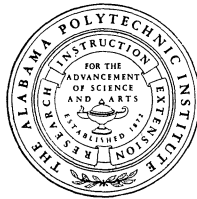


COLD
DAMAGE *to* CAMELLIAS
Winter of 1950-51



AGRICULTURAL EXPERIMENT STATION
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COLD DAMAGE to CAMELLIAS

Winter of 1950-51

M. J. FUNCHESS, *Dean Emeritus*

INTRODUCTION

FOR MANY YEARS camellias have been grown to a limited extent along the Atlantic and Gulf Coasts of this country. Even a casual reading of publications concerning this shrub reveals that from time to time during the past 100 or more years plantings have been made from Texas to points in New York and some New England States. In more recent years, camellia production has been extensive along the Pacific Coast also. Because of climatic limitations, plantings have been most extensive in a belt that extends some 100 or 150 miles inland. Fear of cold damage to plants has been the chief factor restricting extensive development farther from the coastlines. However, a great upsurge of interest in camellias in recent years stimulated efforts to grow the plant much farther from the coastal areas. As a result, numerous plantings of varying sizes may be found now outside the areas that were once thought to be safe.

Greatly increased interest of collectors is responsible for very rapid expansion of commercial nurseries, and millions of camellia plants are being produced annually to satisfy demands of the ultimate consumer. With this expansion of consumer interest, there has come a multiplicity of varieties having a multiplicity of characteristics and susceptibilities. The camellia grower has many problems with which to deal, including fertilizer and watering schedules, protection of plants against attacks of insects and diseases, selection of varieties best suited to his environment, and management of his collection in such a way as to avoid as far as possible damage to his plants from weather, mechanical causes, and the like. Chief among these problems is damage to both blooms and plants caused by occasional severe cold weather. This report deals primarily with the latter problem.

STUDY of COLD DAMAGE to CAMELLIAS

On the morning of November 25, 1950, the United States Weather Bureau recorded the coldest weather ever experienced in some of the Gulf and South Atlantic Coast States for that time of year. As a matter of fact, temperatures recorded in a number of places in the central parts of Alabama, Georgia, Mississippi, and South Carolina were among the record lows during the past 50 years. On that date (morning of November 25, 1950), the United States Weather Bureau recorded temperatures of 10 degrees at Tuscaloosa, 5 degrees at Birmingham, 9 degrees at Auburn, 13 degrees at Montgomery, 17 degrees at Dothan, 19 degrees at Bay Minette, and 22 degrees at Mobile.

As a result of these record low temperatures, there was very severe injury to blooms and bloom buds of many varieties of camellias in the Gulf Coast and South Atlantic Coast areas, as well as some injury to wood of a few varieties. The injury was very severe to both wood and blooms of many varieties in the general latitude of Birmingham, Alabama, and Columbus and Macon, Georgia. The circumstances afforded a good opportunity to study the relative effects of low temperatures on blooms and wood of many camellia varieties in the area. Officials of the Alabama Agricultural Experiment Station decided to take advantage of this opportunity, and assigned to the writer the responsibility of conducting a survey to determine the relative amount of injury sustained by camellia varieties during the unprecedented cold weather that prevailed during the last week of November, 1950.

Results of the survey are divided into two phases. The first phase deals with cold injury to blooms and bloom buds only. Conditions favorable for a study of this phase were found in the general latitude of Mobile and Dothan, Alabama, where the cold was sufficiently severe to injure blooms and bloom buds of many, but not all, varieties. The second phase of the survey is concerned with cold injury to wood of camellia plants. In the general latitude of Birmingham, Alabama, and Columbus and Macon, Georgia, practically all blooms and bloom buds were killed outright on November 25, 1950, and there was very serious injury to wood of many varieties. Therefore, the second phase of the survey was conducted at nurseries and collections located in this area where lower temperatures prevailed than those recorded in the Mobile and Dothan areas. The data recorded in both phases of this survey were obtained by personal visits with nurserymen

and collectors. Without their full cooperation, it would have been quite impossible to secure as full information as is herewith presented. The results of the two phases are reported separately.

RESULTS of FIRST PHASE of SURVEY

Presented in Table 1 are the results obtained in the survey to determine the relative degree of cold injury to blooms and bloom buds of camellia varieties. The data are arranged in four groups,

TABLE 1. SUMMARY REPORT OF COLD DAMAGE TO CAMELLIA BLOOM BUDS

1. Varieties having less than 10 per cent normal bloom buds*

✓Alba Plena	Jessica
Aspasea	Kenny
Bessie Morse Bellingrath	Lotus
Black Dragon	Marchioness of Exeter
Candidissima	Margherita Caleoni
Catherine Cathcart	Mathotiana
✓C. M. Hovey	Pink Ball
✓Daikagura	Purity
Eleanor Haygood	Rev. John Bennett
Fimbriata	R. Superba, Var.
Florence Stratton	Royal White
Frizzle White	St. Andre
✓Gigantea	Tinky Lee
Governor Warren	Waterloo
Hakurakuten	Woodville Red
Henningham Smith	

2. Varieties having 10 to 41 per cent normal bloom buds*

Admiral Nimitz	Mad. Chiang Kai Shek
Alba Superba	Martha Brice
Alba Supreme	Mrs. Baldwin Wood
Bessie McArthur	Mrs. Charles Cobb
Big Beauty	Mrs. Freeman Weiss
✓Chalice	Mrs. K. Sawada
Col. Firey	Noblissima
✓Debutante	Opelousus Peony
Dr. Campbell	Otome
Duchess of Sutherland	Pearl Harbor
Elizabeth	Pink Star
Enrico Bettoni	Queen Bessie
Fanny Bolis	Rainy Sun
Fred Sander	✓Rose Dawn
French Imperator	✓Sarah Frost
Glenn 40	✓September Morn
Goshoguruma	Susan Carter
Imperator	Sweetie Vera
John Illges	Thelma Dale
Kellingtonia	Victory White
King Lear	✓Ville de Nantes
K. Sawada	White Crane
Lady Van Sittart	White Giant
La Reine, Var.	White Swan
Laurel Leaf	William Penn

(Continued)

* After November 25, 1950, freeze.

TABLE 1 (Continued). SUMMARY REPORT OF COLD DAMAGE TO CAMELLIA BLOOM BUDS

3. Varieties having 41 to 61 per cent normal bloom buds*

Adolphe Audusson	Margaret Higdon
Angel's Blush	Margarie Magnificent
Aitonia	Marion Mitchell
Beauty of Holland	Mrs. Chas. Simons
Berence Boddy	Mrs. Harry Sinclair
Blush Hibiscus	Northern Light
Casablanca	✓ Pink Perfection
✓ C. Elegans	Pride of Greenville
Christine Lee	✓ Professor Sargent
Donckelari	Razen Zome
Duncan Bell	Rev. John G. Drayton
General Patton	Robert E. Lee
Gloire de Nantes	Robert Norton
Jarvis Red	Rosea Mundi
Lady Charlotte	Showa-no-Homare
Lady Hume's Blush	Smiling Beauty
Lady Jane Gray	Snowdrift
Lady Mary Cromartie	Virgin's Blush
Lindsay Neill	✓ White Chandelari
	White King

4. Varieties having 61 to 100 per cent normal bloom buds*

Akebono	Imura
Aunt Jetty	Iwane Shibori
Brown's Red	Jas. Hyde Porter
Campbell Ashley	Kimberly
Colletti	Kumasaki
Compte de Nesselrode	Lurie's Favorite
Derbiana	Madam Adele
Dr. W. G. Lee	Madam Maintenon
Dubonnet	Marchioness of Salisbury
Eleanor of Fairroaks	Monjisu
Elizabeth Arden	Nagasaki
✓ Empress	Pink Duchess of Sutherland
Eugene Bolen	Red Hibiscus
Fairhope	Rhapsody
Finlandia, Var.	Sarasa
Firebrand	Semi Double Blush
Firegold—Dr. Shepherd	Sgt. Barrios
Flame	Tri Color
Gov. Leche	Vedrene
✓ Gov. Mouton	✓ White Empress
H. A. Downing	White Hibiscus
✓ Herme	William Downing

* After November 25, 1950, freeze.

listing varieties by percentage of normal bloom buds after the November 25, 1950, freeze as follows: Less than 10 per cent normal, 10 to 41 per cent normal, 41 to 61 per cent normal, and more than 61 per cent normal.

The reader should remember that it is not possible to secure exact information on this kind of problem by means of a survey. In all probability, a number of factors determine whether a given variety of camellia is hardy or is injured by a given set of weather

conditions. All such factors may not even be known or understood. Consequently, all that can be accomplished by a survey is to give, as far as possible, a general measure of the *relative* resistance or susceptibility to cold injury of the varieties included in the study. It must also be recognized that there will be found instances where results observed by individuals may differ from those set out for any given variety in this report. At present, there is no way to explain these kinds of variations in the reactions of plants within a variety.

The varieties listed in Table 1 appeared two or more times in the survey records. However, there were many varieties that were found only once in making this phase of the survey. The actual value of reporting on a variety that was found only once in a number of nurseries and collections has been questioned. Certainly it might be unwise to attach too much significance to a report based on only single observations. Nevertheless, many of the newer and rarer varieties fall in this category. Therefore, after again cautioning the reader against putting too much confidence in a report based on only one observation, varieties with only one listing are given alphabetically. The figure appearing after the variety name is the percentage of bloom buds that appeared to be, or proved to be, normal after the freeze of November 25, 1950.

Admiration, 0; Amabilis, 100; Amazing, 75; Anita, 100; Ann Flo Lee, 100; Anna Frost, 100; Antigoni, 75; Apple Blossom, 0.

Baby Sargent, 100; Barbara Morgan, 0; Beni-Kirin, 12; Betty Boardman, 100; Bleichroeder, 100; Brilliant Star, 90.

Caleb Cope, 0; Cardinal Richelieu, 0; Carone Fonde, 0; Compte de Nesselrode, 100; Clara Brooks, 100; Clara Myrick, 0; C. M. Wilson, 0; C. N. Hastie, 100; Col. Von Wassonhove, 0; Countess of Orkney, 20; Creole Pink, 100; Crepe Rosette, 0; Crown Jewel, 5; Crusader, 100.

Dante, 0; D. C. Strother, 0; Dr. Moore, 95; Duc de Orleans, 10; Duncan Fletcher, 50.

E. H. Folk, 0; Eleanor Franchetti, 0; Emmet Pfungstl, 100; Etienne de Bore, 100.

Finlandia, 0; Flamingo, 0; Flesh Pink Allen, 0; Francine, 0; Frankie Bray, 100.

Galilee, 0; George W. Towle, 100; Giant White, 0; Gilbert Fisher, 100.

Haku-Tsuru, 100; Henry Middleton, 75; Hoshiguruma, 100. Il Cygno, 0.

James Allan, 0; Jason, 100; Jessie Katz, 0; Joan of Arc, 0; Joseph Holland, 100; Joseph Pfungstl, 0; Josephine Hearn, 100; Judge Hammond, 0.

Lady Allingham, 0; Lady Dunn, 0; Lady Marian, 100; Lady of the Lake, 0; LaPeppermint, 0; Leona Bolen, 90; Leucantha, 100; Lila Rosa, 5; Linda Barry, 100; Lois Taylor, 100; Lord Salisbury, 5; Louise Maclay, 100.

Mad. de Strekoloff, 0; Madge Miller, 100; Mansfield, Var., 100; Mary Hare, 0; Mehita, 0; Mollie Moore Davis, 100; Mon Louis Pink, 100; Mrs. Chas. Burgess, 100; Mrs. Sandusky, 0; Mrs. William Thompson, 0.

Nelson, 100; Nafsika, 100.

Opelousus Pink, 100; Orchid Pink, 100; Oriental Brit, 100.

Pansy McIntyre, 100; Pax, 0; Pink Amabilis, 100; Pink Beautiful, 100; Pink Fimbriata, 0; Pink Lace, 0; Pink Strekoloff, 90; Pride of Descanso, 0; Prince Albert, 0; Princess Bacciocchi, 0.

Robinson 56, 100; Rosalaris, 0; Rosary, 100; Rose Emery, 0; Rose Glory, 100; Rose Mallow, 0.

Scarlett O'Hara, 0; Salmon Queen, 0; San Antonio, 0; Sandusky's Pink, 100; Sanki Nishiki, 0; S. de Bienville, 0; S. de B. Litou, 0; Shiro Botan, 0; Shiro Daikagura, 60; Sofia, 100; Stevens Pink, 80; Swan (Y. Dori), 100.

Tallahassee Girl, 100; Tautonia, 100; The Bell, 0; T. K. Var., 100.

Variabilis, 0; Vashti, 0; Victory Maid, 0.

White Gem, 100; White Hope, 0; White Star, 0; William Rosa, 40; Winnie Davis, 100.

RESULTS of SECOND PHASE of SURVEY

Earlier in this report, there was brief mention of the low temperatures experienced on November 25, 1950, in the general latitude of Birmingham, Alabama, to Macon, Georgia. These low temperatures caused very severe injury to the plants of many varieties of camellias and destroyed about 99 per cent of all bloom buds. Consequently, the cold-damage-to-camellia survey in this area dealt entirely with extent of injury sustained by plants. Observations were recorded relative to exposure, degree of defoliation, and loss of terminal and lateral growth buds. Most nurseries and collections were examined in February and early March of 1951, but a second visit with a number of cooperators was made in May and early June to check some of the earlier observations.

In Table 2, all varieties that appeared more than once in the survey are grouped either as (1) hardy, (2) intermediate, or (3) sensitive to cold. This grouping is based on a careful study of the reports on each variety. At once it is obvious that such a classification involves human judgment to a considerable extent, and as such it is subject to a certain amount of error. It should also be remembered that the results of a survey cannot be abso-

lutely factual. However, they may give a good generalized picture of conditions.

The data in Tables 1 and 2 should be carefully considered since they relate to the value of any given variety of camellia. It is possible that a variety may be very cold-hardy with respect to

TABLE 2. DEGREE OF COLD INJURY TO CAMELLIAS (VARIETIES APPEARING MORE THAN ONCE IN SURVEY)

Name	No.	Exposure	Name	No.	Exposure
HARDY			HARDY (Continued)		
Anne Lindbergh	3	Shade	H. A. Downing	9	Shade
Anna Frost	2	Shade	Hishikariato	5	Sun
Amabalis	4	Shade	Herme Sport	4	Shade
Anna Lee	3	Sun			
Angel's Blush	3	Sun	Imura	11	Shade
After Glow	2	Shade	Iwane Shibori	6	Sun
Aunt Jetty	5	Sun			
			Jos. Holland	2	Shade
Blush Hibiscus	5	Shade	Jas. Hyde Porter	4	Shade
Berenice Boddy	6	Shade	Jessie Katz	5	Shade
Barbara Morgan	5	Shade	J. J. Pringle Smith	4	Shade
Brown's Red	2	Sun			
			K. Sawada	13	Shade
C. M. Wilson	12	Shade	Kumasaka	29	Sun
Cameo Pink	10	Shade			
Capt. Martin's Favorite	4	Shade	Lurie's Favorite	8	Shade
Casa Blanca	11	Shade	Lila Rosa	6	Shade
Countess of Orkney	2	Shade	Liberty Belle	6	Shade
Crepe Rosette	3	Shade	Lawrence Walker	7	Sun
Clover's White	4	Shade	Lena Jackson	7	Sun
Cleopatra	2	Sun	Louise Maclay	5	Sun
Capt. John Smith	2	Shade	Lotus	7	Shade
Crusader	3	Sun	Lady Charlotte	4	Shade
Carnation	2	Shade	Lady Hume's Blush	3	Shade
C. de Nesselrode	7	Shade	Lady Van Sittart Sport	2	Sun
			Louise Onetta	4	Shade
Donckelari	17	Shade	Lucille Flannagan	3	Shade
Dr. W. G. Lee	5	Sun			
Dainty	2	Shade	Magnoliaeflora	15	Sun
D. C. Strother	4	Shade	Mrs. Chas. Simons	7	Shade
Dr. Tinsley	8	Shade	Mary Charlotte	8	Shade
			Martha Brice	6	Shade
Eleanor of Fairoaks	5	Shade	Margarie Magnificent	9	Shade
E. H. Folk	7	Shade	Madam Maintenon	4	Sun
Etienne de Bore	2	Shade	Mrs. K. Sawada	13	Shade
Eleanor Nobile	2	Sun	Margaret Higdon	8	Shade
Emmet Barnes	4	Shade	Morning Glow	8	Shade
			Marian Mitchell	8	Shade
Flame	10	Shade	Margaret Jack	5	Shade
Finlandia	7	Shade	Margaret Walker	3	Shade
Fred Sander	5	Sun	Max Goodly	3	Shade
Firebrand	6	Shade	Miss Sacramento	2	Shade
Firegold	6	Shade	Mollie Moore Davis	5	Shade
			Martha Wright	2	Shade
Gov. Mouton	12	Sun	Meredith Lake	2	Shade
Geo. Barrett	5	Shade	Miss Ozark	2	Shade

(Continued)

TABLE 2 (Continued). DEGREE OF COLD INJURY TO CAMELLIAS (VARIETIES APPEARING MORE THAN ONCE IN SURVEY)

Name	No.	Exposure	Name	No.	Exposure
HARDY (Continued)			INTERMEDIATE (Continued)		
Oranda Gasa	3	Shade	Brilliant	7	Sun
Pax	4	Shade	B. M. Bellingrath	10	Shade
Princess Nagaskie	11	Shade	Beau Harp	9	Shade
Prima Donna	4	Shade	B. McArthur	9	Shade
Pride of Descanso	6	Shade	Black Prince	2	Sun
Pearl Harbor	7	Shade	Bryan Wright	3	Sun
Princess Murat	3	Shade	Big Beauty	6	Shade
Pink Calusant	3	Shade	Black Dragon	7	Sun
Pink Glory	5	Sun	Brooklyana	2	Sun
Paulette Goddard	4	Shade	✓ C. Elegans	19	Shade
Pink Silk Satin	2	Sun	Col. Firey	10	Sun
Pink Sarasa	2	Shade	Campbelli	3	Sun
Rev. John Bennett	13	Shade	C. M. Hovey	8	Sun
Rhapsody	2	Sun	Campbell Ashley	6	Sun
Royal White	5	Shade	Cho-no-Hanagata	8	Sun
Rio Rita	3	Shade	Cheerful	3	Sun
Red Eagle	2	Sun	Cliveana	2	Sun
R. L. Wheeler	2	Sun	Daikagura	25	Sun
Semi Double Blush	4	Shade	Derbiana	6	Sun
Sarasa	5	Sun	Dr. Newsome	2	Sun
Shin Akebono	3	Shade	Daiterin	4	Sun
Showa-no-Homare	2	Sun	Dante	3	Sun
Tri Color Seboldi	5	Sun	Dr. Campbell	2	Sun
Tallahassee Girl	3	Shade	Empress	22	Sun
Tiara	6	Shade	Enrico Bettoni	8	Shade
Tinky Lee	3	Shade	Elizabeth Arden	3	Shade
Triphosia	2	Shade	Elizabeth LeBey	5	Sun
T. K. Variegated	5	Sun	Emma	4	Shade
Ville de Nantes	23	Shade	Elizabeth Flemming	2	Sun
Virgin's Blush	13	Shade	Frizzle White	10	Sun
Vedrene	4	Shade	Glenn 40	22	Sun
Victory Maid	3	Shade	Goshoguruma	10	Shade
✓ White Elegans	2	Shade	Gen. Patton	5	Sun
White Hibiscus	2	Sun	Gov. Warren	7	Shade
Yobeki Dori	8	Shade	Galilee	6	Shade
INTERMEDIATE			Gen. Eisenhower	2	Sun
Adolphe Audusson	21	Sun	High Hat	16	Shade
Arthur Middleton	2	Sun	Haka Tsuru	7	Shade
Akebono	6	Sun	Herme Pink	3	Sun
Anita	4	Sun	Hana Fuki	7	Shade
Adm. Nimitz	12	Shade	Imperator	6	Shade

(Continued)

TABLE 2 (continued). DEGREE OF COLD INJURY TO CAMELIAS (VARIETIES APPEARING MORE THAN ONCE IN SURVEY)

Name	No.	Exposure	Name	No.	Exposure
INTERMEDIATE (Continued)			INTERMEDIATE (Continued)		
Jessica	11	Sun	St. Andre	9	Sun
Jenny Jones	3	Sun	Snowdrift	6	Sun
Judge Barrett	4	Sun	Smiling Beauty	6	Shade
Kenny	8	Sun	Sarah Frost	7	Sun
King Lear	6	Sun	Shiro Botan	9	Shade
Lady Van Sittart	15	Sun	Symphonette	2	Sun
Letitia Schrader	8	Sun	Sophia	2	Sun
LaReine, Var.	11	Sun	Simeon	4	Sun
Laurel Leaf	14	Sun	Strawberry Blonde	5	Shade
Leucantha	5	Sun	Star Cream Peony	2	Sun
Lallarook	3	Sun	Sgt. Barrios	5	Sun
Lady of the Lourde	2	Sun	Shu Beni Hitoe	4	Sun
Lada Lucille	2	Sun	Teutonia	5	Sun
Lila Lee	2	Sun	White Empress	18	Shade
Mathotiana	38	Sun	White King	4	Shade
Monarch	9	Sun	Ward-Daikagura	9	Shade
Mrs. Wm. Thompson	2	Sun	White Daikagura	3	Sun
Mary Hare	2	Sun	White Princess	2	Sun
Mrs. Freeman Weiss	5	Sun	Yohei Shiro	2	Sun
McFerrin	2	Sun			
Mrs. Harry Sinclair	3	Sun	SENSITIVE		
Margaret Dykes	2	Sun	Alba Supreme	3	
Mrs. Josephine Hearne	2	Sun	Arajishi	12	
Monroeville Red	2	Sun	Apple Blossom	3	
Otome	8	Shade	Alba Superba	5	
Oniji	2	Sun	Alba Plena*	16	
Orchid Pink	4	Sun	Aitonia	2	
Olive Lee Shepp	2	Sun	Aspaea	6	
Pink Star	9	Shade	Beauty of Holland	6	
Peona Flora	8	Sun	Catherine Cathcart	7	
Pride of Greenville	6	Sun	Colletti	8	
Panache	2	Sun	Claudia Phelps	4	
Prince Albert	2	Sun	Cardinal Richelieu	3	
Peach Blossom	3	Sun	California	6	
Pope Pius	8	Sun	Clara Myrick	3	
Queen Bessie	9	Shade	Celestine	2	
Rosea Superba	18	Sun	Caprice	2	
Rev. John G. Drayton	8	Shade	Crown Jewels	2	
Rosary	3	Sun	Charlotte Bradford	2	

(Continued)

* Of all varieties encountered in survey, those in bold face type are the most sensitive to cold.

TABLE 2 (continued). DEGREE OF COLD INJURY TO CAMELIAS (VARIETIES APPEARING MORE THAN ONCE IN SURVEY)

Name	No.	Name	No.
SENSITIVE (Continued)		SENSITIVE (Continued)	
Debutante	25	Magnolia Queen	8
Duchess of Sutherland*	18	Marchioness of Exeter	8
Duc de Orleans	2	Marie Wood	2
Deacon Dodd	2	Madam de Streckloff	3
Elizabeth Boardman	8	Mrs. Walter Allen	4
Elizabeth	5	Margherita Caleone	3
Emperor of Russia	7	Margaret Hertrich	3
Eleanor Welch	2	Nagasaki	12
Emperor	2	Noblissima	4
Eleanor Haygood	4	Pink Perfection	17
Fanny Bolis	7	Pink Ball	11
Fimbriata	7	Purity	8
French Imperator	5	Pink Duchess of Sutherland	6
Francine	3	Pink Lady	4
Florence Stratton	5	Princess Baciocchi	2
Gloire de Nantes	7	Professor Sargent	18
Gigantea	12	Rose Dawn	13
Gov. Leche	3	Rose Mallow	8
Herme	12	Rainy Sun	7
Henningham Smith	7	Razen Zome	4
Hakurakuten	8	Reticulata	2
Il Tremento	2	Red Hibiscus	5
Jarvis Red	10	Sweetie Vera	9
James Allen, Var.	2	September Morn	11
Julia Dial	2	St. Elmo	6
Jos. Pfingstl	5	Shiro Daikagura	3
Kellingtonia	5	Stardust	2
Lindsay Neill	18	Salmon Queen	2
Lady Jane Gray	18	Thelma Dale	12
LaPeppermint	4	Victor Emmanuel	20
Lady Dunn	2	Victory White	11
Lady of the Lake	2	Woodville Red	17
Lady Mary Cromartie	2	White Giant	11
Lady Saumerez	2	Waterloo	8
Monjisu	8	Wm. Downing	6
Mrs. Chas. Cobb	10	Wm. Penn	6
Mrs. Baldwin Wood	9	White Queen	5
Mad. Chiang Kai Shek	10		
Madam Adele	6		
Madge Miller	2		

* Of all varieties encountered in survey, those in bold face type are the most sensitive to cold.

damage to the plant, but its blooms may be very sensitive to cold. For example, bloom buds of *Mathotiana* (Purple Dawn, Purple Emperor) are killed by moderate cold, but the plant itself will stand fairly severe weather without injury.

Later in this report there is a brief discussion of the apparent importance of shade as a factor in protecting plants from cold injury. This is considered to be so important that it is taken into account in making the groupings that appear in Table 2. The reader is cautioned, therefore, to note whether a variety classification is modified by a requirement of shade. For example, the variety *Amabilis* is classed as hardy. Of the four reports for this variety, all were for plants that were shaded to some extent. If all had been in full sun, the results might have been different, although there is no way to determine such results. These kinds of considerations should warn the reader to make full use of all the data that are reported in the table.

It will be noted that Table 2 does not include any variety that did not appear at least twice in the survey. However, there were many varieties that occurred but once in the records. The actual value of reporting on a variety that was found only once in a number of nurseries and collections is questionable. Certainly it might not be wise to attach too much significance to a report based on only one observation. Nevertheless, many of the newer and rarer varieties fall in this category. Therefore, after again cautioning the reader against putting too much confidence in a report based on only one observation, varieties with only one listing are reported in Table 3.

TABLE 3. DEGREE OF COLD INJURY TO CAMELLIAS (VARIETIES APPEARING ONLY ONCE IN SURVEY)

Name	Exposure	Name	Exposure
DEAD OR SEVERELY INJURED		DEAD OR SEVERELY INJURED	
Abundance	Shade		(Continued)
Alba Gigantea	Sun	Mad. Hahn	Sun
Angelo Cochet	Shade	Marie Louise	Shade
Aunt Bessie	Sun	Matose	Shade
		Mermaid	Sun
Brilliant Star	Shade	Millie Beau	Sun
		Minnie Maddern Fiske	Sun
Cali. Pink Star	Shade	Miss Pasadena	Sun
Carl Tourje	Sun	Mrs. Lurman	Sun
Chalmers Perfection	Shade		
Clara Brock	Shade	Pink Pompom	Sun
Clara Brooks	Shade	Pink Poppy	Sun
Claudia Lee	Sun	Pink Shell	Shade
Conflagration	Sun	Prince of Orange	Sun
Coronde Fondi	Shade	Princess Irene	Sun
Countess of Derby	Sun		
		Red Carnation	Shade
Daisy Banks	Sun	Red Prince	Sun
Dearie Mealing	Sun	Red Wonder	Sun
Dr. Carver	Shade	Ramona Thompson	Sun
Dr. Wilds	Sun	Roosevelt Blues	Sun
		Rosea, Var.	Shade
Ella Drayton	Sun	Rox Crawley	Sun
Emma Balchen	Sun	Ruth Royer	Sun
Empress of Russia	Shade		
Evalyn Lee Blanck	Shade	Sarah Watson	Shade
Evening Star	Sun	Sastome	Sun
		S. de Bohand	Sun
Fielders Pink	Sun	S. de B. Litou	Sun
Fragrant Striped	Sun	Shak-ko	Sun
		Snow Ball	Sun
Haryo Shiro	Sun	Souvenir	Sun
Hatchett's Var.	Sun	Star Red	Sun
Henry Middleton	Sun	St. Valentine	Sun
Imperator	Sun	Toto An	Sun
Iwo Jima	Sun	Tripod	Sun
		Tylertown Pink	Sun
Jim Boldman	Sun		
Josephine Duell	Sun	Vanity Fair	Sun
		Virginalis	Shade
Lady Langtry	Sun		
Lady Marion	Sun	White Beauty	Sun
Lila Ramsey	Sun		
Lois Taylor	Sun	Yuki Botan	Sun
Loreli	Shade		
Lovely Illusion	Sun	INTERMEDIATE	
		Abbe Wilder	Shade
		American Beauty	Sun
		Anna Schawabe	Sun

(Continued)

TABLE 3 (Continued). DEGREE OF COLD INJURY TO CAMELLIAS (VARIETIES APPEARING ONLY ONCE IN SURVEY)

Name	Exposure	Name	Exposure
INTERMEDIATE (Continued)		LITTLE OR NONE	
Barbara Cole	Sun	Ada Wilson	Sun
Bella Romana	Sun	Alice Stokes	Sun
C. Lavini Maggi	Sun	Althea Parti Color	Sun
Constellation	Shade	Ann Flo Lee	Shade
Crimson Sunset	Shade	Ann McDonald	Shade
Dixie	Sun	Arabella	Shade
Dr. F. L. Cato	Sun	Ballerina	Sun
Edith Churchwell	Sun	Bertha A. Harms	Shade
Elata	Shade	Betty Boardman	Sun
Ellen McKenzie	Shade	Bill Lee	Sun
Gardenia	Sun	Blanche Aurea	Sun
Grady McCord	Sun	Bleichroeder	Shade
Gunell	Sun	Cali. Tri Color	Shade
Jubilee	Sun	Carole Lombard	Shade
Judge Vaughn	Shade	Catherine Stanton	Shade
Mad. Calusant Pink	Sun	Chrissee	Sun
Margaret Mitchell	Sun	Clarke	Sun
Martha Betts	Sun	C. N. Hastie	Shade
Matsu Kosa	Sun	Comtesse Niegant	Shade
Moss Point Red	Shade	Dave Strother	Shade
Mrs. Clarke	Sun	David Gerbing	Sun
Mrs. Hardwick	Sun	Daybreak	Shade
Oveta	Sun	Duchess of Northumberland	Sun
Rose Glory	Sun	Eddie Wheeler	Sun
Rosalaris	Shade	Ed. S. Northrup	Sun
Rosa Lee	Sun	Eleanor McGrady	Shade
Rebya Ellis	Sun	Eleanor Van Cleve	Shade
Robt. Casa Major, Var.	Sun	Emmet Pfingstl	Shade
Rubra Virginalis	Shade	Ermine	Sun
Rye Heriot	Sun	Eugene Bolen	Shade
Shiro Toma	Sun	Finlandia Rosea	Sun
Sylvia	Sun	Flesh Pink Peony	Shade
Tutcheria	Sun	Frances Lanahan	Shade
Wacissa	Sun	Franky Bray	Shade
Williams Middleton	Sun	Garnus Flora	Shade
		Gov. Wm. Bradford	Shade
		Grande Flora Rosea	Shade
		Gulatt's White	Shade

(Continued)

TABLE 3 (Continued). DEGREE OF COLD INJURY TO CAMELLIAS (VARIETIES APPEARING ONLY ONCE IN SURVEY)

Name	Exposure	Name	Exposure
LITTLE OR NONE (Continued)		LITTLE OR NONE (Continued)	
Harlequin	Shade	Radiance	Sun
Hatsu Arashi	Shade	Red Dale	Shade
Highirimer	Sun	Robert E. Lee	Shade
Hirenge	Shade	Rochelle	Sun
Hollis Boardman	Shade	Rosea Plena	Shade
Il Cygno	Sun	Rose and Snow	Shade
J. S. Bradford	Sun	Rose Emery	Sun
Kosugano	Shade	Sanko Nishiki	Sun
Ladiner's Pink	Sun	Seboldi Alba	Sun
Leila	Shade	Southern Belle	Shade
Louise Weick	Shade	Strom	Sun
Marquis de Montcalm	Shade	Sunny South	Shade
Martha Boardman	Shade	Supresse Noblissima	Shade
Martha Thaggard	Shade	Sweet 16	Shade
Mon Louie Pink	Shade	T. G. 13	Shade
Moonlight	Shade	Tinsie	Shade
Mrs. F. L. Gibson	Sun	Varegata	Shade
Oki-no-nomi	Shade	Variabilis	Shade
Otome White	Sun	Warratah	Shade
Paul Howard's White	Shade	White Herme	Shade
Payne's Red	Sun	White Symphony	Sun
Pearl Maxwell	Shade	Wilks, Var.	Shade
Pink Elegans	Shade		
Pink Hibiscus	Sun		
Plumfield White	Shade		
Princess Lucille	Shade		

GENERAL DISCUSSION

Effect of Shade

An analysis of the data obtained in the survey showed that a large number of camellia plants reported to be injured little or none were shaded to some degree. The very important part played by shade is made clear by an analysis of data for **all** varieties, which may be summarized as follows: Of all records of killed or severely injured plants, 431 were in sun while 481 were in shade to some extent; there were 88 plants in shade and 71 plants in sun in the group that sustained intermediate injury; and of those that suffered little or no injury, 717 were in shade and 209 were in sun.

A similar study of the data for those varieties that appear but once in the reports shows that, of those reported dead or severely injured, 55 were in sun and 18 were in shade; in the group sustaining intermediate injury, 27 were in sun while 9 were shaded to some degree; but, of the 85 plants that were injured little or none, 30 were in sun and 55 were in shade. These data strongly indicate that shade is one very important factor affecting the degree of injury sustained by camellias in times of very low temperatures.

Effect of Dormancy

Another very important factor determining whether low temperatures injure camellias is the degree of dormancy of the plants at the time of severe cold weather. Support for this is found in the reports of the United States Weather Bureau. On the morning of November 25, 1950, temperatures ranging from 5 degrees at Birmingham to 8 or 10 degrees at Auburn, Alabama, and at Columbus, Fort Valley, and Macon, Georgia, were recorded. Throughout this area, camellias suffered very severely from the low temperatures. From 50 to 80 per cent of all varieties in some collections were killed or severely injured. On the same day, the Weather Bureau recorded temperatures ranging from 17 degrees at Dothan, Alabama, to 22 degrees at Mobile. Though liners, young grafts, and certain tender varieties of camellias in exposed situations were more or less severely injured, in general the injury to most camellia plants was relatively slight in the Dothan and Mobile areas. Then came the freeze of February 3, 1951, when the following temperatures were officially recorded in Alabama: Birmingham, 7; Auburn, 9; Tuscaloosa, 6; Montgomery (A.P.),

10; Dothan (A.P.), 12; Bay Minette, 10; Fairhope, 10; and Mobile (A.P.), 11. In the general latitude of Birmingham, Tuscaloosa, Auburn, and Montgomery, the February freeze was as severe as the November freeze; whereas, in the general latitude of Dothan, Bay Minette, Fairhope, and Mobile, there were recorded some of the lowest temperature records of all time. Yet damage to camellias by the February freeze was negligible.

It is the opinion of the writer that camellia plants had become dormant by the time of the February freeze, and it was due to this dormancy that the camellia plants suffered little or no damage anywhere in Alabama at that time. Here, again, the reader is cautioned to remember that the foregoing statement is not absolutely factual, but it is supported by what a layman may call "circumstantial evidence." In the opinion of the author, the conclusion is entirely sound.

Based on evidence of the importance of shade and of dormancy, it would appear that a healthy, dormant camellia plant that has the benefit of reasonably good protection from direct rays of sunlight will stand very low temperatures.

Can man hasten dormancy in camellias? Possibly, yes. Some nurserymen are strongly of the opinion that no nitrogenous fertilizer should be applied after about June 1. However, there is a very wide divergence of opinion among nurserymen and collectors as to what constitutes a good fertilizer schedule. Nearly every nurseryman and collector interviewed followed a fertilization schedule that differed to some extent from that of each of the other growers contacted. There is urgent need for a greatly expanded program of experiments with fertilizers for camellias. In the meantime, it may be repeated that "circumstantial" evidence indicates that dormancy may be hastened by omitting nitrogen to fertilizer applications made between June 1 and December 1.

Finally, it should be recalled that this report was prompted by the effects of an extremely severe freeze that occurred during the last week of November, and that a similar very severe freeze about mid-season caused little or no damage to camellias anywhere in Alabama. According to the laws of chance, 75 years may pass before another such freeze comes as early in the season. While nurserymen and collectors have suffered severe losses because of this very early freeze, there is evidence that great interest in camellias will continue.

ACKNOWLEDGMENTS

This survey was made possible by the cooperation of the following nurserymen and collectors:

ALABAMA. John C. Ball, Jr., M. J. Funchess, and H. G. Good, Auburn; O. J. Mancini and J. H. Stacy, Bay Minette; Miss Elizabeth Aust, J. V. Blackwell, Mrs. C. F. Manley, and E. D. Mercer, Birmingham; Malbis Nursery, Daphne; Mark Cannon, Carter's Nursery, W. F. Covington, B. P. Poyner, and Dr. W. H. Turner, Dothan; Azalea Glen Nursery, Loxley; Flowerwood, Overlook, Pace, Semmes, and Tom Dodd Nurseries, Mobile; Mrs. R. T. Ashurst, Jr., and Dalraida Nursery, Montgomery; C. S. Shealy and Mrs. J. A. Walker, Opelika; East Alabama Nursery, Phenix City; Mrs. C. B. Grimes, Guthrie-Barton Nursery, and Judge Reuben Wright, Tuscaloosa; and Judge William Varner, Tuskegee.

GEORGIA. John Illges, Columbus; Dr. W. G. Lee, Macon; and D. C. Strother, Fort Valley.

