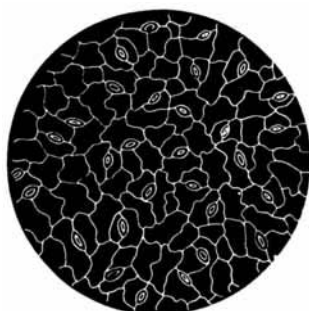


Fig. 7.—*C. Marilandica*—
Lower epidermis.

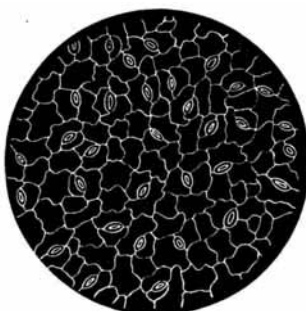


Fig. 8.—*C. Medsgeri*—
Lower epidermis.

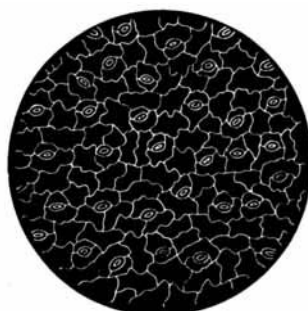


Fig. 9.—*C. nictitans*—
Lower epidermis.

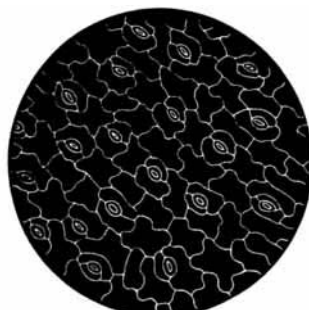


Fig. 10.—*C. Chamæcrista*—
Lower epidermis.



Fig. 11.—*C. Senna*—
Lower epidermis.

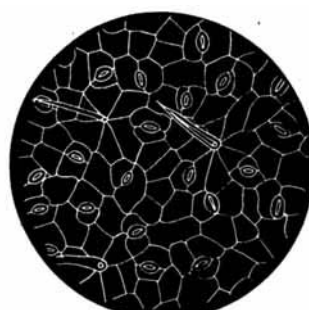


Fig. 12.—*C. angustifolia*—
Lower epidermis.

Table I gives the results of the study of the stomata found on the upper and lower surfaces of the official sennas and of the Maryland sennas.

TABLE I.—STOMATA OF THE OFFICIAL SENNAS AND OF THE MARYLAND SENNAS.

Plant.	Stomata per Sq. Mm., U. E.	Stomata per Sq. Mm., L. E.	Average Size Stomata (Microns), U. E.	Average Size Stomata (Microns), L. E.	Ratio of Shorter Di- ameter to Larger, U. E.	Ratio of Shorter Di- ameter to Larger, L. E.
Alexandria Senna	189.4	215.1	21.73 × 28.68	20.16 × 26.73	0.758 to 1	0.754 to 1
India Senna	203.5	266.4	21.95 × 29.92	18.76 × 26.81	0.73 to 1	0.7 to 1
<i>Cassia Marilandica</i>	...	349.9	.....	22.08 × 28.46	.....	0.776 to 1
<i>Cassia Medsgeri</i>	...	250.5	.....	17.15 × 21.98	.....	0.78 to 1
<i>Cassia Chamæcrista</i>	143	219.7	13.89 × 20.56	16.53 × 23.51	0.68 to 1	0.703 to 1
<i>Cassia nictitans</i>	?	358.0	13.06 × 16.77	14.23 × 19.2	0.78 to 1	0.742 to 1

In the first column for *C. nictitans*, a question mark is placed. Whether this space should be left blank or filled in, depends entirely upon the portion of the leaflet examined. If the upper epidermis is examined close to the margins or along the midrib, and as along these areas, stomata are found, this space should be filled. However, in order to give the approximate average size of the stomata on the upper epidermis, ten were examined and the results were included in Table I.

The table shows (1) the stomata of the upper and lower epidermis of Alexandria Senna are approximately the same size; (2) the stomata on the lower epidermis of India Senna are somewhat smaller than those of the upper epidermis; (3) the difference in the sizes of the stomata of the official sennas could hardly be used as a means of separating them under the microscope; (4) *C. Marilandica* and *C. Medsgeri* have no stomata upon the upper surfaces unless the area near the midrib is examined and there they are found occasionally; (5) with *C. Chamæcrista* stomata are found on both surfaces of the leaflet, the stomata on the upper surface being the smaller; (6) *C. nictitans* has stomata uniformly distributed on the lower epidermis only; (7) the stomata of *C. Chamæcrista* are larger than the stomata of *C. nictitans* and (8) the stomata of the official sennas, upon the whole, are the largest studied.

2. *Neighboring Cells*.—The results of a study of the neighboring cells of the sennas are shown in Table II.

TABLE II.—NEIGHBORING CELLS.

Plant.	No. Stomata Examined.	Stomata (2 N. C.).	Stomata (3 N. C.).	Stomata (4 N. C.).	Stomata (5 N. C.).
<i>Cassia Senna</i>	150	144	6	..	...
<i>C. angustifolia</i>	150	129	17	4	...
<i>C. Marilandica</i>	300	203	65	28	4
<i>C. Medsgeri</i>	315	291	14	7	3
<i>C. Chamæcrista</i>	220 (U. E.)	220	..	..	...
	310 (L. E.)	310	..	..	...
<i>C. nictitans</i>	425	357	62	6	...

This table shows (1) that stomata with two neighboring cells predominate; (2) making use of the possibility of five neighboring cells we can readily divide the above sennas into three groups, the official sennas without five neighboring cells, two Maryland sennas with five neighboring cells and two Maryland sennas without five neighboring cells; (3) furthermore, each of the three main groups may be separated into its two components, thus *C. angustifolia* is readily separated from *C. Senna* as the former exhibits a greater number of stomata with three neighboring cells and it is the only official senna having stomata with four neighboring cells; stomata with three neighboring cells and four neighboring cells occur to a greater degree in *C. Marilandica* than in *C. Medsgeri*; and *C. Chamæcrista* always shows its stomata accompanied by only two neighboring cells while in *C. nictitans* stomata with three and four neighboring cells are present.

3. *Epidermal Cells*.—Attempt was made to separate the sennas by means of a study of their epidermal cells. It was noted that the thickness of the cell wall is of no value as approximately the same thickness of cell wall exists in each senna and that the epidermal cells vary in shape to such an extent as to make the measuring of the cells of no value, nevertheless, the epidermal cells, like the neighboring cells, have characteristics which are of value in separating the sennas into three groups.

Because of the trichomes on the epidermis, the official sennas have certain epidermal cells that are very characteristic. The base of each hair is surrounded by four to nine epidermal cells similar to the spokes of a wheel so that the portion of each cell adjacent to the base of the hair is more narrow than that at the opposite side. Usually, six epidermal cells accompany a hair in each of the official sennas; and with both sennas, variability in the shape of these cells occurs.

The other epidermal cells are of various shapes, but the outline of each is made up of straight lines, or lines that are just slightly curved.

Maryland sennas show hairs to be absent and, as a result, the characteristic epidermal cells that are present in the official sennas, are absent.

The epidermal cells of *C. Medsgeri* and *C. Marilandica* are more undulate on the lower epidermis and are practically the same size as the largest neighboring cell. The epidermal cells of *C. Marilandica* are approximately the same size as those of *C. Medsgeri* but those of *C. Marilandica* tend to be square-like while those of *C. Medsgeri* are very undulate. Now, just as in the case of their neighboring cells, certain ones of *C. Medsgeri* may look like those of *C. Marilandica* and certain ones of *C. Marilandica* look like those of *C. Medsgeri*, so the epidermal cells of *C. Marilandica* may sometimes become undulate while those of *C. Medsgeri* appear square-like; but an examination of the center portion of the leaflets will show the typical cells of each species.

In comparing *C. nictitans* and *C. Chamæcrista*, the former shows the outline of the epidermal cells to be more undulate and its epidermal cells are on an average, slightly larger than the average neighboring cells; while *C. Chamæcrista* exhibits epidermal cells which are much larger than the average neighboring cells. In both cases, the epidermal cells found on the upper epidermis are slightly larger than those on the lower.

4. *Epidermal Hairs*.—On the upper and lower epidermis of *C. Marilandica*, *C. Medsgeri*, *C. Chamæcrista* and *C. nictitans*, hairs are absent whereas with the official sennas, hairs are present on both surfaces. The apices and the midribs of the leaflets of the Maryland sennas also were examined for hairs with the following results. Occasionally hairs are present on the tips of *C. Marilandica* and *C. Medsgeri* leaflets and rarely, also on the midrib; but hairs are not found either on the apices or midribs of leaflets of *C. nictitans* and *C. Chamæcrista*.

The arrangement of the epidermal cells around the hairs of the official sennas is already mentioned. These arrangements were studied and the number of arrangements occurring on each epidermis was counted to ascertain if there was enough variation in them to be of value in identifying the official sennas. As the hairs are more numerous on the lower surface of *C. Senna* leaflets, more arrangements should be found here, and this proved to be true.

For simplicity, each arrangement will be called an epidermal hair apparatus and will be designated by the abbreviation E. H. A. This abbreviation when used will always represent the four to nine epidermal cells which arrange themselves in a circular fashion around the base of any hair. The following table shows the distribution of hairs.

TABLE III.—DISTRIBUTION OF HAIRS.

Plant.	Epidermis Examined.	Av. No. E. H. A. in a Field.	Average Size of Hairs.	Size of Largest Hair.
India Senna	Upper	0.06	105.0 microns long	188.4 microns long
	Lower	1.83	13.9 microns in dia.	19.3 microns in dia.
Alex. Senna	Upper	1.72	114.0 microns long	216.0 microns long
	Lower	12.10	12.5 microns in dia.	16.6 microns in dia.

NOTE: In each case, 50 fields were examined.

From the results obtained, it is readily seen that, by means of the E. H. A.'s the upper epidermis of *C. angustifolia* can be distinguished from that of *C. Senna* and the same holds especially true for the lower surfaces of these two official sennas. But it would be more difficult to distinguish the upper epidermis of *C. Senna* from the lower of *C. angustifolia*, the average of the E. H. A.'s of the former being 1.72 and of the latter 1.83. Here the E. H. A.'s are of no help and another method for their separation must be applied. Under the heading of neighboring cells, it was concluded that stomata with three neighboring cells are found more often in *C. angustifolia* and stomata with four are rarely found in *C. Senna*. If this method is applied, the upper epidermis of *C. angustifolia* is recognized as it shows stomata with three neighboring cells to be present more often and occasionally a stoma with four, the absence of which would determine the lower epidermis of *C. Senna*.

Hairs are found along the midrib, upon both epidermal surfaces of *C. angustifolia*, being more numerous upon the lower surface. Upon both surfaces the number of hairs increase as one passes from apex to the base of the leaflet. The distribution of hairs on *C. Senna* is the same as on *C. angustifolia*, except that they are far more numerous, exceeding the number found there, vastly.

The apices of one hundred leaflets of each of the two official sennas were examined. *C. Senna* usually shows hairs present, the number varying from one to many; occasionally, however, an apex without a single hair is observed. *C. angustifolia* usually shows apices without hairs, but occasionally an apex with hairs is noted.

5. *Margins*.—The margins of the senna leaflets were studied and the sennas with similar margins were grouped together, three groups being formed; the official sennas, *C. angustifolia* and *C. Senna* form one, *C. Marilandica* and *C. Medsgeri* another and *C. nictitans* and *C. Chamæcrista* the third, the following table making this clear.

TABLE IV.—COMPARISON OF MARGINS.

Plants.	Size of Largest Hair.	Remarks.
Alex. Senna	.....	The larger hairs appear on margins of India Senna.
India Senna	52.25 microns long 23.5 microns in dia.	In both sennas, hairs are usually found with long diameters almost parallel to the margin and their tips pointing toward the apex. Hairs are found at very irregular intervals.
<i>C. Marilandica</i>	933 microns long 24 microns in dia.	The margins of these leaflets show large hairs. <i>C. Medsgeri</i> usually exhibits hairs parallel to the margin and tips of hairs touching the margin. With <i>C. Marilandica</i> , hairs usually occur almost perpendicular to the margin.
<i>C. Medsgeri</i>	587 microns long 27 microns in dia.	
<i>C. Chamæcrista</i>	Hairs are absent Serrated margins	In <i>C. Chamæcrista</i> the serrations extend from the base to the apex on both margins. <i>C. nictitans</i> shows one margin completely serrated and the other serrated about $\frac{1}{6}$ of the distance from the base to the apex.
<i>C. nictitans</i>	Hairs are absent Serrated margins	

To summarize, the official sennas have margins of leaflets almost free of hairs, only occasionally is a small hair found; the margins of leaflets of *C. Medsgeri* and *C. Marilandica* have large hairs; and the margins of the leaflets of *C. Chamæcrista*

and *C. nictitans* are more or less serrated, those of the former being serrated along both margins, whereas in *C. nictitans*, one margin alone is completely serrated and the other is serrated only about one-fifth of the way from the base to the apex.

6. *Apices*.—The results of a study of the apices of the senna leaflets studied are shown in Table V.

TABLE V.—A COMPARISON OF APICES.

Plant.	Av. Size Tip.	Remarks.
<i>C. angustifolia</i>	261 microns long 250 microns wide	The apices are about as long as wide and are either conical or ball-shape. <i>C. Senna</i> usually shows apices with hairs present. <i>C. angustifolia</i> usually shows apices without hairs.
<i>C. Senna</i>	246 microns long 246 microns wide	
<i>C. Marilandica</i>	584 microns long 211 microns wide	These sennas exhibit apices which are similar but those of <i>C. Marilandica</i> are about three times as long as wide. The apices of <i>C. Medsgeri</i> are about twice as long as wide. The apices taper slightly.
<i>C. Medsgeri</i>	316 microns long 175 microns wide	
<i>C. Chamæcrista</i>	283 microns long 150 microns wide	The apices of <i>C. nictitans</i> are about three times as long as wide and those of <i>C. Chamæcrista</i> are about twice as long as wide. The apices taper to a sharp slender point.
<i>C. nictitans</i>	433 microns long 133 microns wide	

The above table shows that it is possible to separate the sennas into the 6 species by the appearance of their apices.

7. *Petiolules*.—It was also found that the sennas could be separated into three groups by means of the petiolules which are classified as large, medium or small.

C. Marilandica and *C. Medsgeri* have the large petiolules, 500 to 750 microns wide and 1250 to 2100 microns long; the official sennas, the medium-sized, 500 to 850 microns wide and 675 to 1100 microns long and with *C. nictitans* and *C. Chamæcrista*, the petiolules are very small. The chart that follows shows the most important characteristics of the petiolules.

Petiolules	{	Large	{	Rarely without hairs, hairs numerous— <i>C. Medsgeri</i> .
			{	Occasionally with hairs, hairs not numerous— <i>C. Marilandica</i> .
	Medium	{	Hairs numerous on petiolules and along outlines of petiolules— <i>C. Senna</i> .	
	{	Hairs not numerous on petiolules and along outlines of petiolules— <i>C. angustifolia</i> .		
	Small	{	<i>C. nictitans</i> or <i>C. Chamæcrista</i> .	

8. *Glands*.—The petioles of the sennas were examined for the presence of glands. Numerous petioles of the official sennas were obtained from stock and in every case, no glands were seen.

On the petioles of the Maryland sennas glands are always present. Those of *C. Marilandica* and *C. Medsgeri* have conical glands while *C. nictitans* and *C. Chamæcrista* show cup-shaped glands beneath the lowest pair of leaflets. The latter plant possesses the larger cup-shaped glands. A comparison of the glands is shown in Table VI.

TABLE VI.—A COMPARISON OF GLANDS.

Plant.	Glands on Petioles.	Remarks.
<i>C. Senna</i>	Absent	.....
<i>C. angustifolia</i>	Absent	.....
<i>C. Marilandica</i>	Present	Conical or club-shaped glands.
<i>C. Medsgeri</i>	Present	Conical glands.
<i>C. Chamæcrista</i>	Present	Large cup-shaped glands beneath the lowest pair of leaflets.
<i>C. nictitans</i>	Present	Small cup-shaped glands beneath the lowest pair of leaflets.

9. *Cross Section of Leaflets.*—In studying the cross sections of the leaflets, the palisade tissue was the determining factor in the separation of the official sennas and the Maryland sennas. The official sennas (2) possess two layers of palisade tissue, one layer near the upper surface and another, near the lower surface of the leaflet. However, all the Maryland sennas show but one layer of palisade tissue which is adjacent to the upper surface.

10. *Powdered Senna Leaflets.*—All the sennas were examined, according to Sayre's (3) method. A No. 60 powder was made of each senna and to one-half Gm. of the powder in a small homeopathic vial, 6 Gm. of a solution of equal parts of glycerin (sp. gr. 1.25) and water, were added. The official sennas are readily differentiated, as Alexandria senna¹ shows 4.4 hair tips and India senna² one hair tip in a field, the low-power objective being used. These results are similar to those obtained by Sayre.

The Maryland sennas may be identified as follows. *C. Marilandica* and *C. Medsgeri* are determined by the shape of their epidermal cells although the number of stomata in the field, their size and the number of neighboring cells can be used to confirm the identification. *C. nictitans* and *C. Chamæcrista* are also recognized by their epidermal cells and by the shape and size of their stomata. The epidermal cells of *C. Chamæcrista* are less undulate and larger than those of *C. nictitans*, while the latter has smaller, nearly spherical stomata in contrast to those of *C. Chamæcrista* which are elliptical and of which there are fewer per field.

A No. 60 powder was used to study the number of tips of hairs in the field, and, for the recognition of the powdered sennas, a No. 20 powder. In every case, the sample of the powdered leaflet was treated with a drop or two of a saturated aqueous solution of chloral hydrate for three to five minutes prior to its examination.

11. *Microsublimation was also carried out but the results were not conclusive.*

III. COMPARISONS AND CONCLUSIONS.

A comparison of the senna leaflets studied is shown in the following table.

TABLE VII.—A COMPARISON OF SENNAS.

Group I. <i>C. Senna</i> and <i>C. angustifolia</i> .	Group II. <i>C. Marilandica</i> and <i>C. Medsgeri</i> .	Group III. <i>C. Chamæcrista</i> and <i>C. nictitans</i> .
1. Terminal branches of veinlets anastomose near the margins of the leaflets. Effect is less pronounced than that of Group II.	1. Terminal branches of veinlets anastomose near the margins of the leaflets.	1. Terminal branches of veinlets end abruptly near the margins. Veinlets do not anastomose.

¹ *Cassia Senna*.

² *Cassia angustifolia*.

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| 2. Largest stomata studied. Occasionally, there are two stomata with their guard cells touching. Stomata are accompanied by characteristic neighboring cells. | 2. Stomata are practically absent from the upper surfaces of these leaflets. | 2. Both surfaces of these leaflets show stomata present. |
| 3. Hairs are present on both surfaces. | 3. Hairs are absent from both surfaces. | 3. Hairs are absent from both surfaces. |
| 4. Occasionally, very small hairs are found along the margins. | 4. Hairs of large size are present along the margins. | 4. Hairs are absent along the margins. Margins are serrated. |
| 5. Two rows of palisade tissue. | 5. One row of palisade tissue. | 5. One row of palisade tissue. |
| 6. Petioles are devoid of glands. | 6. Petioles show the presence of conical or club-shaped glands. | 6. Petioles show the presence of cup-shaped glands. |
| 7. Plants are shrubs. | 7. Plants are perennial herbs. | 7. Plants are annuals. |
| 8. Apices are conical or ball-shape. | 8. Apices taper slightly. | 8. Apices taper to a sharp, slender point. |

CONCLUSIONS.

In conclusion, an examination of the three groups will bring out the following:

(1) That there are three groups, each group being distinct in itself. The resemblance of any group to each of the other two, is merely superficial.

(2) The differences between Group I and the other two are far greater than the differences between these two groups. It would therefore be only logical that, if Group III is separated from *Cassia*, Group I should also be separated from this genus. We would therefore have Group I composed of the official sennas, consisting of *Cassia angustifolia* and *C. Senna* (*C. acutifolia* Delile), considered under a new Genus, *Senna*, and then recognized as *Senna angustifolia* and *S. acutifolia*, Group II composed of *Cassia Marilandica* and *C. Medsgeri* continued under Genus *Cassia* and Group III, composed of *Cassia nictitans*, and *C. Chamæcrista*, under Genus *Chamæcrista* and known as *Chamæcrista nictitans* and *C. fasciculata*, as already recognized by botanists.

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- (1) C. C. Plitt, *Cassia Medsgeri*, Shafer, in Md., Jr. *Md. Acad. Sciences*, Vol. 1 (1930), 61.
- (2) Gilg-Brandt, "Pharmacognosie," 3 Auflage, 167.
- (3) L. E. Sayre, *Am J. Pharm.*, 69 (1897), 298-307.

ABSTRACT OF PAPER PRESENTED BEFORE SECTION ON PRACTICAL PHARMACY AND DISPENSING, A. PH. A., WASHINGTON MEETING, 1934.

"A Study of the Physical and Chemical Properties of a Number of Specimens of Calomel of American and European Manufacture," by C. H. LaWall and J. W. E. Harrison.

The authors have made an investigation of fourteen commercial samples of calomel, nine of which are of American manufacture and five of European manufacture.

Especial attention was paid to the physical properties and the microscopic appearance, in the light of the U. S. P. requirement that it should show "only small isolated crystals when viewed under a lens having a magnifying power of one hundred diameters."