NATIONAL BUREAU OF STANDARDS REPORT

4370

SPECTROPHOTOMETRIC AND COLORIMETRIC

STUDY OF FOLIAGE

STORED IN COVERED METAL CONTAINERS

By

Harry J. Keegan,

John C. Schleter,

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and

Gladys M. Haas

To

U. S. Department of the Air Force
Aerial Reconnaissance Laboratory
Wright Air Development Center
Wright-Patterson Air Force Base, Ohio

U. S. DEPARTMENT OF COMMERCE
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PREFACE

This is one of a series of NBS reports of spectrophotometric and colorimetric work done under NBS Project No. 0201 - 20 - 2325 entitled Color Reconnaissance Studies, financed by the Aerial Reconnaissance Laboratory, Wright Air Development Center, Wright - Patterson Air Force Base, Ohio; Air Force Contract No. 33(616) 52-21. It is coordinated with Air Force Contract No. 33(616) - 262 under Dr. Hugh T. O'Neill, O'Neill Associates, Annapolis, Maryland, who requested the NBS to perform this test of tree, shrub, and herb leaves stored in covered metal containers.

Harry J. Keegan
Project Leader

4370

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Harry J. Keegan, John C. Schleter, Wiley A. Hall, Jr., and Gladys M. Haas*

Abstract

A spectrophotometric and colorimetric study has been made on the leaves of three species of trees (Beech, Dogwood, and White Oak), one shrub (Mountain Laurel) and one herb (Milkweed), stored in metal containers with tightly fitting metal covers for intervals of 17 hours to 12 days. This was done to determine the color variations that occur in these representative types of foliage during storage, and to predict, if possible, the color variations that may occur in similar and other types of foliage during periods of shipment in similar covered metal containers.

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* Miss Haas is at present employed at the Mare Island Naval Shipyard, San Francisco, California.

I. Introduction

The overall objective of this Air Force investigation is stated as follows: "To develop by visible, near infrared, and near ultraviolet spectrophotometry, methods for the detection of objects from color reconnaissance; to study the colors, tonal contrast, and color separation necessary in aerial photography to yield maximum information; to determine the wavelength region at which the film manufacturer should strive to obtain maximum sensitivity to yield clear separation of an object from its adjacent area rather than to yield true color fidelity; to determine the characteristics required in a sensitized material for the rapid and accurate extraction of this information".

The present report pertains to the natural background of many aerial photographs; namely, the leaves of trees, shrubs and herbs. It especially pertains to leaves picked in an area of aerial interest and shipped to a distant laboratory for study. This study is made to determine, if possible, the suitability of well capped metal containers for shipping and storing foliage for subsequent spectrophotometric study (1) by measuring the color changes that leathery (coriaceous) leaves and thin (membranous) leaves go through during shipment in a metal container; (2) by measuring the rate of change and stages for different types of leaves: (a) leaves showing incipient fall coloring (Beech), (b) leaves showing advanced fall coloration (Dogwood), (c) leaves showing no visible fall coloration (White Oak), and (d) evergreen leaves (Mountain Laurel); and (3) by comparison of these changes with those of leaves of the same species changed naturally in sunlight.

The method of measurement and computation is that requested in the original project proposal and used in a previous report on this project [1]*.

To fulfill this request, spectral directional reflectance measurements have been made for the visible and near infrared spectral regions, 400 to 1080 millimicrons, for both the ventral and dorsal sides of 32 specimens of foliage of 5 species of tree, shrub, and herb stored in a large metal can with a tight fitting metal top. Colorimetric computations have been made for the visible spectrum, 400 to 750 millimicrons, for both sides of the foliage specimens to obtain the chromaticity coordinates and daylight reflectances for the International Commission on Illumination (C.I.E.) standard observer and coordinate system for Source C, representative of average daylight. In addition, these C.I.E. chromaticity coordinates and daylight reflectances have been converted into terms of the Munsell renotation system and into the ISCC-NBS color designations. Illustrations show the changes in spectral directional reflectances, chromaticity coordi-

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* Figures in brackets indicate the index reference, page 9 of this report.

nates, Munsell renotations, and color differences caused by the storage of foliage of Beech, Dogwood, Mountain Laurel, and White Oak for periods of approximately 1, 2, 4, 5, 7, 10, and 12 days, and the foliage of Milkweed for periods of approximately 5, 7, and 12 days. An additional set of measurements was made on foliage of a Beech tree, stored for approximately 5 days, the branch of which had been incompletely broken from the tree about one month before the measurement.

It is believed that this type of information will assist in selecting a suitable method for storing and transporting foliage for subsequent laboratory analysis, and that it is a necessary step towards attaining the overall objective of this investigation.

II. Material

The foliage of this experiment was collected by Dr. Hugh T. O'Neill from trees and plants located at the site of his field laboratory at the head of Broad Creek of the South River, a tributary of the Chesapeake Bay, near Annapolis, Maryland. The trees were designated by him as: Beech (Fagus grandifolia Ehrh.), Dogwood (Cornus florida L.), and White Oak (Quercus alba L.); the shrub as: Mountain Laurel (Kalmia latifolia L.); and the herb as: Milkwood (Asclepias syriaca L.).

A large number of leaves of each species had been collected at each time of picking, and when received at the NBS the leaves had been stored in a 5 gallon metal container with a tightly fitting metal top. They were arranged in seven layers in the container, separated by layers of newspapers. All of the leaves in a given layer were picked at the same time. Each species carried an identification label with the indicated date and time of picking and storage. The extra unmeasured leaves served to maintain fairly constant storage conditions within the container during the period of storage especially after a series of sets of leaves had been removed for measurement. To extend the time scale of storage, the specimens collected last were measured first; those collected next to last were measured second; and so forth until those collected first were measured last.

A listing of the date and time of picking, the date and time of measurement, and the approximate number of hours that each set of leaves remained in storage, is given in Table I.

III. Spectrophotometric Measurements

Seven sets of measurements of spectral directional reflectance for the visible and near infrared spectral regions, 400 to 1080 millimicrons, were made on both the ventral and the dorsal sides of 32 specimens of foliage on a General Electric recording spectrophotometer [2, 3] for the condition of included specular component of the reflected radiant energy. Slits of approximately 10 millimicrons of spectral width were used for the measure-

ments in the visible spectrum 400 to 750 millimicrons, and 20 millimicrons of spectral width for the near infrared spectrum 730 to 1080 millimicrons.

The first set of measurements was made on the morning that the specimens were received at the NBS. Those leaves that had been in storage for approximately 17 hours, were removed from the tin can, and the lid was immediately replaced. They were arranged roughly according to hue, and representative specimens were selected as measuring and backing leaves for each species. In each case, the measurements for both the ventral and the dorsal sides were made on the selected measuring leaf. For the ventral side measurements, the ventral side of the backing leaf was placed against the dorsal side of the measuring leaf, and for the dorsal side measurements, the reversed sides were placed together. An effort was made to measure the same area of leaf on each side. Each pair of samples was backed with black paper on a wooden block.

After each set of measurements, the measuring and backing samples of each species were filed in separate manila envelops for possible future reference while the excess leaves were discarded. It will be noted, accordingly, that the measurements at the different time intervals are on different samples.

The same procedure described for the first set was followed for the remaining sets of leaves. The time schedule for these measurements is given in Table I.

IV. Spectrophotometric Results

The results of this spectrophotometric study of the changes of spectral directional reflectances of leaves of trees and plants stored for periods of time in covered metal containers are shown on the 14 Ozalid prints of the original recordings in Appendix A of this report. There are 7 graphs of the visible spectrum and 7 graphs of the near infrared spectrum; for each set of measurements the infrared graph sheet follows its companion visible spectrum graph.

Values of spectral directional reflectance were read at each ten millimicron interval from 400 to 1080 millimicrons from each of the 64 spectrophotometric curves of the ventral and dorsal sides of 5 species of leaves shown on the 14 graph sheets of Appendix A. These values are listed in Appendix B of this report. For wavelengths 730, 740 and 750 millimicrons, which spectral region appears on both the visible and on the near infrared graph sheets, the average values for both determinations are reported. The tables of Appendix B are arranged in groups alphabetically by order of tree, shrub, or herb common name and with increasing times of storage for each species making up the group.

The data from each of these groups of measurements have been assembled and plotted to show how each side of each leaf changes spectrally for the

various periods of storage of this experiment. These illustrations are shown for both the visible and near infrared spectral regions, for all but one of the samples studied, in Figures 1 through 9. The exception was the sample taken from the Beech tree branch that had been incompletely broken. The data from this sample did not fit into the systematic arrangement of the spectral data. However, all of the computations have been made and are listed for this sample in the tables of data. The leaf behaved like a leaf that had aged considerably more than the other leaves of its same species of this study.

The remainder of this report deals with the visible spectrum part of these measurements and with their conversions into chromaticity coordinates, daylight reflectances, Munsell renotations, ISCC-NBS color designations, and color differences. [4]

V. Colorimetric Computations

The spectral directional reflectances for the visible spectrum 380 to 750 millimicrons, for the 32 determinations made on the ventral side, and the 32 determinations made on the dorsal side, of the 5 foliage species kept in storage were integrated into the International Commission on Illumination (C.I.E.) standard observer and coordinate system [5] for Source C, representative of average daylight. These colorimetric computations yielded the chromaticity coordinates and daylight reflectances listed in Table II of this report.

The area of the C.I.E. chromaticity diagram covered by each of the five species of foliage studied in this storage experiment are shown in Figure 10. Enlargements of each of these areas are shown in Figures 11 through 15. The numbers used to designate the points in these graphs are those assigned in Table I and the Index to Appendix A.

VI. Munsell Renotations and ISCC-NBS Color Designations

By the use of the above C.I.E. chromaticity coordinates and daylight reflectances of the 32 sets of ventral and dorsal sides of stored foliage, the Munsell renotations were obtained from graphs of conversion from the C.I.E. system to the Munsell system [6] . These Munsell renotations were then converted into terms of the ISCC-NBS color designations [7] . Both the Munsell renotations and the ISCC-NBS color designations of all 64 determinations on the ventral and the dorsal sides of stored leaves are shown in Tables III and IV, respectively.

The colorimetric changes in these leaves are shown in the illustrations of the vertical and horizontal projections of ideal Munsell color space, Figures 16 through 20. The numbers assigned to the plotted points are the same as used on the C.I.E. diagrams, in Table I and in the Index to Appendix A.

VII. Color Difference

From the Munsell renotations of the 64 determinations of the ventral and the dorsal sides of stored leaves, color differences in terms of NBS units, ΔE, were computed by means of the Balinkin formula [8], for all of the determinations of each species of leaf relative to that of the initial determination. For all samples except the Milkweed sample the initial determination was made after the leaf had been in storage for 17 hours. For the Milkweed sample the reference point was the determination at storage time 122 hours as we had no sample previous to this time. The Beech sample from the broken branch was referenced to the normal sample at 17 hours for lack of other data.

These 54 color differences are tabulated in Table V, and plotted against time in storage for each of the five species of leaves studied in Figures 21 through 25. For convenience two time scales are used, the one at the bottom of the graph in hours, and the one at the top in days, of storage.

It should be noted that this is the only report in this series in which the Balinkin formula for the determination of color difference is used. In NBS Report 4322 and in the rest of the reports of this series, the Godlove [1] formula is used. The Balinkin formula is somewhat easier to use and is sufficiently accurate in this case since the samples of the present report have relatively small changes in hue. Where large changes in hue are present, the use of the Godlove formula results in color difference evaluations more closely approximating the visual estimates of color differences.

VIII. Summary

A series of especially selected leaves of trees, a shrub, and an herb have been stored in metal containers with tight fitting metal lids and then measurements of spectral directional reflectance were made for both the ventral and the dorsal sides for the visible and the near infrared spectral regions, 400 to 1080 millimicrons. Thus a record was obtained of the spectral change that these leaves underwent in storage.

The visible spectral data were then converted into colorimetric terms for comparative purposes. These conversions were to C.I.E. standard observer and coordinate system, then into the Munsell renotation system, the ISCC-NBS color designation system, and finally into NBS ΔE terms of color differences between the initial determination and each successive determination on each side of each leaf.

These extensive data have been illustrated in 25 figures and tabulated in 5 tables, resulting from 14 original spectrophotometric recordings and 64 tables of spectral data for the visible and near infrared spectra included in Appendices A and B of this report.

IX. Conclusions

From this study of specially selected leaves stored in large metal containers with tightly fitting metal lids for periods of 17 hours to 12 days, it is evident that slight changes in the color of two (Beech and Dogwood) of the five species of leaves begin almost immediately upon storage. As samples "unstored" were not submitted, data could not be obtained but it is almost certain that color changes started well in advance of the first measurement at "over-night" or after 17 hours of storage.

There is a strong indication that the thick leathery (coriaceous) leaves change very little if at all during storage. The differences indicated in Table V and Figure 24 for Mountain Laurel are possibly due to variation of the leaves taken from the same branch. Furthermore, White Oak leaves changed but little up to 50 hours in storage. Likewise, small color differences are indicated in Table V and Figure 23 for Milkweed leaves but it is possible that larger changes occurred during the first 122 hours of storage for which no samples were available.

The Beech leaves, which showed the incipient fall coloring, changed more rapidly during the first two days of storage than any of the other leaves. However, after four days of storage, the White Oak leaves that had shown no visible fall coloration prior to storage, suddenly changed quite rapidly and between the fourth and seventh days in storage showed the greatest changes. For the first 90 hours, the Beech leaves in storage changed more rapidly than the Dogwood leaves. After 90 hours in storage, the rate of change for these two sets of leaves was about the same.

The changes in the tree leaves of this study are the same as in sunlight [9] ; that is, from green to brown. The same is true for the dorsal side of the dogwood leaves. However, the ventral sides of these Dogwood leaves were red initially and in storage this red color changed from grayish reddish brown through grayish yellowish brown to brownish gray. The dorsal sides of these same leaves changed from moderate olive through light olive brown to grayish yellowish brown.

The indicated changes in the tree leaves in storage are variable and erratic for both hue and saturation. The indicated changes of the shrub and herb leaves are fairly constant in hue but erratic in saturation. Some, and perhaps all, of this variation is ascribable to the use of separate specimens for each storage period.

The spectrophotometric changes (Figures 1 to 9 and Appendices A and B) are not always the same for both sides of the same leaves. The major changes in all cases of the leaves studied are between 500 and 600 milli-

microns in the visible spectrum and between 750 and 900 millimicrons in the near infrared spectrum. In all specimens studied, except the White Oak and Mountain Laurel, the water absorption band at 980 millimicrons disappeared between the 17 and the 49 hour storage periods. The White Oak leaves showed slightly more resistance to this loss of water but they also had this absorption band disappear between 49 and 90 hours of storage. The Mountain Laurel curves showed this water band throughout the series of measurements even to the 282 hour period.

The practice of shipping and storing leaves in well capped metal containers for subsequent spectrophotometric study would appear from these results to be satisfactory for tough leathery leaves, such as the Mountain Laurel, and also for storage of White Oak leaves for not more than two days; but it is unsatisfactory for Beech and Dogwood leaves. Whether this conventional method of shipping and storage is satisfactory for Milkweed leaves was not decided by this test. It is possible that the practice of dry shipment and storage of leaves should be supplanted by the practice of shipping them soaked in water. Note from NBS Report 4322 that White Oak leaves kept soaked in water remained substantially unchanged for over 300 hours, although shipment in tightly closed dry metal containers permitted a substantial change after only 90 hours.

X. Bibliography

[1] H. J. Keegan, J. C. Schleter, and W. A. Hall, Jr., Spectrophotometric and colorimetric change in the leaf of a white oak tree under conditions of natural drying and excessive moisture, NBS Report 4322, September 1955.

[2] A. C. Hardy, A new recording spectrophotometer, J. Opt. Soc. Am. 25, 305 (1935); also A. C. Hardy, History of the design of the recording spectrophotometer, J. Opt. Soc. Am. 28, 360 (1938).

[3] J. L. Michaelson, Construction of the General Electric recording spectrophotometer, J. Opt. Soc. Am. 28, 365 (1938).

[4] D. B. Judd, Color in Business, Science, and Industry, New York, John Wiley & Sons, p. 108, 1952.

[5] Proceedings, Eighth Session, Commission Internationale de l'Eclairage, Cambridge, England, pp. 19 to 29, September 1931.

[6] S. M. Newhall, D. Nickerson, and D. B. Judd, Final report of the OSA subcommittee on the spacing of the Munsell colors, J. Opt. Soc. Am. 33, 385 (1943).

[7] K. L. Kelly and D. B. Judd, The ISCC-NBS method of designating colors and a dictionary of color names, NBS Circular C553, (1955).

[8] I. A. Balinkin, Measurement and designation of small color differences, Am. Ceram. Soc. Bull. 20, 392 (1941).

[9] H. J. Keegan and H. T. O'Neill, Spectrophotometric study of autumn leaves, J. Opt. Soc. Am. 41, 284 (1951).

Figure 1. Visible and near infrared spectral directional reflectance of the ventral side of Beech (Fagus grandifolia Ehrh.) leaves stored in metal containers for the time periods indicated.

Figure 2. Visible and near infrared spectral directional reflectance of the dorsal side of Beech (Fagus grandifolia Ehrh.) leaves stored in metal containers for the time periods indicated.

Figure 3. Visible and near infrared spectral directional reflectance of the ventral side of Dogwood (Cornus florida L.) leaves stored in metal containers for the time periods indicated.

Figure 4. Visible and near infrared spectral directional reflectance of the dorsal side of Dogwood (Cornus florida L.) leaves stored in metal containers for the time periods indicated.

Figure 5. Visible and near infrared spectral directional reflectance of the ventral and dorsal sides of Milkweed (Asclepias syriaca L.) leaves stored in metal containers for the time periods indicated.

Figure 6. Visible and near infrared spectral directional reflectance of the ventral side of Mountain Laurel (Kalmia latifolia L.) leaves stored in metal containers for the time periods indicated.

Figure 7. Visible and near infrared spectral directional reflectance of the dorsal side of Mountain Laurel (Kalmia latifolia L.) leaves stored in metal containers for the time periods indicated.

Figure 8. Visible and near infrared spectral directional reflectance of the ventral side of White Oak (Quercus alba L.) leaves stored in metal containers for the time periods indicated.

Figure 9. Visible and near infrared spectral directional reflectance of the dorsal side of White Oak (Quercus alba L.) leaves stored in metal containers for the time periods indicated.

Figure 10. The chromaticity diagram of the International Commission on Illumination (C.I.E.). The indicated areas show the parts of this diagram applying to this report. They are the areas shown in Figures 11, 12, 13, 14, and 15 for Beech (Fagus grandifolia Ehrh.), Dogwood (Cornus florida L.), Milkweed (Asclepias syriaca L.), Mountain Laurel (Kalmia latifolia L.), and White Oak (Quercus alba L.) leaves stored in metal containers.

Figure 11. Segment of the C.I.E. chromaticity diagram showing dominant wavelength, excitation purity, and chromaticity coordinates of the ventral and dorsal sides of Beech (Fagus grandifolia Ehrh.) leaves stored in metal containers. (For numbering system, see Table I.)

Figure 12. Segment of the C.I.E. chromaticity diagram showing dominant wavelength, excitation purity, and chromaticity coordinates of the ventral and dorsal sides of Dogwood (Cornus florida L.) leaves stored in metal containers. (For numbering system, see Table I.)

Figure 13. Segment of the C.I.E. chromaticity diagram showing dominant wavelength, excitation purity, and chromaticity coordinates of the ventral and dorsal sides of Milkweed (Asclepias syriaca L.) leaves stored in metal containers. (For numbering system, see Table I.)

Figure 14. Segment of the C.I.E. chromaticity diagram showing dominant wavelength, excitation purity, and chromaticity coordinates of the ventral and dorsal sides of Mountain Laurel (Kalmia latifolia L.) leaves stored in metal containers. (For numbering system, see Table I.)

Figure 15. Segment of the C.I.E. chromaticity diagram showing dominant wavelength, excitation purity, and chromaticity coordinates of the ventral and dorsal sides of White Oak (Quercus alba L.) leaves stored in metal containers. (For numbering system, see Table I.)

Figure 16. Vertical and horizontal projections of the color change of the ventral and dorsal sides of Beech (Fagus grandifolia Ehrh.) leaves stored in metal containers. The upper diagram shows the Munsell Value of these measurements plotted against the Munsell Hue and Chroma points projected from the lower diagram. (For numbering system, see Table I.)

Figure 17. Vertical and horizontal projections of the color change of the ventral and dorsal sides of Dogwood (Cornus florida L.) leaves stored in metal containers. The upper diagram shows the Munsell Value of these measurements plotted against the Munsell Hue and Chroma points projected from the lower diagram. (For numbering system, see Table I.)

Figure 18. Vertical and Horizontal projections of the color change of the ventral and dorsal sides of Milkweed (Asclepias syriaca L.) leaves stored in metal containers. The upper diagram shows the Munsell Value of these measurements plotted against the Munsell Hue and Chroma points projected from the lower diagram. (For numbering system, see Table I.)

Figure 19. Vertical and horizontal projections of the color change of the ventral and dorsal sides of Mountain Laurel (Kalmia latifolia L.) leaves stored in metal containers. The upper diagram shows the Munsell Value of these measurements plotted against the Munsell Hue and Chroma points projected from the lower diagram. (For numbering system, see Table I.)

Figure 20. Vertical and horizontal projections of the color change of the ventral and dorsal sides of White Oak (Quercus alba L.) leaves stored in metal containers. The upper diagram shows the Munsell Value of these measurements plotted against the Munsell Hue and Chroma points projected from the lower diagram. (For numbering system, see Table I.)

Figure 21. Color differences computed from the Balinkin color-difference formula, converted into NBS units, and plotted against time for the ventral and dorsal sides of Beech (Fagus grandifolia Ehrh.) leaves stored in metal containers.

Figure 22. Color differences computed from the Balinkin color-difference formula, converted into NBS units, and plotted against time for the ventral and dorsal sides of Dogwood (Cornus florida L.) leaves stored in metal containers.

Figure 23. Color differences computed from the Balinkin color-difference formula, converted into NBS units, and plotted against time for the ventral and dorsal sides of Milkweed (Asclepias syriaca L.) leaves stored in metal containers.

Figure 24. Color differences computed from the Balinkin color-difference formula, converted into NBS units, and plotted against time of the ventral and dorsal sides for Mountain Laurel (Kalmia latifolia L.) leaves stored in metal containers.

Figure 25. Color differences computed from the Balinkin color-difference formula, converted into NBS units, and plotted against time of the ventral and dorsal sides for White Oak (Quercus alba L.) leaves stored in metal containers.

Table I

Set Numbers, Hours of Storage, and Date and Time of Picking and Measuring of Leaves Indicated.

Set of Leaves	Time In Storage Hours	Picked		Measured	
		Date	Time	Date	Time
Beech, Dogwood, Mountain Laurel, and White Oak.					
1	17	9-28-52	1600	9-29-52	0900
2	49	9-28-52	0745	9-30-52	0845
3	90	9-27-52	1500	10- 1-52	0900
4	122	9-27-52	0700	10- 2-52	0900
5	160	9-26-52	1700	10- 3-52	0900
6	242	9-26-52	0700	10- 6-52	0900
7	282	9-25-52	1500	10- 7-52	0900
Milkweed					
1, (4)*	122	9-27-52	0700	10- 2-52	0900
2, (5)*	160	9-26-52	1700	10- 3-52	0900
3, (6)*	282	9-25-52	1500	10- 7-52	0900
Beech (Incompletely broken off one month prior to measurement)					
1	122	9-27-52	0700	10- 2-52	0900

*These numbers are listed for the dorsal side in Figure 5.

Table II

Chromaticity Coordinates and Daylight Reflectances of the Ventral and Dorsal Sides of Foliage Stored in Covered Metal Containers for the Storage Time Indicated.

Set Of Leaves	Time In Storage Hours	Ventral Side Chromaticity Coordinates x	Ventral Side Chromaticity Coordinates y	Ventral Side Daylight Reflectance Y(%)	Dorsal Side Chromaticity Coordinates x	Dorsal Side Chromaticity Coordinates y	Dorsal Side Daylight Reflectance Y(%)
Beech							
1	17	0.384	0.426	13.6	0.374	0.411	20.4
2	49	.380	.380	8.0	.386	.399	18.3
3	90	.376	.390	8.5	.394	.405	17.8
4	122	.376	.377	7.9	.412	.398	16.7
5	160	.379	.378	7.2	.415	.403	16.0
6	242	.392	.352	6.7	.429	.388	13.2
7	282	.387	.378	8.4	.412	.393	15.8
Dogwood							
1	17	0.383	0.330	6.8	0.353	0.376	28.5
2	49	.371	.324	5.5	.354	.364	27.0
3	90	.381	.349	8.1	.348	.369	30.8
4	122	.357	.338	7.4	.347	.354	23.9
5	160	.373	.360	10.9	.351	.353	24.5
6	242	.342	.332	5.5	.348	.346	17.1
7	282	.346	.333	5.4	.352	.351	18.4
Milkweed							
1, (4)*	122	0.340	0.339	7.9	0.360	0.364	22.1
2, (5)*	160	.346	.344	6.9	.353	.358	21.3
3, (6)*	282	.346	.344	8.8	.356	.360	19.9
Mountain Laurel							
1	17	0.333	0.390	9.4	0.359	0.422	19.0
2	49	.336	.403	9.0	.364	.429	20.2
3	90	.337	.417	9.8	.361	.424	20.2
4	122	.321	.374	6.3	.358	.428	17.2
5	160	.340	.410	8.9	.364	.416	18.0
6	242	.335	.394	8.5	.362	.424	17.2
7	282	.330	.393	8.5	.361	.430	16.3
White Oak							
1	17	0.349	0.408	11.1	0.345	0.390	19.2
2	49	.358	.420	11.5	.347	.393	18.1
3	90	.366	.381	9.7	.349	.363	15.4
4	122	.370	.372	7.9	.346	.349	12.5
5	160	.375	.378	9.6	.354	.340	12.3
6	242	.373	.371	8.7	.339	.340	13.1
7	282	.374	.380	10.0	.352	.358	15.4
Beech**							
1	122	0.372	0.393	16.1	0.419	0.388	19.6

*These numbers are listed for the dorsal side in Figure 5.
**Foliage from branch incompletely broken off one month previous to measurement.

Table III

Munsell Renotations and ISCC-NBS Color Designations of the Ventral Side of Leaves Stored in Metal Containers for the Time Indicated.

Set Of Leaves	Time In Storage Hours	Ventral Side		
		Munsell Renotations		ISCC-NBS Color Designations
Beech				
1	17	9.9Y	4.2/3.9	Moderate Olive
2	49	2.8Y	3.3/2.5	Moderate Olive Brown
3	90	5.6Y	3.4/2.6	Grayish Olive
4	122	2.8GY	3.3/2.3	Grayish Olive Green
5	160	2.6Y	3.2/2.4	Moderate Olive Brown
6	242	4.6YR	3.0/2.6	Moderate Brown
7	282	1.2Y	3.4/2.6	Moderate Olive Brown
Dogwood				
1	17	8.9R	3.1/2.5	Grayish Reddish Brown
2	49	7.3R	2.8/2.1	Grayish Reddish Brown
3	90	4.8R	3.3/2.4	Grayish Brown
4	122	4.3YR	3.2/1.5	Brownish Gray to Grayish Brown
5	160	9.1YR	3.8/2.2	Grayish Yellowish Brown
6	242	5.4YR	2.8/0.9	Brownish Gray
7	282	5.6YR	2.7/1.0	Brownish Gray
Milkweed				
1	122	0.4Y	3.3/1.0	Brownish Gray
2	160	0.5Y	3.1/1.2	Brownish Gray
3	282	0.2Y	3.5/1.2	Dark Grayish Yellowish Brown to Grayish Yellowish Brown
Mountain Laurel				
1	17	5.9GY	3.6/2.6	Grayish Olive Green
2	49	6.0GY	3.5/3.0	Grayish Olive Green to Moderate Olive Green
3	90	6.3GY	3.6/3.6	Moderate Olive Green
4	122	7.0GY	2.9/2.2	Grayish Olive Green
5	160	5.8GY	3.5/3.2	Moderate Olive Green
6	242	5.7GY	3.4/2.8	Moderate Olive Green
7	282	6.5GY	3.4/2.8	Grayish Olive Green
White Oak				
1	17	4.3GY	3.9/3.1	Moderate Olive Green
2	49	3.5GY	3.9/3.5	Moderate Olive Green
3	90	6.1Y	3.6/2.3	Grayish Olive
4	122	3.2Y	3.3/2.1	Moderate Olive Green
5	160	3.1Y	3.6/2.4	Moderate Olive Brown
6	242	2.0Y	3.4/2.3	Dark Olive Brown
7	282	3.8Y	3.7/2.4	Moderate Olive Brown
Beech*				
1	122	7.0Y	4.6/3.1	Light Olive

*Foliage from branch incompletely broken off one month previous to measurement.

Table IV

Munsell Renotations and ISCC-NBS Color Designations of the Dorsal Side of Leaves Stored in Covered Metal Containers for the Time Indicated.

Set of Leaves	Time In Storage Hours	Dorsal Side Munsell Renotations		ISCC-NBS Color Designations
Beech				
1	17	9.7Y	5.1/3.9	Moderate Olive
2	49	5.0Y	4.8/3.6	Light Olive
3	90	4.6Y	4.8/3.9	Light Olive
4	122	1.1Y	4.6/4.4	Light Olive Brown
5	160	1.5Y	4.6/4.5	Light Olive Brown
6	242	8.0YR	4.2/4.6	Moderate Brown to Moderate Yellowish Brown
7	282	0.2Y	4.5/4.2	Moderate Yellowish Brown
Dogwood				
1	17	8.5Y	5.9/2.8	Moderate Olive
2	49	3.9Y	5.7/2.4	Light Olive Brown
3	90	8.5Y	6.1/2.4	Light Grayish Olive
4	122	3.3Y	5.4/1.9	Light Olive Brown
5	160	1.8Y	5.5/2.0	Light Olive Brown
6	242	9.9YR	4.7/1.6	Grayish Yellowish Brown
7	282	0.7Y	4.8/1.8	Grayish Yellowish Brown
Milkweed				
(4)*	122	2.6Y	5.3/2.4	Light Olive Brown
(5)*	160	2.8Y	5.2/2.0	Light Olive Brown
(6)*	282	2.7Y	5.0/2.1	Light Olive Brown
Mountain Laurel				
1	17	3.7GY	4.9/4.3	Moderate Yellow Green
2	49	3.5GY	5.0/4.6	Moderate Yellow Green
3	90	3.5GY	5.0/4.4	Moderate Yellow Green
4	122	4.2GY	4.7/4.3	Moderate Yellow Green
5	160	2.2GY	4.8/3.9	Moderate Yellow Green
6	242	3.3GY	4.7/4.2	Moderate Olive Green
7	282	3.9GY	4.6/3.2	Moderate Yellow Green
White Oak				
1	17	3.6GY	4.9/3.0	Grayish Yellow Green to Moderate Yellow Green
2	49	3.4GY	4.8/3.0	Grayish Yellow Green to Moderate Yellow Green
3	90	6.3Y	4.5/1.8	Light Olive Gray to Grayish Olive
4	122	2.5Y	4.1/1.4	Moderate Olive Brown
5	160	6.5YR	4.0/1.6	Grayish Brown
6	242	0.5Y	4.2/1.1	Brownish Gray
7	282	3.3Y	4.5/1.8	Moderate Olive Brown to Light Olive Brown
Beech**				
1	122	8.4YR	5.0/4.9	Moderate Yellowish Brown

*These numbers are listed for the dorsal side of Milkweed in Figure 5.
**Foliage from branch incompletely broken off one month previous to measurement.

Table V

Color Differences between the Initial Measurement (17 Hours Storage) and each Succeeding Measurement of the Ventral and Dorsal Sides of Foliage Stored in Covered Metal Containers.

Determinations Numbers	Hours in Storage	Color Difference, ΔE Ventral Side	Dorsal Side
Beech			
1 and 2	49	16.4	8.8
1 and 3	90	13.4	9.6
1 and 4	122	14.4	17.9
1 and 5	160	17.8	17.0
1 and 6	242	27.3	24.6
1 and 7	282	17.4	19.0
Dogwood			
1 and 2	49	4.0	4.8
1 and 3	90	7.1	3.1
1 and 4	122	9.6	9.7
1 and 5	160	10.8	10.1
1 and 6	242	13.4	13.3
1 and 7	282	13.1	14.2
Milkweed			
1 and 2	160	2.0	3.1
1 and 3	282	4.7	3.1
Mountain Laurel			
1 and 2	49	3.1	2.4
1 and 3	90	7.5	1.1
1 and 4	122	6.1	1.8
1 and 5	160	4.4	4.3
1 and 6	242	2.0	5.9
1 and 7	282	2.0	3.4
White Oak			
1 and 2	49	3.6	0.0
1 and 3	90	12.1	10.0
1 and 4	122	16.3	17.6
1 and 5	160	15.8	22.5
1 and 6	242	17.6	19.8
1 and 7	282	15.2	15.5
Beech* (Compared with Beech #1 above)	122	8.5	25.7

*Foliage from branch incompletely broken off one month previous to measurement.

Appendix A

Set of the Ozalid prints of the 14 original recordings of the visible and the near infrared spectral directional reflectance (400 to 1080 millimicrons) made on a General Electric recording spectrophotometer for the ventral and dorsal sides of 5 species of leaves (Beech, Dogwood, Milkweed, Mountain Laurel, and White Oak) stored in metal containers for time intervals of 17, 49, 90, 122, 160, 242, and 282 hours, or for parts of these intervals. An index to the spectrophotometric curves of this set are listed in the following table.

Index to Appendix A.

Set Of Leaves	Time In Storage Hours	Foliage Of:	GE Graph Sheet Serial Number: Visible Spectrum	GE Graph Sheet Serial Number: Near Infrared Spectrum	Curve Number: Ventral Side	Curve Number: Dorsal Side
1	17	Beech	GE II-1035	GE II-1036	5	6
1	17	Dogwood	1035	1036	7	8
1	17	Mountain Laurel	1035	1036	3	4
1	17	White Oak	1035	1036	1	2
2	49	Beech	1037	1038	5	6
2	49	Dogwood	1037	1038	7	8
2	49	Mountain Laurel	1037	1038	3	4
2	49	White Oak	1037	1038	1	2
3	90	Beech	1041	1042	5	6
3	90	Dogwood	1041	1042	7	8
3	90	Mountain Laurel	1041	1042	3	4
3	90	White Oak	1041	1042	1	2
4	122	Beech	1045	1046	5	6
1	122	Beech**	1045	1046	11	12
4	122	Dogwood	1045	1046	7	8
1,(4)*	122	Milkweed	1045	1046	9	10
4	122	Mountain Laurel	1045	1046	3	4
4	122	White Oak	1045	1046	1	2
5	160	Beech	1047	1048	5	6
5	160	Dogwood	1047	1048	7	8
2,(5)*	160	Milkweed	1047	1048	9	10
5	160	Mountain Laurel	1047	1048	3	4
5	160	White Oak	1047	1048	1	2
6	242	Beech	1049	1050	5	6
6	242	Dogwood	1049	1050	7	8
6	242	Mountain Laurel	1049	1050	3	4
6	242	White Oak	1049	1050	1	2
7	282	Beech	1051	1052	5	6
7	282	Dogwood	1051	1052	7	8
3,(6)*	282	Milkweed	1051	1052	9	10
7	282	Mountain Laurel	1051	1052	3	4
7	282	White Oak	1051	1052	1	2

*These numbers are listed for the dorsal side of Milkweed in Figure 5.

**Foliage from branch incompletely broken off one month previous to measurement.

Appendix B

Tables of visible and near infrared spectral directional reflectance (400 to 1080 millimicrons) of 64 determinations made on the ventral and dorsal sides of 5 species of leaves (Beech, Dogwood, Milkweed, Mountain Laurel and White Oak) stored in metal containers for time intervals of 17, 49, 90, 122, 160, 242, and 282 hours, or for parts of these intervals. Values of spectral directional reflectance were read at 10 millimicron intervals from the 14 recordings shown in Appendix A. For the overlapping segments of the region 730 to 750 millimicrons, an average of both determinations in each case is reported.

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 17 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.044	750	0.596	400	0.064	750	0.590
10	.044	60	.617	10	.072	60	.600
20	.046	70	.626	20	.076	70	.606
30	.049	80	.632	30	.080	80	.612
40	.050	90	.636	40	.084	90	.616
450	.050	800	.638	450	.088	800	.620
60	.051	10	.641	60	.092	10	.624
70	.051	20	.644	70	.094	20	.626
80	.051	30	.646	80	.098	30	.630
90	.052	40	.649	90	.100	40	.632
500	.055	850	.651	500	.114	850	.634
10	.065	60	.653	10	.140	60	.636
20	.092	70	.655	20	.175	70	.638
30	.129	80	.656	30	.206	80	.641
40	.156	90	.659	40	.222	90	.642
550	.176	900	.661	550	.241	900	.644
60	.184	10	.662	60	.246	10	.646
70	.174	20	.664	70	.239	20	.648
80	.158	30	.666	80	.226	30	.650
90	.148	40	.666	90	.219	40	.650
600	.142	950	.666	600	.216	950	.651
10	.135	60	.666	10	.210	60	.651
20	.124	70	.666	20	.201	70	.651
30	.119	80	.666	30	.198	80	.651
40	.111	90	.666	40	.191	90	.652
650	.094	1000	.669	650	.171	1000	.653
60	.081	10	.672	60	.158	10	.656
70	.066	20	.674	70	.138	20	.658
80	.062	30	.677	80	.131	30	.662
90	.093	40	.680	90	.175	40	.665
700	.228	1050	.682	700	.291	1050	.668
10	.366	60	.685	10	.400	60	.670
20	.416	70	.688	20	.475	70	.672
30	.535	80	.690	30	.535	80	.674
40	.574			40	.570		

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 49 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.452	400	0.051	750	0.507
10	.040	60	.480	10	.059	60	.526
20	.041	70	.495	20	.066	70	.537
30	.042	80	.509	30	.071	80	.548
40	.042	90	.522	40	.076	90	.558
450	.042	800	.536	450	.081	800	.570
60	.042	10	.550	60	.085	10	.580
70	.042	20	.565	70	.090	20	.591
80	.043	30	.577	80	.094	30	.600
90	.044	40	.591	90	.100	40	.612
500	.045	850	.603	500	.110	850	.621
10	.050	60	.615	10	.128	60	.628
20	.056	70	.626	20	.148	70	.637
30	.066	80	.636	30	.166	80	.642
40	.075	90	.645	40	.182	90	.648
550	.085	900	.652	550	.196	900	.655
60	.094	10	.661	60	.206	10	.661
70	.097	20	.666	70	.211	20	.666
80	.096	30	.671	80	.211	30	.671
90	.096	40	.676	90	.212	40	.675
600	.096	950	.681	600	.214	950	.678
10	.096	60	.685	10	.214	60	.681
20	.092	70	.686	20	.211	70	.682
30	.090	80	.688	30	.211	80	.684
40	.086	90	.691	40	.208	90	.686
650	.076	1000	.693	650	.194	1000	.688
60	.069	10	.696	60	.184	10	.691
70	.061	20	.699	70	.167	20	.692
80	.059	30	.701	80	.163	30	.695
90	.081	40	.704	90	.204	40	.697
700	.120	1050	.706	700	.299	1050	.698
10	.271	60	.708	10	.375	60	.700
20	.345	70	.712	20	.426	70	.702
30	.399	80	.715	30	.466	80	.702
40	.432			40	.490		

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 90 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.468	400	0.042	750	0.516
10	.040	60	.487	10	.050	60	.536
20	.041	70	.502	20	.056	70	.550
30	.042	80	.512	30	.062	80	.560
40	.042	90	.530	40	.066	90	.570
450	.042	800	.542	450	.071	800	.580
60	.043	10	.554	60	.076	10	.590
70	.044	20	.568	70	.080	20	.600
80	.044	30	.580	80	.084	30	.609
90	.044	40	.592	90	.090	40	.618
500	.048	850	.604	500	.101	850	.626
10	.053	60	.614	10	.121	60	.634
20	.064	70	.624	20	.141	70	.640
30	.076	80	.632	30	.160	80	.647
40	.086	90	.640	40	.175	90	.652
550	.096	900	.646	550	.189	900	.658
60	.102	10	.653	60	.200	10	.663
70	.102	20	.660	70	.204	20	.667
80	.100	30	.665	80	.206	30	.671
90	.099	40	.669	90	.208	40	.674
600	.099	950	.672	600	.212	950	.677
10	.095	60	.676	10	.212	60	.679
20	.090	70	.678	20	.209	70	.680
30	.089	80	.680	30	.212	80	.682
40	.085	90	.681	40	.206	90	.684
650	.074	1000	.686	650	.192	1000	.686
60	.065	10	.688	60	.178	10	.688
70	.056	20	.691	70	.159	20	.691
80	.056	30	.693	80	.162	30	.693
90	.094	40	.695	90	.225	40	.695
700	.200	1050	.700	700	.326	1050	.700
10	.300	60	.702	10	.394	60	.702
20	.367	70	.704	20	.441	70	.704
30	.413	80	.705	30	.476	80	.705
40	.446			40	.499		

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 122 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.472	400	0.039	750	0.542
10	.040	60	.504	10	.045	60	.572
20	.042	70	.520	20	.051	70	.584
30	.042	80	.532	30	.057	80	.595
40	.043	90	.545	40	.061	90	.606
450	.044	800	.556	450	.065	800	.616
60	.044	10	.567	60	.069	10	.625
70	.044	20	.577	70	.074	20	.634
80	.044	30	.586	80	.076	30	.642
90	.044	40	.596	90	.082	40	.648
500	.044	850	.604	500	.090	850	.656
10	.047	60	.612	10	.105	60	.663
20	.056	70	.620	20	.124	70	.670
30	.070	80	.626	30	.141	80	.676
40	.076	90	.630	40	.156	90	.680
550	.085	900	.635	550	.172	900	.684
60	.092	10	.640	60	.187	10	.688
70	.094	20	.643	70	.196	20	.692
80	.093	30	.647	80	.204	30	.694
90	.093	40	.650	90	.210	40	.696
600	.094	950	.653	600	.217	950	.699
10	.092	60	.656	10	.220	60	.700
20	.089	70	.656	20	.222	70	.701
30	.088	80	.658	30	.226	80	.702
40	.086	90	.660	40	.224	90	.703
650	.078	1000	.662	650	.212	1000	.705
60	.070	10	.664	60	.200	10	.706
70	.062	20	.666	70	.184	20	.710
80	.060	30	.670	80	.184	30	.711
90	.084	40	.672	90	.235	40	.713
700	.174	1050	.674	700	.334	1050	.715
10	.275	60	.676	10	.405	60	.716
20	.352	70	.676	20	.455	70	.716
30	.416	80	.678	30	.502	80	.718
40	.450			40	.526		

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 160 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.038	750	0.448	400	0.038	750	0.514
10	.038	60	.478	10	.042	60	.539
20	.038	70	.492	20	.048	70	.550
30	.038	80	.505	30	.052	80	.561
40	.039	90	.518	40	.056	90	.571
450	.039	800	.530	450	.059	800	.581
60	.039	10	.542	60	.062	10	.591
70	.040	20	.553	70	.065	20	.600
80	.040	30	.564	80	.068	30	.610
90	.040	40	.576	90	.072	40	.618
500	.042	850	.586	500	.080	850	.627
10	.046	60	.596	10	.094	60	.634
20	.052	70	.606	20	.112	70	.641
30	.060	80	.615	30	.128	80	.647
40	.068	90	.622	40	.144	90	.653
550	.076	900	.630	550	.162	900	.658
60	.084	10	.636	60	.176	10	.663
70	.086	20	.640	70	.188	20	.668
80	.086	30	.646	80	.195	30	.672
90	.086	40	.650	90	.202	40	.675
600	.088	950	.654	600	.209	950	.678
10	.086	60	.657	10	.211	60	.680
20	.084	70	.660	20	.212	70	.682
30	.082	80	.661	30	.216	80	.683
40	.080	90	.663	40	.215	90	.685
650	.071	1000	.666	650	.203	1000	.687
60	.065	10	.668	60	.191	10	.689
70	.058	20	.671	70	.172	20	.690
80	.056	30	.673	80	.176	30	.692
90	.082	40	.674	90	.232	40	.694
700	.173	1050	.676	700	.320	1050	.695
10	.270	60	.679	10	.388	60	.696
20	.340	70	.681	20	.432	70	.699
30	.397	80	.684	30	.476	80	.700
40	.427			40	.495		

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 242 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.322	400	0.035	750	0.418
10	.040	60	.357	10	.039	60	.452
20	.040	70	.369	20	.044	70	.465
30	.041	80	.386	30	.046	80	.478
40	.041	90	.402	40	.049	90	.492
450	.041	800	.421	450	.051	800	.505
60	.041	10	.438	60	.054	10	.519
70	.041	20	.457	70	.056	20	.532
80	.041	30	.475	80	.059	30	.542
90	.042	40	.493	90	.062	40	.559
500	.042	850	.512	500	.066	850	.572
10	.044	60	.529	10	.074	60	.586
20	.046	70	.545	20	.084	70	.600
30	.050	80	.560	30	.094	80	.610
40	.054	90	.575	40	.106	90	.622
550	.060	900	.588	550	.121	900	.632
60	.066	10	.601	60	.136	10	.640
70	.072	20	.612	70	.150	20	.649
80	.079	30	.622	80	.164	30	.656
90	.086	40	.630	90	.175	40	.662
600	.092	950	.636	600	.186	950	.668
10	.096	60	.642	10	.196	60	.672
20	.099	70	.648	20	.202	70	.676
30	.103	80	.650	30	.212	80	.679
40	.107	90	.654	40	.220	90	.682
650	.102	1000	.658	650	.218	1000	.685
60	.094	10	.662	60	.211	10	.686
70	.081	20	.666	70	.196	20	.690
80	.082	30	.668	80	.200	30	.692
90	.111	40	.671	90	.240	40	.695
700	.175	1050	.674	700	.300	1050	.698
10	.225	60	.678	10	.334	60	.700
20	.254	70	.680	20	.356	70	.702
30	.287	80	.682	30	.390	80	.703
40	.306			40	.406		

Beech
(Fagus grandifolia Ehrh.)

Spectral Directional Reflectance, R_λ of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 282 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.039	750	0.498	400	0.044	750	0.506
10	.040	60	.526	10	.050	60	.531
20	.041	70	.542	20	.054	70	.542
30	.042	80	.556	30	.058	80	.556
40	.043	90	.572	40	.061	90	.568
450	.044	800	.586	450	.064	800	.581
60	.044	10	.600	60	.068	10	.593
70	.045	20	.612	70	.070	20	.605
80	.045	30	.625	80	.072	30	.617
90	.046	40	.637	90	.076	40	.627
500	.048	850	.648	500	.084	850	.637
10	.052	60	.660	10	.096	60	.647
20	.059	70	.670	20	.110	70	.656
30	.066	80	.679	30	.124	80	.664
40	.075	90	.687	40	.139	90	.672
550	.086	900	.694	550	.156	900	.680
60	.096	10	.701	60	.171	10	.686
70	.100	20	.708	70	.184	20	.692
80	.102	30	.714	80	.192	30	.697
90	.105	40	.718	90	.200	40	.702
600	.106	950	.722	600	.209	950	.705
10	.104	60	.725	10	.214	60	.708
20	.102	70	.726	20	.217	70	.710
30	.104	80	.728	30	.222	80	.712
40	.100	90	.730	40	.222	90	.712
650	.090	1000	.730	650	.214	1000	.714
60	.081	10	.731	60	.202	10	.714
70	.071	20	.732	70	.186	20	.715
80	.071	30	.732	80	.191	30	.715
90	.110	40	.732	90	.246	40	.715
700	.209	1050	.732	700	.331	1050	.715
10	.316	60	.732	10	.391	60	.716
20	.388	70	.732	20	.426	70	.716
30	.447	80	.732	30	.470	80	.716
40	.476			40	.490		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 17 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.044	750	0.633	400	0.105	750	0.650
10	.044	60	.650	10	.120	60	.660
20	.046	70	.657	20	.136	70	.666
30	.049	80	.662	30	.150	80	.668
40	.050	90	.666	40	.160	90	.671
450	.050	800	.668	450	.171	800	.672
60	.051	10	.671	60	.181	10	.675
70	.051	20	.674	70	.188	20	.676
80	.051	30	.676	80	.193	30	.678
90	.052	40	.676	90	.200	40	.679
500	.052	850	.679	500	.216	850	.680
10	.052	60	.681	10	.241	60	.682
20	.054	70	.682	20	.269	70	.682
30	.054	80	.684	30	.288	80	.684
40	.054	90	.685	40	.296	90	.685
550	.055	900	.686	550	.301	900	.686
60	.056	10	.687	60	.305	10	.687
70	.061	20	.688	70	.306	20	.688
80	.069	30	.688	80	.304	30	.688
90	.081	40	.688	90	.304	40	.688
600	.097	950	.688	600	.305	950	.688
10	.112	60	.686	10	.304	60	.686
20	.120	70	.684	20	.298	70	.684
30	.128	80	.682	30	.296	80	.682
40	.126	90	.683	40	.288	90	.683
650	.109	1000	.686	650	.266	1000	.686
60	.096	10	.688	60	.251	10	.688
70	.076	20	.690	70	.229	20	.690
80	.071	30	.692	80	.222	30	.692
90	.118	40	.695	90	.272	40	.695
700	.268	1050	.698	700	.388	1050	.698
10	.408	60	.700	10	.479	60	.700
20	.502	70	.702	20	.549	70	.702
30	.570	80	.704	30	.600	80	.704
40	.611			40	.634		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 49 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.544	400	0.112	750	0.613
10	.040	60	.562	10	.130	60	.628
20	.041	70	.576	20	.146	70	.635
30	.042	80	.587	30	.156	80	.641
40	.042	90	.597	40	.166	90	.648
450	.044	800	.604	450	.175	800	.652
60	.045	10	.613	60	.183	10	.658
70	.046	20	.619	70	.190	20	.662
80	.046	30	.626	80	.194	30	.667
90	.046	40	.632	90	.199	40	.671
500	.046	850	.638	500	.212	850	.674
10	.046	60	.642	10	.232	60	.678
20	.046	70	.648	20	.251	70	.681
30	.046	80	.652	30	.262	80	.684
40	.046	90	.656	40	.268	90	.686
550	.047	900	.660	550	.272	900	.690
60	.048	10	.665	60	.277	10	.692
70	.050	20	.667	70	.282	20	.694
80	.052	30	.671	80	.288	30	.696
90	.058	40	.674	90	.293	40	.699
600	.066	950	.676	600	.300	950	.700
10	.078	60	.677	10	.304	60	.701
20	.091	70	.678	20	.306	70	.702
30	.106	80	.678	30	.311	80	.702
40	.116	90	.680	40	.306	90	.702
650	.112	1000	.682	650	.289	1000	.704
60	.106	10	.684	60	.274	10	.706
70	.090	20	.686	70	.250	20	.708
80	.086	30	.688	80	.245	30	.709
90	.114	40	.690	90	.305	40	.710
700	.225	1050	.692	700	.416	1050	.712
10	.320	60	.694	10	.494	60	.712
20	.403	70	.695	20	.541	70	.713
30	.480	80	.696	30	.576	80	.714
40	.522			40	.599		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 90 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.038	750	0.535	400	0.134	750	0.602
10	.040	60	.554	10	.152	60	.611
20	.044	70	.572	20	.167	70	.629
30	.048	80	.586	30	.178	80	.638
40	.051	90	.600	40	.188	90	.646
450	.054	800	.611	450	.198	800	.654
60	.055	10	.621	60	.205	10	.660
70	.056	20	.631	70	.211	20	.667
80	.056	30	.639	80	.216	30	.674
90	.057	40	.646	90	.224	40	.680
500	.059	850	.654	500	.241	850	.686
10	.063	60	.662	10	.266	60	.691
20	.066	70	.669	20	.291	70	.696
30	.069	80	.675	30	.308	80	.701
40	.070	90	.681	40	.317	90	.705
550	.072	900	.686	550	.324	900	.710
60	.076	10	.691	60	.329	10	.713
70	.080	20	.695	70	.328	20	.716
80	.086	30	.700	80	.326	30	.719
90	.094	40	.702	90	.326	40	.721
600	.104	950	.705	600	.328	950	.724
10	.114	60	.707	10	.325	60	.726
20	.122	70	.710	20	.322	70	.727
30	.134	80	.710	30	.325	80	.728
40	.135	90	.712	40	.314	90	.731
650	.124	1000	.715	650	.295	1000	.732
60	.110	10	.718	60	.278	10	.734
70	.095	20	.720	70	.258	20	.736
80	.098	30	.721	80	.264	30	.739
90	.164	40	.724	90	.342	40	.740
700	.282	1050	.726	700	.444	1050	.741
10	.374	60	.729	10	.507	60	.744
20	.446	70	.730	20	.544	70	.746
30	.483	80	.731	30	.568	80	.748
40	.512			40	.587		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 122 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.042	750	0.468	400	0.119	750	0.548
10	.045	60	.486	10	.133	60	.568
20	.048	70	.506	20	.141	70	.582
30	.051	80	.523	30	.156	80	.595
40	.054	90	.539	40	.164	90	.606
450	.056	800	.555	450	.170	800	.616
60	.058	10	.567	60	.176	10	.625
70	.059	20	.579	70	.181	20	.634
80	.060	30	.592	80	.186	30	.642
90	.060	40	.603	90	.190	40	.648
500	.062	850	.612	500	.200	850	.656
10	.064	60	.624	10	.210	60	.663
20	.065	70	.634	20	.222	70	.670
30	.066	80	.642	30	.229	80	.677
40	.068	90	.650	40	.232	90	.684
550	.068	900	.656	550	.237	900	.688
60	.070	10	.662	60	.242	10	.694
70	.072	20	.669	70	.246	20	.698
80	.075	30	.674	80	.252	30	.702
90	.079	40	.679	90	.258	40	.706
600	.085	950	.683	600	.264	950	.710
10	.092	60	.688	10	.270	60	.712
20	.099	70	.691	20	.277	70	.715
30	.108	80	.693	30	.286	80	.716
40	.115	90	.696	40	.288	90	.719
650	.112	1000	.700	650	.279	1000	.721
60	.106	10	.700	60	.272	10	.723
70	.096	20	.703	70	.256	20	.725
80	.098	30	.708	80	.258	30	.728
90	.146	40	.710	90	.314	40	.730
700	.250	1050	.712	700	.398	1050	.731
10	.332	60	.714	10	.452	60	.732
20	.386	70	.716	20	.484	70	.733
30	.416	80	.718	30	.512	80	.734
40	.447			40	.531		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 160 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.048	750	0.504	400	0.126	750	0.559
10	.051	60	.522	10	.139	60	.575
20	.058	70	.540	20	.150	70	.588
30	.062	80	.554	30	.159	80	.600
40	.066	90	.568	40	.166	90	.610
450	.068	800	.581	450	.172	800	.621
60	.070	10	.594	60	.178	10	.630
70	.072	20	.606	70	.183	20	.638
80	.074	30	.616	80	.186	30	.646
90	.076	40	.626	90	.192	40	.654
500	.080	850	.634	500	.200	850	.660
10	.086	60	.642	10	.214	60	.668
20	.094	70	.650	20	.225	70	.674
30	.098	80	.656	30	.232	80	.679
40	.100	90	.662	40	.236	90	.684
550	.104	900	.668	550	.242	900	.689
60	.106	10	.674	60	.248	10	.693
70	.111	20	.679	70	.253	20	.697
80	.116	30	.682	80	.259	30	.700
90	.124	40	.687	90	.266	40	.703
600	.130	950	.690	600	.272	950	.706
10	.136	60	.693	10	.279	60	.709
20	.144	70	.696	20	.286	70	.710
30	.156	80	.699	30	.296	80	.712
40	.157	90	.700	40	.299	90	.714
650	.148	1000	.702	650	.289	1000	.716
60	.138	10	.704	60	.281	10	.716
70	.122	20	.706	70	.265	20	.718
80	.126	30	.708	80	.271	30	.720
90	.198	40	.710	90	.334	40	.722
700	.319	1050	.711	700	.424	1050	.722
10	.388	60	.713	10	.474	60	.724
20	.432	70	.716	20	.504	70	.725
30	.459	80	.718	30	.526	80	.726
40	.483			40	.544		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 242 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.340	400	0.089	750	0.418
10	.040	60	.366	10	.096	60	.425
20	.041	70	.382	20	.105	70	.437
30	.042	80	.396	30	.114	80	.448
40	.044	90	.410	40	.121	90	.458
450	.046	800	.424	450	.127	800	.468
60	.048	10	.437	60	.132	10	.478
70	.048	20	.449	70	.136	20	.488
80	.049	30	.460	80	.141	30	.496
90	.050	40	.471	90	.146	40	.503
500	.050	850	.482	500	.150	850	.512
10	.050	60	.492	10	.155	60	.520
20	.051	70	.502	20	.159	70	.527
30	.052	80	.511	30	.162	80	.537
40	.052	90	.520	40	.164	90	.542
550	.053	900	.528	550	.166	900	.548
60	.054	10	.536	60	.169	10	.554
70	.054	20	.544	70	.172	20	.560
80	.055	30	.551	80	.176	30	.566
90	.056	40	.558	90	.181	40	.571
600	.059	950	.564	600	.186	950	.576
10	.061	60	.569	10	.194	60	.580
20	.065	70	.575	20	.202	70	.584
30	.072	80	.578	30	.212	80	.588
40	.080	90	.582	40	.224	90	.591
650	.085	1000	.586	650	.231	1000	.593
60	.089	10	.590	60	.236	10	.595
70	.087	20	.593	70	.235	20	.597
80	.089	30	.598	80	.240	30	.598
90	.111	40	.600	90	.272	40	.600
700	.175	1050	.602	700	.324	1050	.600
10	.225	60	.606	10	.355	60	.601
20	.268	70	.609	20	.376	70	.601
30	.303	80	.613	30	.389	80	.601
40	.323			40	.404		

Dogwood
(Cornus florida L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 282 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.039	750	0.327	400	0.089	750	0.423
10	.040	60	.344	10	.099	60	.440
20	.041	70	.360	20	.108	70	.450
30	.042	80	.375	30	.118	80	.460
40	.043	90	.390	40	.124	90	.470
450	.044	800	.405	450	.130	800	.481
60	.044	10	.418	60	.136	10	.490
70	.045	20	.432	70	.142	20	.500
80	.045	30	.445	80	.145	30	.508
90	.046	40	.458	90	.150	40	.518
500	.048	850	.470	500	.155	850	.526
10	.049	60	.482	10	.162	60	.535
20	.050	70	.494	20	.168	70	.544
30	.050	80	.505	30	.172	80	.552
40	.050	90	.516	40	.176	90	.561
550	.051	900	.526	550	.180	900	.569
60	.052	10	.537	60	.184	10	.576
70	.052	20	.547	70	.188	20	.584
80	.054	30	.556	80	.193	30	.592
90	.056	40	.564	90	.199	40	.598
600	.058	950	.572	600	.204	950	.603
10	.061	60	.578	10	.211	60	.608
20	.066	70	.583	20	.219	70	.612
30	.072	80	.588	30	.229	80	.616
40	.080	90	.591	40	.236	90	.618
650	.082	1000	.594	650	.238	1000	.620
60	.084	10	.598	60	.237	10	.622
70	.080	20	.600	70	.231	20	.624
80	.086	30	.601	80	.238	30	.624
90	.125	40	.602	90	.280	40	.625
700	.196	1050	.602	700	.331	1050	.625
10	.237	60	.602	10	.360	60	.625
20	.266	70	.602	20	.380	70	.625
30	.288	80	.602	30	.398	80	.625
40	.309			40	.412		

Milkweed
(Asclepias syriaca L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 122 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.056	750	0.146	400	0.105	750	0.387
10	.058	60	.156	10	.111	60	.399
20	.058	70	.160	20	.116	70	.408
30	.060	80	.169	30	.124	80	.418
40	.062	90	.179	40	.130	90	.428
450	.062	800	.190	450	.138	800	.438
60	.064	10	.200	60	.146	10	.447
70	.065	20	.211	70	.154	20	.456
80	.066	30	.224	80	.160	30	.465
90	.068	40	.236	90	.167	40	.473
500	.070	850	.248	500	.176	850	.482
10	.072	60	.260	10	.186	60	.490
20	.072	70	.272	20	.197	70	.498
30	.074	80	.284	30	.205	80	.506
40	.076	90	.296	40	.212	90	.512
550	.078	900	.309	550	.220	900	.520
60	.079	10	.322	60	.226	10	.526
70	.081	20	.334	70	.234	20	.534
80	.082	30	.346	80	.240	30	.540
90	.084	40	.357	90	.246	40	.546
600	.086	950	.368	600	.251	950	.550
10	.088	60	.378	10	.256	60	.555
20	.090	70	.390	20	.259	70	.561
30	.092	80	.399	30	.263	80	.566
40	.092	90	.409	40	.267	90	.570
650	.095	1000	.417	650	.265	1000	.574
60	.096	10	.426	60	.264	10	.578
70	.098	20	.434	70	.259	20	.582
80	.099	30	.443	80	.262	30	.585
90	.106	40	.449	90	.288	40	.588
700	.114	1050	.454	700	.321	1050	.591
10	.121	60	.458	10	.341	60	.594
20	.128	70	.462	20	.354	70	.598
30	.132	80	.467	30	.366	80	.598
40	.138			40	.377		

Milkweed
(Asclepias syriaca L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 160 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.048	750	0.142	400	0.110	750	0.358
10	.048	60	.150	10	.115	60	.369
20	.048	70	.156	20	.121	70	.376
30	.049	80	.165	30	.128	80	.385
40	.050	90	.173	40	.134	90	.394
450	.052	800	.182	450	.142	800	.402
60	.053	10	.192	60	.150	10	.410
70	.055	20	.200	70	.156	20	.418
80	.056	30	.211	80	.162	30	.425
90	.058	40	.221	90	.168	40	.432
500	.059	850	.232	500	.176	850	.440
10	.060	60	.242	10	.184	60	.448
20	.062	70	.251	20	.192	70	.454
30	.064	80	.262	30	.200	80	.462
40	.066	90	.272	40	.206	90	.468
550	.068	900	.284	550	.212	900	.474
60	.070	10	.293	60	.218	10	.481
70	.071	20	.304	70	.224	20	.486
80	.074	30	.314	80	.228	30	.492
90	.075	40	.324	90	.232	40	.498
600	.076	950	.334	600	.236	950	.503
10	.078	60	.342	10	.240	60	.508
20	.080	70	.353	20	.243	70	.513
30	.082	80	.362	30	.248	80	.516
40	.084	90	.370	40	.250	90	.521
650	.085	1000	.378	650	.249	1000	.525
60	.086	10	.386	60	.248	10	.528
70	.086	20	.393	70	.244	20	.531
80	.089	30	.400	80	.248	30	.534
90	.096	40	.404	90	.270	40	.536
700	.106	1050	.410	700	.299	1050	.538
10	.114	60	.413	10	.316	60	.541
20	.121	70	.416	20	.328	70	.542
30	.128	80	.418	30	.340	80	.544
40	.135			40	.350		

Milkweed
(Asclepias syriaca L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 282 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.059	750	0.175	400	0.100	750	0.359
10	.061	60	.184	10	.106	60	.368
20	.062	70	.192	20	.111	70	.376
30	.064	80	.200	30	.118	80	.386
40	.065	90	.209	40	.124	90	.395
450	.066	800	.218	450	.130	800	.403
60	.068	10	.228	60	.136	10	.412
70	.070	20	.238	70	.142	20	.420
80	.072	30	.248	80	.149	30	.428
90	.074	40	.258	90	.154	40	.436
500	.076	850	.268	500	.162	850	.444
10	.078	60	.278	10	.170	60	.452
20	.080	70	.290	20	.179	70	.460
30	.082	80	.300	30	.186	80	.466
40	.084	90	.310	40	.191	90	.473
550	.086	900	.320	550	.198	900	.480
60	.089	10	.332	60	.204	10	.486
70	.091	20	.341	70	.209	20	.493
80	.094	30	.352	80	.214	30	.498
90	.096	40	.360	90	.218	40	.503
600	.099	950	.370	600	.222	950	.508
10	.100	60	.378	10	.226	60	.513
20	.102	70	.385	20	.230	70	.516
30	.104	80	.394	30	.234	80	.520
40	.107	90	.400	40	.236	90	.524
650	.108	1000	.406	650	.238	1000	.525
60	.110	10	.410	60	.238	10	.526
70	.110	20	.416	70	.234	20	.528
80	.114	30	.420	80	.238	30	.530
90	.123	40	.422	90	.264	40	.530
700	.135	1050	.424	700	.295	1050	.530
10	.144	60	.425	10	.316	60	.530
20	.152	70	.425	20	.329	70	.530
30	.160	80	.425	30	.340	80	.530
40	.168			40	.350		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 17 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.052	750	0.560	400	0.060	750	0.546
10	.054	60	.616	10	.066	60	.574
20	.055	70	.626	20	.071	70	.581
30	.056	80	.632	30	.074	80	.586
40	.056	90	.636	40	.076	90	.588
450	.056	800	.638	450	.081	800	.591
60	.056	10	.641	60	.085	10	.593
70	.056	20	.642	70	.086	20	.596
80	.058	30	.644	80	.088	30	.598
90	.058	40	.645	90	.091	40	.600
500	.059	850	.646	500	.104	850	.601
10	.061	60	.648	10	.136	60	.603
20	.082	70	.650	20	.176	70	.605
30	.106	80	.650	30	.215	80	.606
40	.122	90	.652	40	.231	90	.608
550	.125	900	.652	550	.238	900	.609
60	.122	10	.652	60	.234	10	.611
70	.108	20	.653	70	.219	20	.612
80	.094	30	.653	80	.200	30	.614
90	.084	40	.652	90	.186	40	.614
600	.081	950	.649	600	.179	950	.612
10	.076	60	.643	10	.171	60	.610
20	.071	70	.638	20	.160	70	.608
30	.068	80	.636	30	.154	80	.608
40	.066	90	.636	40	.145	90	.610
650	.061	1000	.639	650	.126	1000	.612
60	.058	10	.642	60	.111	10	.616
70	.055	20	.646	70	.094	20	.621
80	.054	30	.651	80	.088	30	.626
90	.060	40	.656	90	.125	40	.630
700	.112	1050	.660	700	.228	1050	.632
10	.220	60	.662	10	.330	60	.636
20	.335	70	.665	20	.412	70	.638
30	.453	80	.666	30	.484	80	.640
40	.527			40	.524		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 49 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.044	750	0.578	400	0.058	750	0.594
10	.044	60	.601	10	.064	60	.612
20	.045	70	.614	20	.068	70	.623
30	.046	80	.621	30	.070	80	.630
40	.048	90	.626	40	.072	90	.634
450	.049	800	.630	450	.079	800	.638
60	.049	10	.632	60	.085	10	.642
70	.050	20	.634	70	.086	20	.646
80	.050	30	.636	80	.088	30	.648
90	.050	40	.638	90	.093	40	.650
500	.052	850	.640	500	.109	850	.652
10	.059	60	.642	10	.144	60	.656
20	.076	70	.644	20	.189	70	.658
30	.104	80	.645	30	.228	80	.660
40	.118	90	.646	40	.246	90	.662
550	.123	900	.648	550	.251	900	.664
60	.119	10	.649	60	.250	10	.666
70	.104	20	.650	70	.234	20	.666
80	.088	30	.650	80	.214	30	.668
90	.079	40	.650	90	.200	40	.668
600	.075	950	.647	600	.194	950	.666
10	.070	60	.642	10	.185	60	.662
20	.064	70	.636	20	.172	70	.658
30	.061	80	.635	30	.166	80	.656
40	.059	90	.635	40	.156	90	.658
650	.054	1000	.637	650	.134	1000	.660
60	.050	10	.642	60	.116	10	.664
70	.048	20	.646	70	.095	20	.668
80	.046	30	.651	80	.088	30	.672
90	.052	40	.654	90	.134	40	.677
700	.109	1050	.658	700	.254	1050	.682
10	.216	60	.662	10	.358	60	.684
20	.349	70	.665	20	.412	70	.688
30	.451	80	.668	30	.510	80	.691
40	.533			40	.564		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 90 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.584	400	0.062	750	0.583
10	.040	60	.600	10	.067	60	.600
20	.044	70	.613	20	.072	70	.610
30	.047	80	.620	30	.074	80	.616
40	.048	90	.625	40	.076	90	.620
450	.048	800	.628	450	.084	800	.626
60	.049	10	.631	60	.088	10	.629
70	.049	20	.632	70	.090	20	.632
80	.049	30	.635	80	.092	30	.635
90	.050	40	.637	90	.100	40	.637
500	.052	850	.639	500	.118	850	.639
10	.065	60	.642	10	.154	60	.642
20	.091	70	.643	20	.196	70	.643
30	.120	80	.644	30	.224	80	.646
40	.134	90	.646	40	.243	90	.649
550	.136	900	.646	550	.248	900	.650
60	.131	10	.648	60	.244	10	.652
70	.112	20	.648	70	.229	20	.653
80	.094	30	.649	80	.212	30	.655
90	.085	40	.648	90	.200	40	.655
600	.081	950	.646	600	.194	950	.653
10	.075	60	.642	10	.186	60	.650
20	.068	70	.637	20	.175	70	.648
30	.064	80	.636	30	.170	80	.646
40	.060	90	.638	40	.158	90	.649
650	.052	1000	.639	650	.130	1000	.651
60	.050	10	.643	60	.119	10	.655
70	.045	20	.648	70	.099	20	.660
80	.044	30	.652	80	.098	30	.664
90	.061	40	.656	90	.184	40	.668
700	.146	1050	.662	700	.312	1050	.670
10	.216	60	.664	10	.394	60	.672
20	.392	70	.666	20	.458	70	.676
30	.477	80	.668	30	.513	80	.678
40	.547			40	.556		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 122 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.554	400	0.056	750	0.571
10	.040	60	.585	10	.060	60	.585
20	.042	70	.600	20	.064	70	.595
30	.042	80	.607	30	.065	80	.600
40	.043	90	.612	40	.066	90	.605
450	.044	800	.615	450	.070	800	.607
60	.044	10	.616	60	.074	10	.610
70	.044	20	.619	70	.074	20	.612
80	.044	30	.620	80	.076	30	.614
90	.044	40	.622	90	.079	40	.616
500	.044	850	.624	500	.091	850	.617
10	.047	60	.625	10	.120	60	.618
20	.056	70	.627	20	.162	70	.620
30	.070	80	.628	30	.198	80	.621
40	.081	90	.629	40	.214	90	.622
550	.084	900	.630	550	.219	900	.624
60	.081	10	.630	60	.216	10	.624
70	.070	20	.631	70	.200	20	.625
80	.060	30	.631	80	.179	30	.625
90	.054	40	.630	90	.165	40	.624
600	.052	950	.626	600	.158	950	.622
10	.050	60	.621	10	.150	60	.618
20	.047	70	.615	20	.139	70	.615
30	.046	80	.612	30	.134	80	.612
40	.044	90	.614	40	.124	90	.614
650	.042	1000	.617	650	.104	1000	.617
60	.041	10	.622	60	.092	10	.622
70	.040	20	.626	70	.078	20	.626
80	.040	30	.631	80	.074	30	.631
90	.042	40	.635	90	.110	40	.635
700	.074	1050	.639	700	.216	1050	.639
10	.156	60	.643	10	.316	60	.641
20	.282	70	.646	20	.406	70	.642
30	.408	80	.648	30	.486	80	.644
40	.500			40	.522		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 160 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.038	750	0.598	400	0.060	750	0.582
10	.038	60	.628	10	.066	60	.596
20	.042	70	.638	20	.070	70	.605
30	.043	80	.644	30	.071	80	.611
40	.044	90	.648	40	.073	90	.614
450	.045	800	.650	450	.078	800	.616
60	.046	10	.651	60	.082	10	.618
70	.046	20	.654	70	.082	20	.621
80	.047	30	.655	80	.084	30	.622
90	.048	40	.656	90	.089	40	.622
500	.050	850	.656	500	.104	850	.623
10	.058	60	.658	10	.135	60	.624
20	.079	70	.659	20	.172	70	.626
30	.103	80	.660	30	.212	80	.626
40	.116	90	.661	40	.228	90	.626
550	.120	900	.661	550	.234	900	.626
60	.116	10	.660	60	.230	10	.626
70	.102	20	.660	70	.214	20	.626
80	.088	30	.660	80	.194	30	.626
90	.080	40	.660	90	.181	40	.626
600	.076	950	.656	600	.174	950	.624
10	.071	60	.653	10	.166	60	.620
20	.064	70	.650	20	.154	70	.618
30	.062	80	.648	30	.150	80	.616
40	.059	90	.648	40	.139	90	.616
650	.053	1000	.650	650	.120	1000	.616
60	.050	10	.652	60	.106	10	.619
70	.045	20	.654	70	.089	20	.621
80	.044	30	.656	80	.084	30	.622
90	.052	40	.658	90	.128	40	.625
700	.114	1050	.659	700	.241	1050	.626
10	.220	60	.660	10	.346	60	.627
20	.349	70	.662	20	.436	70	.628
30	.476	80	.663	30	.508	80	.630
40	.554			40	.556		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 242 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.041	750	0.558	400	0.050	750	0.576
10	.042	60	.582	10	.056	60	.600
20	.044	70	.596	20	.060	70	.608
30	.046	80	.602	30	.064	80	.614
40	.049	90	.606	40	.066	90	.618
450	.050	800	.610	450	.070	800	.622
60	.050	10	.612	60	.075	10	.624
70	.050	20	.615	70	.076	20	.626
80	.050	30	.616	80	.078	30	.628
90	.050	40	.618	90	.081	40	.630
500	.050	850	.619	500	.094	850	.632
10	.057	60	.621	10	.119	60	.634
20	.072	70	.622	20	.156	70	.636
30	.095	80	.623	30	.191	80	.637
40	.108	90	.624	40	.209	90	.638
550	.114	900	.625	550	.216	900	.640
60	.111	10	.626	60	.214	10	.640
70	.099	20	.626	70	.200	20	.641
80	.084	30	.626	80	.183	30	.641
90	.076	40	.626	90	.170	40	.642
600	.073	950	.624	600	.164	950	.640
10	.069	60	.620	10	.156	60	.636
20	.064	70	.616	20	.146	70	.634
30	.061	80	.614	30	.140	80	.632
40	.059	90	.615	40	.134	90	.632
650	.054	1000	.616	650	.115	1000	.634
60	.051	10	.620	60	.102	10	.635
70	.049	20	.622	70	.086	20	.636
80	.048	30	.625	80	.078	30	.640
90	.050	40	.626	90	.111	40	.640
700	.096	1050	.630	700	.208	1050	.642
10	.188	60	.630	10	.309	60	.644
20	.312	70	.630	20	.402	70	.645
30	.430	80	.631	30	.492	80	.645
40	.512			40	.544		

Mountain Laurel
(Kalmia latifolia L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 282 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.045	750	0.610	400	0.044	750	0.597
10	.046	60	.630	10	.050	60	.603
20	.048	70	.643	20	.054	70	.615
30	.050	80	.650	30	.058	80	.622
40	.050	90	.654	40	.061	90	.627
450	.050	800	.658	450	.064	800	.631
60	.050	10	.660	60	.068	10	.635
70	.050	20	.664	70	.070	20	.639
80	.050	30	.666	80	.072	30	.642
90	.051	40	.668	90	.076	40	.644
500	.054	850	.670	500	.084	850	.647
10	.060	60	.672	10	.116	60	.650
20	.078	70	.674	20	.154	70	.652
30	.100	80	.676	30	.186	80	.654
40	.111	90	.676	40	.202	90	.656
550	.115	900	.678	550	.208	900	.657
60	.110	10	.678	60	.204	10	.658
70	.096	20	.680	70	.189	20	.658
80	.082	30	.680	80	.170	30	.660
90	.075	40	.678	90	.159	40	.660
600	.072	950	.676	600	.154	950	.657
10	.068	60	.672	10	.146	60	.654
20	.062	70	.667	20	.135	70	.650
30	.060	80	.666	30	.130	80	.650
40	.058	90	.665	40	.121	90	.649
650	.054	1000	.666	650	.105	1000	.650
60	.050	10	.668	60	.092	10	.650
70	.048	20	.670	70	.077	20	.651
80	.048	30	.671	80	.073	30	.652
90	.055	40	.672	90	.110	40	.652
700	.110	1050	.672	700	.209	1050	.653
10	.219	60	.672	10	.316	60	.654
20	.356	70	.673	20	.418	70	.655
30	.474	80	.674	30	.503	80	.656
40	.562			40	.562		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 17 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.046	750	0.528	400	0.087	750	0.546
10	.048	60	.543	10	.094	60	.556
20	.050	70	.553	20	.100	70	.565
30	.051	80	.560	30	.102	80	.570
40	.054	90	.566	40	.104	90	.575
450	.056	800	.570	450	.108	800	.580
60	.056	10	.574	60	.113	10	.584
70	.056	20	.578	70	.114	20	.586
80	.058	30	.582	80	.116	30	.589
90	.059	40	.586	90	.118	40	.592
500	.062	850	.589	500	.128	850	.596
10	.074	60	.592	10	.149	60	.598
20	.096	70	.596	20	.177	70	.601
30	.124	80	.599	30	.207	80	.603
40	.137	90	.602	40	.221	90	.607
550	.144	900	.606	550	.228	900	.609
60	.142	10	.608	60	.227	10	.611
70	.130	20	.611	70	.216	20	.612
80	.115	30	.614	80	.200	30	.614
90	.106	40	.616	90	.191	40	.616
600	.101	950	.616	600	.186	950	.616
10	.096	60	.616	10	.178	60	.616
20	.088	70	.616	20	.169	70	.616
30	.084	80	.616	30	.164	80	.616
40	.081	90	.618	40	.156	90	.618
650	.073	1000	.620	650	.141	1000	.621
60	.066	10	.622	60	.129	10	.624
70	.058	20	.627	70	.112	20	.628
80	.055	30	.632	80	.106	30	.632
90	.068	40	.634	90	.138	40	.634
700	.140	1050	.638	700	.228	1050	.638
10	.249	60	.641	10	.330	60	.641
20	.356	70	.642	20	.412	70	.642
30	.442	80	.643	30	.477	80	.643
40	.472			40	.521		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 49 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.041	750	0.504	400	0.082	750	0.545
10	.044	60	.518	10	.087	60	.551
20	.045	70	.529	20	.091	70	.560
30	.046	80	.536	30	.094	80	.568
40	.048	90	.541	40	.095	90	.574
450	.050	800	.546	450	.100	800	.580
60	.052	10	.550	60	.104	10	.584
70	.052	20	.555	70	.105	20	.590
80	.054	30	.560	80	.106	30	.593
90	.055	40	.564	90	.109	40	.598
500	.060	850	.567	500	.119	850	.602
10	.074	60	.571	10	.138	60	.606
20	.099	70	.575	20	.168	70	.610
30	.128	80	.578	30	.196	80	.614
40	.142	90	.582	40	.210	90	.618
550	.150	900	.585	550	.216	900	.621
60	.149	10	.588	60	.216	10	.624
70	.136	20	.592	70	.205	20	.626
80	.121	30	.594	80	.191	30	.628
90	.112	40	.596	90	.182	40	.630
600	.108	950	.598	600	.176	950	.632
10	.102	60	.598	10	.170	60	.631
20	.094	70	.598	20	.161	70	.630
30	.090	80	.600	30	.156	80	.630
40	.084	90	.602	40	.150	90	.632
650	.074	1000	.604	650	.132	1000	.634
60	.066	10	.608	60	.121	10	.638
70	.056	20	.614	70	.105	20	.642
80	.054	30	.616	80	.099	30	.645
90	.072	40	.622	90	.133	40	.648
700	.152	1050	.625	700	.224	1050	.651
10	.256	60	.628	10	.320	60	.654
20	.349	70	.631	20	.403	70	.656
30	.422	80	.634	30	.468	80	.660
40	.474			40	.517		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 90 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.038	750	0.364	400	0.086	750	0.404
10	.040	60	.384	10	.091	60	.422
20	.044	70	.399	20	.094	70	.435
30	.048	80	.412	30	.098	80	.448
40	.052	90	.426	40	.100	90	.462
450	.054	800	.441	450	.102	800	.474
60	.056	10	.454	60	.104	10	.486
70	.058	20	.468	70	.106	20	.499
80	.059	30	.482	80	.108	30	.511
90	.062	40	.494	90	.110	40	.522
500	.066	850	.508	500	.118	850	.534
10	.074	60	.521	10	.128	60	.546
20	.082	70	.533	20	.139	70	.558
30	.091	80	.544	30	.149	80	.568
40	.098	90	.556	40	.155	90	.578
550	.104	900	.566	550	.162	900	.588
60	.109	10	.576	60	.166	10	.596
70	.109	20	.584	70	.168	20	.604
80	.108	30	.592	80	.168	30	.612
90	.108	40	.600	90	.168	40	.618
600	.109	950	.606	600	.168	950	.624
10	.107	60	.612	10	.166	60	.628
20	.105	70	.616	20	.164	70	.631
30	.106	80	.620	30	.164	80	.635
40	.102	90	.626	40	.159	90	.639
650	.096	1000	.631	650	.149	1000	.644
60	.087	10	.636	60	.139	10	.650
70	.078	20	.641	70	.126	20	.654
80	.078	30	.646	80	.128	30	.659
90	.110	40	.650	90	.167	40	.662
700	.184	1050	.653	700	.248	1050	.668
10	.245	60	.658	10	.301	60	.672
20	.290	70	.664	20	.338	70	.676
30	.324	80	.668	30	.367	80	.678
40	.346			40	.384		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 122 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.039	750	0.324	400	0.086	750	0.355
10	.041	60	.352	10	.088	60	.384
20	.042	70	.367	20	.089	70	.398
30	.042	80	.380	30	.090	80	.412
40	.044	90	.395	40	.091	90	.426
450	.046	800	.410	450	.092	800	.440
60	.047	10	.424	60	.092	10	.454
70	.048	20	.438	70	.093	20	.468
80	.049	30	.452	80	.094	30	.483
90	.050	40	.468	90	.096	40	.496
500	.054	850	.484	500	.099	850	.511
10	.058	60	.498	10	.104	60	.525
20	.064	70	.512	20	.110	70	.538
30	.070	80	.526	30	.118	80	.551
40	.076	90	.539	40	.122	90	.564
550	.081	900	.552	550	.128	900	.576
60	.086	10	.564	60	.132	10	.588
70	.088	20	.576	70	.135	20	.598
80	.089	30	.585	80	.136	30	.608
90	.090	40	.594	90	.138	40	.617
600	.092	950	.604	600	.139	950	.625
10	.092	60	.611	10	.139	60	.632
20	.091	70	.618	20	.139	70	.638
30	.092	80	.624	30	.140	80	.644
40	.092	90	.631	40	.139	90	.650
650	.088	1000	.636	650	.132	1000	.654
60	.082	10	.642	60	.126	10	.660
70	.074	20	.646	70	.116	20	.665
80	.074	30	.652	80	.115	30	.670
90	.094	40	.656	90	.144	40	.674
700	.151	1050	.660	700	.204	1050	.678
10	.205	60	.662	10	.252	60	.680
20	.246	70	.666	20	.288	70	.683
30	.287	80	.670	30	.324	80	.687
40	.308			40	.342		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 160 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.041	750	0.362	400	0.088	750	0.371
10	.044	60	.390	10	.089	60	.396
20	.048	70	.402	20	.090	70	.408
30	.050	80	.416	30	.091	80	.420
40	.050	90	.430	40	.092	90	.432
450	.052	800	.444	450	.093	800	.444
60	.054	10	.456	60	.094	10	.456
70	.055	20	.470	70	.094	20	.470
80	.056	30	.482	80	.096	30	.481
90	.060	40	.495	90	.098	40	.492
500	.064	850	.508	500	.100	850	.503
10	.070	60	.521	10	.106	60	.514
20	.079	70	.534	20	.114	70	.524
30	.087	80	.545	30	.120	80	.534
40	.092	90	.556	40	.125	90	.544
550	.100	900	.567	550	.131	900	.553
60	.105	10	.578	60	.135	10	.562
70	.108	20	.586	70	.138	20	.570
80	.110	30	.596	80	.140	30	.578
90	.112	40	.603	90	.142	40	.584
600	.113	950	.611	600	.144	950	.591
10	.112	60	.616	10	.144	60	.596
20	.112	70	.624	20	.144	70	.600
30	.116	80	.628	30	.148	80	.606
40	.114	90	.633	40	.146	90	.610
650	.106	1000	.637	650	.138	1000	.612
60	.100	10	.641	60	.131	10	.616
70	.088	20	.645	70	.122	20	.620
80	.090	30	.650	80	.124	30	.622
90	.125	40	.651	90	.158	40	.625
700	.197	1050	.655	700	.226	1050	.626
10	.255	60	.657	10	.276	60	.630
20	.292	70	.662	20	.306	70	.631
30	.328	80	.663	30	.345	80	.633
40	.347			40	.357		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 242 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.039	750	0.352	400	0.100	750	0.363
10	.040	60	.376	10	.101	60	.396
20	.044	70	.392	20	.102	70	.411
30	.046	80	.406	30	.103	80	.426
40	.049	90	.424	40	.104	90	.442
450	.050	800	.439	450	.104	800	.458
60	.050	10	.454	60	.105	10	.472
70	.052	20	.470	70	.105	20	.488
80	.054	30	.485	80	.106	30	.504
90	.056	40	.500	90	.106	40	.519
500	.060	850	.516	500	.109	850	.535
10	.064	60	.530	10	.112	60	.550
20	.070	70	.545	20	.118	70	.564
30	.078	80	.558	30	.124	80	.576
40	.082	90	.571	40	.126	90	.589
550	.086	900	.583	550	.131	900	.600
60	.092	10	.594	60	.136	10	.612
70	.096	20	.605	70	.139	20	.624
80	.099	30	.615	80	.141	30	.632
90	.101	40	.623	90	.142	40	.640
600	.102	950	.631	600	.144	950	.648
10	.102	60	.638	10	.144	60	.655
20	.104	70	.644	20	.144	70	.660
30	.107	80	.650	30	.148	80	.666
40	.108	90	.654	40	.146	90	.671
650	.102	1000	.658	650	.140	1000	.676
60	.094	10	.662	60	.135	10	.680
70	.090	20	.666	70	.126	20	.684
80	.089	30	.672	80	.125	30	.688
90	.110	40	.674	90	.150	40	.691
700	.190	1050	.676	700	.208	1050	.694
10	.241	60	.678	10	.258	60	.696
20	.274	70	.680	20	.291	70	.698
30	.312	80	.680	30	.327	80	.700
40	.333			40	.348		

White Oak
(Quercus alba L.)

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 282 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.040	750	0.406	400	0.087	750	0.424
10	.042	60	.441	10	.092	60	.450
20	.046	70	.450	20	.096	70	.465
30	.050	80	.468	30	.100	80	.478
40	.051	90	.481	40	.102	90	.491
450	.053	800	.494	450	.104	800	.504
60	.055	10	.506	60	.106	10	.517
70	.056	20	.518	70	.108	20	.529
80	.059	30	.530	80	.110	30	.541
90	.062	40	.541	90	.114	40	.552
500	.066	850	.552	500	.119	850	.564
10	.074	60	.563	10	.126	60	.576
20	.082	70	.572	20	.136	70	.586
30	.091	80	.582	30	.144	80	.596
40	.095	90	.590	40	.150	90	.606
550	.102	900	.598	550	.156	900	.615
60	.109	10	.606	60	.162	10	.622
70	.112	20	.612	70	.166	20	.630
80	.115	30	.620	80	.170	30	.636
90	.117	40	.625	90	.172	40	.642
600	.116	950	.630	600	.172	950	.648
10	.114	60	.635	10	.170	60	.652
20	.114	70	.638	20	.171	70	.656
30	.118	80	.640	30	.175	80	.660
40	.115	90	.645	40	.172	90	.662
650	.107	1000	.646	650	.161	1000	.665
60	.099	10	.647	60	.154	10	.668
70	.088	20	.650	70	.141	20	.670
80	.090	30	.652	80	.145	30	.671
90	.128	40	.652	90	.189	40	.672
700	.208	1050	.653	700	.264	1050	.672
10	.275	60	.654	10	.320	60	.672
20	.322	70	.655	20	.356	70	.673
30	.369	80	.656	30	.390	80	.674
40	.389			40	.409		

Beech
(Fagus grandifolia Ehrh.)
Branch Incompletely Broken Off One Month Previous To Measurements

Spectral Directional Reflectance, R_λ, of Foliage Stored in a Covered Metal Container for the Number of Hours Indicated (See Appendix A for Copies of the Original Recording Sheets).

TIME IN STORAGE 122 HOURS

Ventral Side				Dorsal Side			
Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ	Wave Length mμ	R_λ
400	0.052	750	0.582	400	0.052	750	0.574
10	.060	60	.597	10	.060	60	.588
20	.070	70	.610	20	.066	70	.600
30	.076	80	.620	30	.073	80	.609
40	.078	90	.630	40	.077	90	.619
450	.081	800	.638	450	.081	800	.628
60	.084	10	.646	60	.084	10	.634
70	.085	20	.652	70	.086	20	.640
80	.086	30	.658	80	.091	30	.646
90	.090	40	.664	90	.096	40	.652
500	.098	850	.669	500	.104	850	.657
10	.109	60	.674	10	.118	60	.662
20	.124	70	.679	20	.132	70	.666
30	.138	80	.682	30	.149	80	.670
40	.150	90	.684	40	.166	90	.672
550	.168	900	.688	550	.185	900	.675
60	.176	10	.690	60	.203	10	.678
70	.184	20	.692	70	.219	20	.680
80	.189	30	.694	80	.235	30	.682
90	.194	40	.696	90	.249	40	.685
600	.197	950	.699	600	.264	950	.686
10	.200	60	.700	10	.278	60	.688
20	.203	70	.701	20	.292	70	.690
30	.206	80	.702	30	.304	80	.690
40	.194	90	.703	40	.308	90	.692
650	.170	1000	.705	650	.300	1000	.692
60	.161	10	.706	60	.300	10	.694
70	.149	20	.708	70	.296	20	.696
80	.153	30	.709	80	.309	30	.697
90	.236	40	.711	90	.368	40	.699
700	.378	1050	.712	700	.444	1050	.700
10	.464	60	.713	10	.491	60	.700
20	.514	70	.714	20	.521	70	.701
30	.546	80	.714	30	.546	80	.702
40	.567			40	.560		